Jan. 9, 1945. W. SUMMERBELL 2,366,758

FIRING MECHANISM

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Fig. 1

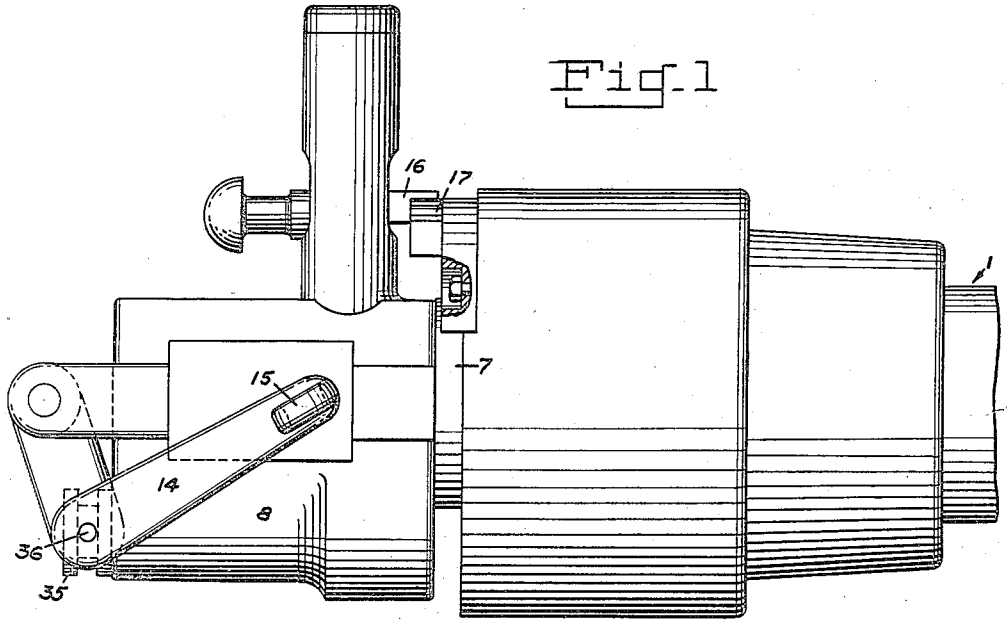


Fig. 3

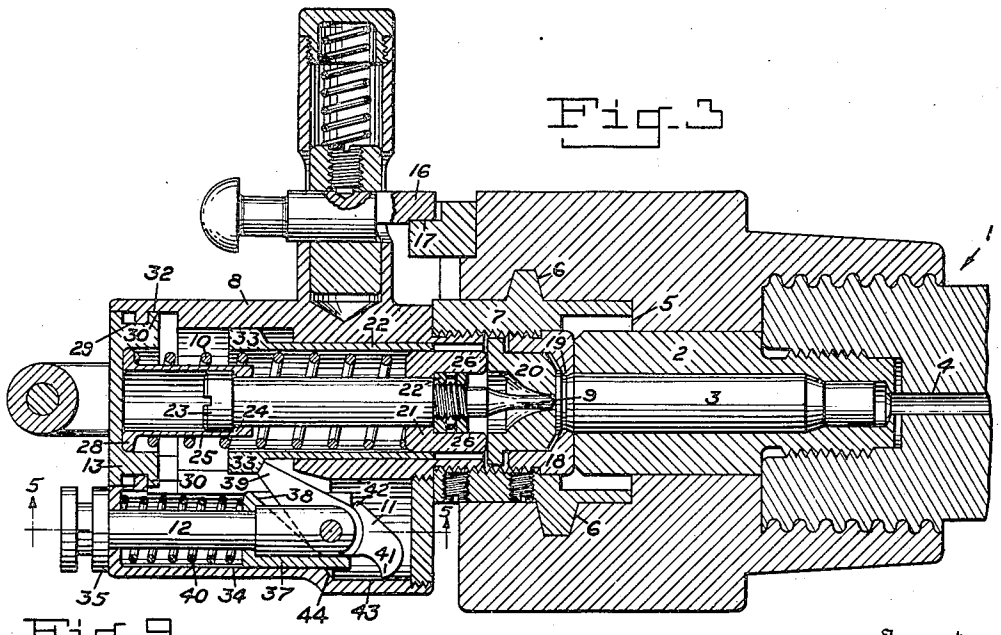
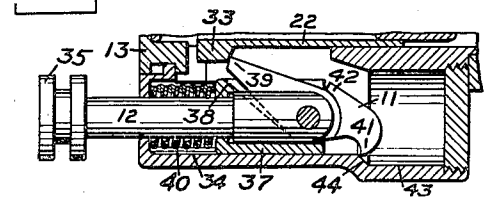


Fig. 9



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FIRING MECHANISM

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Fig. 2

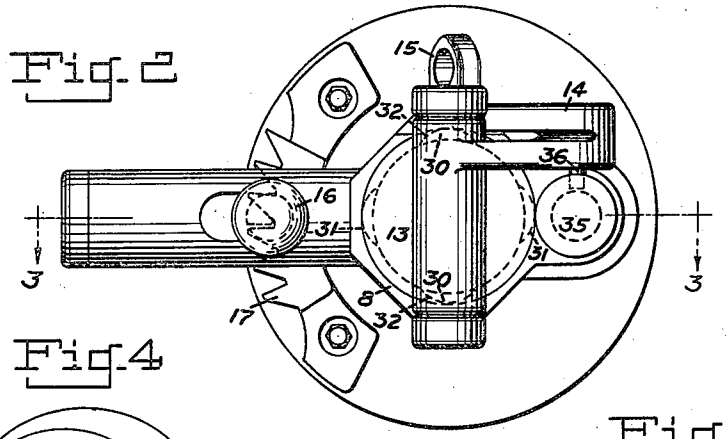


Fig. 4

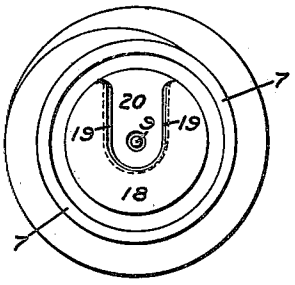


Fig. 5

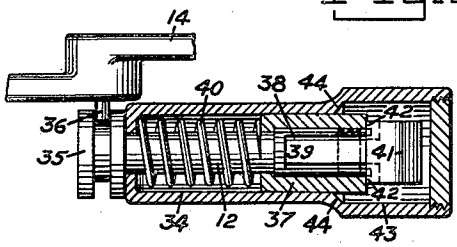


Fig. 8

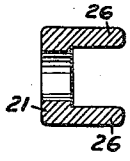


Fig. 6

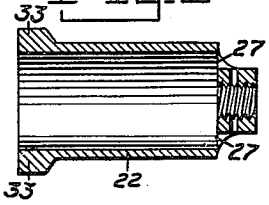


Fig. 7

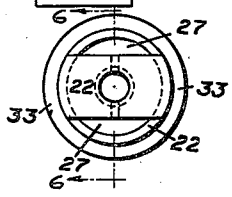
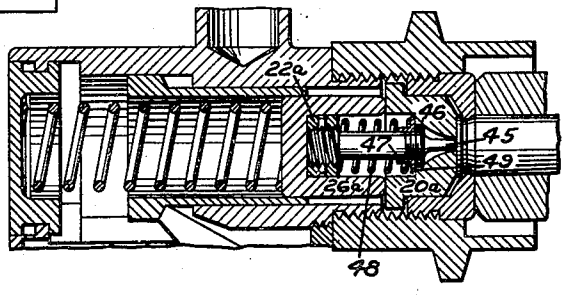


Fig. 10



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UNITED STATES PATENT OFFICE

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FIRING MECHANISM

William Summerbell, Washington, D. C.

Application July 16, 1942, Serial No. 451,192

8 Claims. (Cl. 89—27)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

This invention relates to a percussive firing mechanism and more particularly to such a mechanism for a breech loading gun of the separate loading type, wherein a primer cartridge is fired through a passage in the obturator to ignite the main charge.

It is an object of this invention to provide an improved firing mechanism of the type in which a single continuous pull of the lanyard serves to tension the firing pin spring and to release the same to drive the firing pin to firing position.

It is a further object to provide a firing mechanism in which the firing pin spring is rendered inoperative in the later part of the firing stroke to enable the firing pin to move to firing position under its own inertia and to provide for immediate retraction of the firing pin sufficient to clear the primer cartridge.

An additional object is to provide improved means of securing a primer cartridge to the firing mechanism and to provide for automatic control of the headspacing thereof thus improving the certainty of firing.

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 drawings in which:

Figure 1 is a top plan view of the firing mechanism and a portion of the breech block.

Figure 2 is a rear end elevational view corresponding to Figure 1.

Figure 3 is a horizontal longitudinal sectional view on the line 3—3 of Figure 2.

Figure 4 is a front elevational view of a part of the firing mechanism.

Figure 5 is a vertical longitudinal sectional view of the pull rod and tripper mechanism taken on the line 5—5 of Figure 3.

Figure 6 is a longitudinal sectional view of the firing pin sleeve.

Figure 7 is an end elevational view corresponding to Figure 6.

Figure 8 is a longitudinal sectional view of the spring stop collar.

Figure 9 is a partial horizontal longitudinal sectional view showing the tripper and sear in a retracted position taken in the same plane as Figure 3.

Figure 10 is a partial longitudinal sectional view in the same plane as Figure 3 showing a modified firing pin retracting means.

Referring to the drawings by characters of reference there is shown a portion 1 of an obturator breech mechanism of conventional form. The member 1 comprises a chamber defining member 2 housing a primer cartridge 3 and an axial bore 4 leading to the powder chamber of the weapon. The member 1 also includes a rearwardly opening bore 5 coaxial with the member 2 and provided with internal threads 6 for the reception of the firing mechanism.

Broadly the firing mechanism comprises an externally threaded block 7 adapted to screw into the bore 5 and means to secure thereto the primer cartridge 3 in axial alignment with the chamber in the member 2. A firing mechanism housing 8 is secured to the rear end of the block 7 and houses the firing pin 9, firing pin spring 10, tripper 11, pull rod 12 and associated parts to be described in more detail later. A retainer 13 is provided to secure the firing mechanism within the housing and journals are provided on the housing to support the trigger arm 14 which is provided with means to engage the pull rod for actuation of the firing mechanism on pulling a lanyard attached to the eye 15. The housing is further provided with a radially slidable, spring restrained latch 16 adapted to engage in the teeth of a ratchet 17 secured to the rear face of the member 1 for releasably retaining the firing mechanism in the bore.

Referring to the drawings in more detail Figure 4 shows a front elevational view of the primer holder 18 into which the primer cartridge may be inserted from the side and secured by engagement of the extractor groove with the lip 19. From an inspection of Figure 3 it will be seen that the firing pin guide 20 has a limited capacity for axial movement in the block 7 and that the firing pin spring 10 through the medium of the stop collar 21 normally urges the guide 20 forwardly into a position in which the primer cartridge is firmly gripped by engagement between the lip 19 of the primer holder and the front face of the firing pin guide 20. This engagement prevents dropping or displacement of the primer cartridge prior to insertion in the chamber and insures that the headspacing of the primer cartridge will be maintained correct for insuring efficient ignition.

The firing pin 9 is threadably secured to the firing pin sleeve 22, shown in detail in Figures 6 and 7, and the front face of the head 23 of the firing pin is engaged by the rear face of the

inner flange 24 of the retracting collar 25. A stop collar 21 is slidable on the firing pin and has legs 26 projecting through the cut out portions 27 of the sleeve 22. The firing pin spring 10 is engaged between the rear face of the spring stop collar 21 and the front face of the outer flange 28 of the retracting collar 25. A retainer 13 has a portion 29 of reduced diameter extending forwardly into the housing and is provided on the forward end thereof with a pair of opposed locking ears 30. In assembly the retainer is inserted into the end of the housing, the ears 30 passing through cut away openings 31, pressed forwardly against the resistance of the firing pin spring, and given a quarter turn to bring the ears 30 into alignment with the partially cut out seats 32 in the housing in which it is held by the firing pin spring. Disassembly is effected by a reversal of the above procedure. The firing pin retracting device functions generally in the same manner as that shown in my prior Patent No. 2,245,621. Briefly the sleeve 22 is moved rearwardly by the engagement of a tripper 11 with the flange 33 surrounding the rear end of the sleeve. As the sleeve is moved rearwardly it carries with it the stop collar 21 and tensions the spring 10. Upon release of the sleeve from the tripper the firing pin, sleeve, and stop collar are impelled forwardly by the spring until the legs 26 of the spring stop collar contact the rear face of the firing pin guide 20. The sleeve and firing pin continue due to their own inertia and the firing pin forceably engages the primer. However, as the head 23 of the firing pin engages the inner flange 24 of the retracting collar, the collar will be carried forward by the firing pin during its latter phase of motion and will serve to place tension on the firing pin spring tending to withdraw the pin from the primer and return it to the normal, retracted position in which it is shown in Figure 3, and in which it offers no obstruction to insertion or removal of the primer cartridges.

The tripper 11, as has been mentioned above, engages the flange 33 in tensioning the spring. The tripper is pivotably mounted in the bifurcated end of the pull rod 12 which is slidable axially in the bore 34 and carries on its exposed end the button 35 engaging the tripper pin 36 on the trigger arm 14. A bushing 37 is slidable on the pull rod and is provided on its upper side with a slot 38 of sufficient width to allow the finger 39 of the tripper 11 to swing therethrough. A pull rod spring 40 is confined on the pull rod between the bushing 37 and the end of the firing mechanism housing serving to yieldingly maintain the pull rod within the housing and to hold the bushing 37 as far to the right in Figure 3 as it may go. It will be noted that the foot 41 of the tripper 11 is of greater width than the finger 39, see Figure 5, providing shoulders 42 which engage the front face of the bushing and will retract the bushing slightly as shown in Figure 9 when the tripper is rocked in either direction. Thus the action of the spring against the bushing constantly urges the finger of the tripper into flange engaging position. The forward end of the bore 34 has a portion 43 of enlarged diameter and when the pull rod is drawn to the rear by the tripper the foot 41 of the tripper engages the shoulder 44 at the transition zone between the two diameters of bore and forces the finger 39 out of engagement with the flange 33 on the firing pin sleeve at the time when the firing pin spring is fully tensioned.

It will be seen from the foregoing that a single operation of the trigger results in carrying the firing pin to the rear and tensioning the firing pin spring in which position the finger is released by the camming action of the shoulder upon the tripper foot and the firing pin is driven forwardly to initiate the primer. Upon completion of the forward stroke the firing spring will have been retensioned to an extent sufficient to withdraw the firing pin to a safe retracted position.

Figure 10 shows a modified form of the invention in which a separate spring is utilized to effect retraction of the firing pin. In this modification a firing pin 45 is threadably supported in the firing pin sleeve 22*a* but does not necessarily extend rearwardly therewithin. Slidable on the firing pin and retained thereon by a nut 46 is a bushing 47 which is normally maintained in an extended position by a spring 48 engaged between the flange on the bushing and the front face of the sleeve 22*a*. A rearwardly facing shoulder 49 is provided in coaxial relation to the passage through the firing pin guide 20*a* and serves to engage the bushing when the firing pin is driven forward under its own momentum in the last phase of its firing stroke after the stop collar 26*a* has contacted the guide 20*a*. When the momentum has been absorbed by impact with the primer the compressed retracting spring 48 will extend itself and retract the firing pin. In other respects the modified form functions as described above.

As this firing mechanism is intended to be capable of functioning with equal facility for guns, howitzers, or mortars the trigger arm has been designed to permit operation either by pulling the lanyard to one side or in a generally rearward direction. Firing mechanisms which require a rearward pull are highly inconvenient at the high angles of elevation employed with howitzers and mortars. It will be appreciated that the firing mechanism shown will allow the gun crews to take advantage of any cover which may be available without interfering with efficient operation of the firing mechanism.

I claim:

1. In a firing mechanism, a pull rod having a bifurcated end, a tripper pivoted in said end, a spring encircling said pull rod and opposing rearward movement thereof, and a bushing surrounding the pull rod engaged by the spring to bias said tripper to a predetermined angular position with respect to said pull rod.

2. In a firing mechanism, a pull rod, a bifurcated end on said pull rod, a tripper comprising a finger pivoted in the bifurcated end of said pull rod and having a foot of greater width than said finger forming a continuation thereof beyond the pivotal point of said finger, a bushing slidable on said pull rod and having a slot to allow said finger to oscillate therethrough, means on said bushing engaging the foot on said tripper, and spring means engaging said bushing tending to move the same toward said tripper.

3. In a firing mechanism, a pull rod, an enlarged bifurcated end providing arms on said pull rod, a pivot pin spanning the arms of said pull rod, a tripper comprising a finger received between the arms of said pull rod and oscillatable about said pivot, a bushing slidable on the said pull rod and continuing over the bifurcated end, and having a slot therein through which said finger is oscillatable, a foot on said tripper of greater width than said finger and engageable with the end of said bushing when said tripper is oscillated, and a spring encircling said pull rod tend-

ing to move said bushing to tripper-engaging position.

4. In a firing mechanism, a breech block, a stationary primer holder in the block and having a side opening for insertion of a primer cartridge and a lip for engagement with the groove in the primer cartridge, a firing pin guide slidably mounted in said holder, a firing pin, a firing pin sleeve, a stop collar surrounding the firing pin within the sleeve and having extensions extending through said sleeve into engagement with the rear face of the firing pin guide to hold said guide in engagement with the primer cartridge, a spring surrounding the firing pin and normally urging said stop collar and pin forwardly, means for moving said firing pin rearward against the pressure of said spring, and means for releasing said pin at an appropriate point in its rearward movement.

5. In a firing mechanism, a breech block, a stationary primer holder in said block and having a side opening for insertion of a primer cartridge and a lip for engagement with the groove in the primer cartridge, a firing pin guide slidably mounted in said holder, a firing pin, a firing pin sleeve having a sear-engaging portion on its periphery adjacent its rear end, a stop collar within the sleeve and surrounding the firing pin and having forward extensions extending through the firing pin sleeve into engagement with the face of the firing pin guide to hold said guide in engagement with the primer cartridge, a spring surrounding the firing pin and urging the collar against the guide, a pull rod, and means for urging it normally forward, a sear pivoted in said pull rod and normally engaging the sear-engaging portion of said sleeve, and means for disengaging the sear from said sleeve portion at a predetermined point in the rearward movement of the pull rod.

6. In a firing mechanism, a pull rod, a tripper pivoted to one end of said rod, a spring encircling said pull rod and opposing rearward movement thereof, and a bushing surrounding a portion of said pull rod engaged by the spring to bias said tripper to a predetermined angular position with respect to said pull rod.

7. In a firing mechanism, a pull rod, a tripper comprising a finger and foot portions pivoted to one end of said pull rod, a bushing slidable on said pull rod and having a slot to allow said finger to oscillate therethrough, means on said tripper engaging one end of said bushing, and spring means engaging the other end of said bushing tending to move the same toward said tripper.

8. In a firing mechanism, a pull rod, a tripper comprising a finger pivoted to one end of said pull rod and having a foot of greater width than said finger forming a continuation thereof beyond the pivotal point of said finger, a bushing slidable on said pull rod and having a slot to allow said finger to oscillate therethrough, means on said bushing engaging the foot on said tripper and spring means engaging said bushing tending to move the same toward said tripper.

WILLIAM SUMMERBELL.