Aug. 17, 1948. A. J. POPE 2,447,091

INTERCHANGEABLE GUN BARREL AND STOCK

Filed Sept. 18, 1943 5 Sheets-Sheet 1

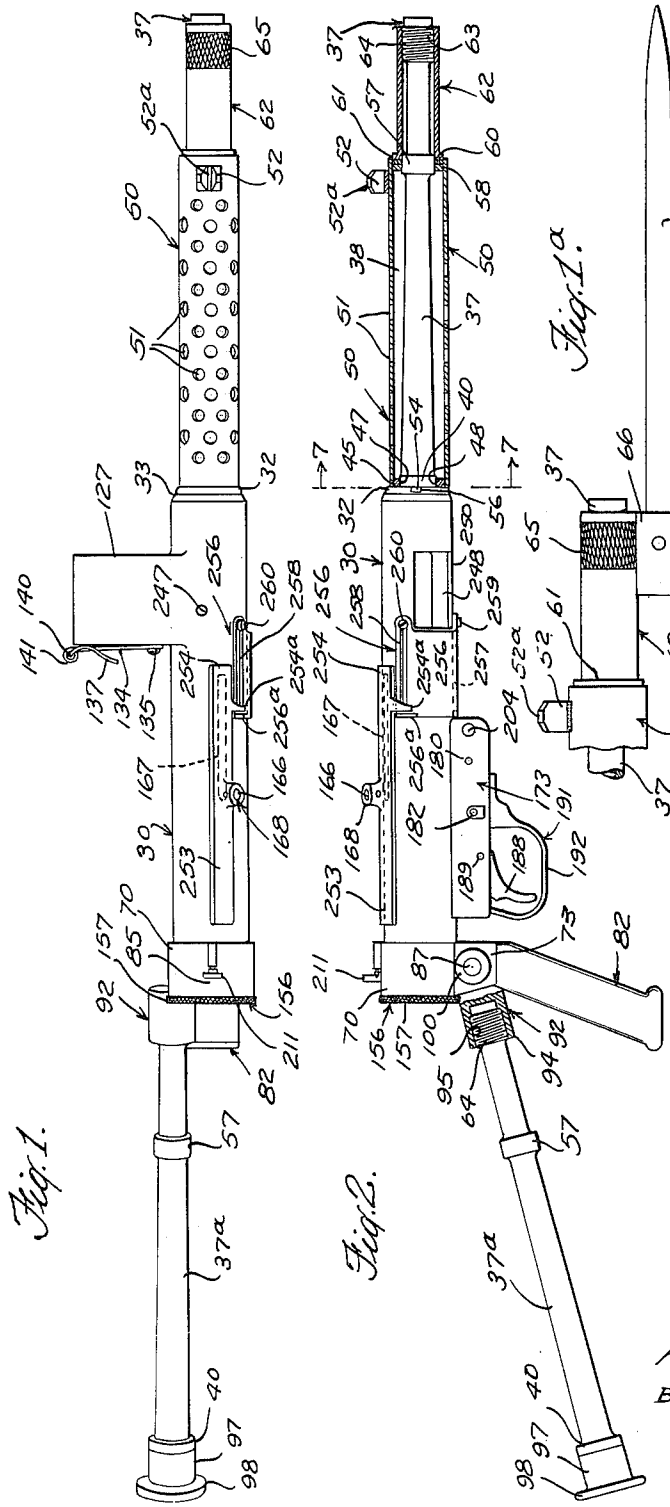

Fig. 1.

Fig. 2.

Fig. 1a.

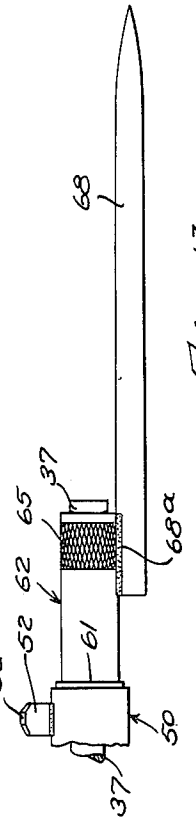

Fig. 1b.

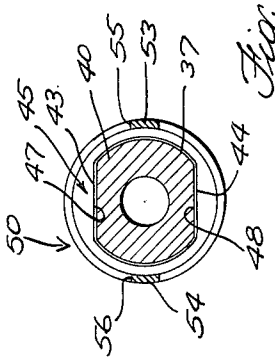

Fig. 7.

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INTERCHANGEABLE GUN BARREL AND STOCK

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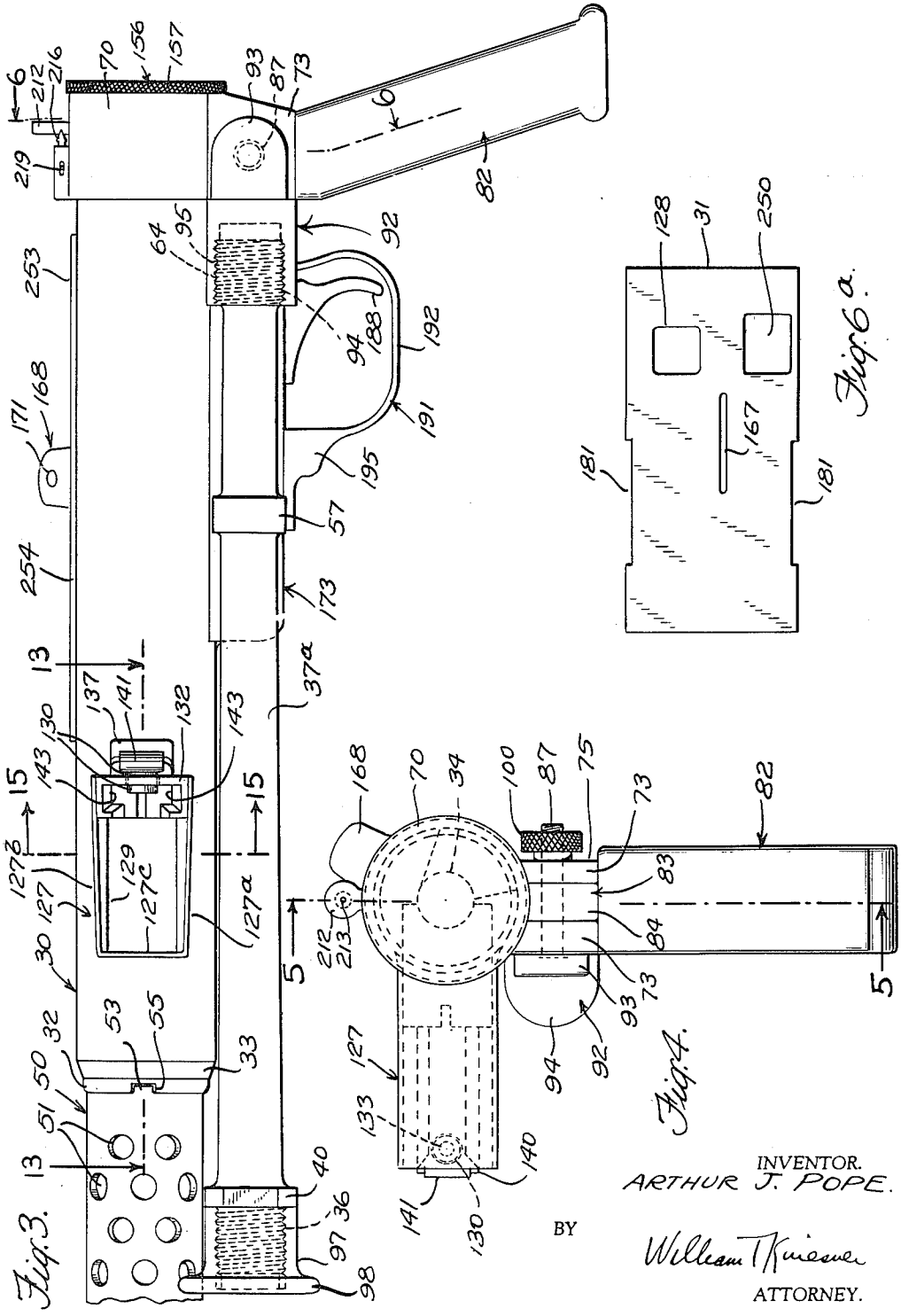

Fig. 3.

Fig. 6a.

Fig. 4.

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INTERCHANGEABLE GUN BARREL AND STOCK

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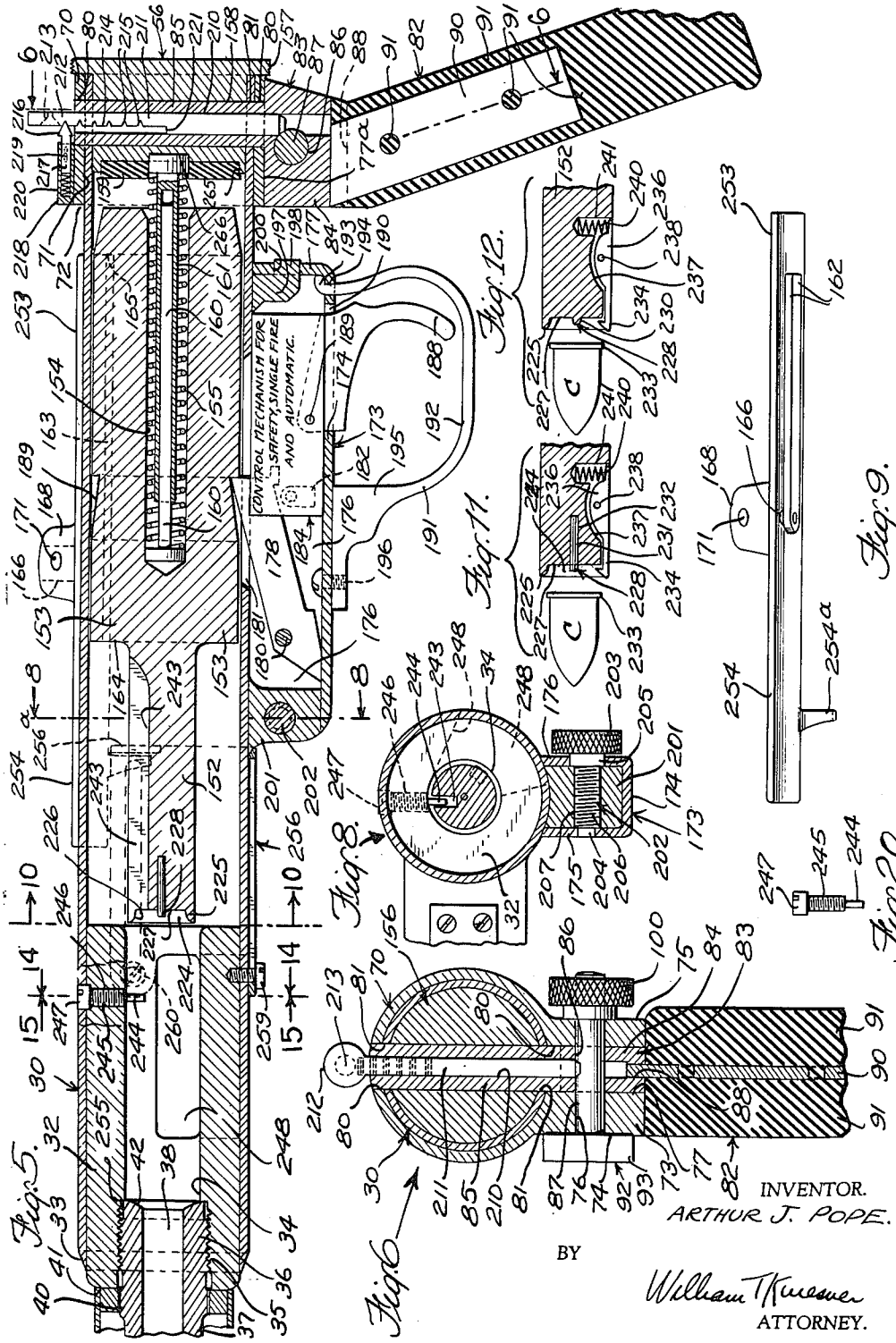

Fig. 5.

Fig. 6

Fig. 8.

Fig. 9.

Fig. 11.

Fig. 12.

Fig. 20.

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INTERCHANGEABLE GUN BARREL AND STOCK

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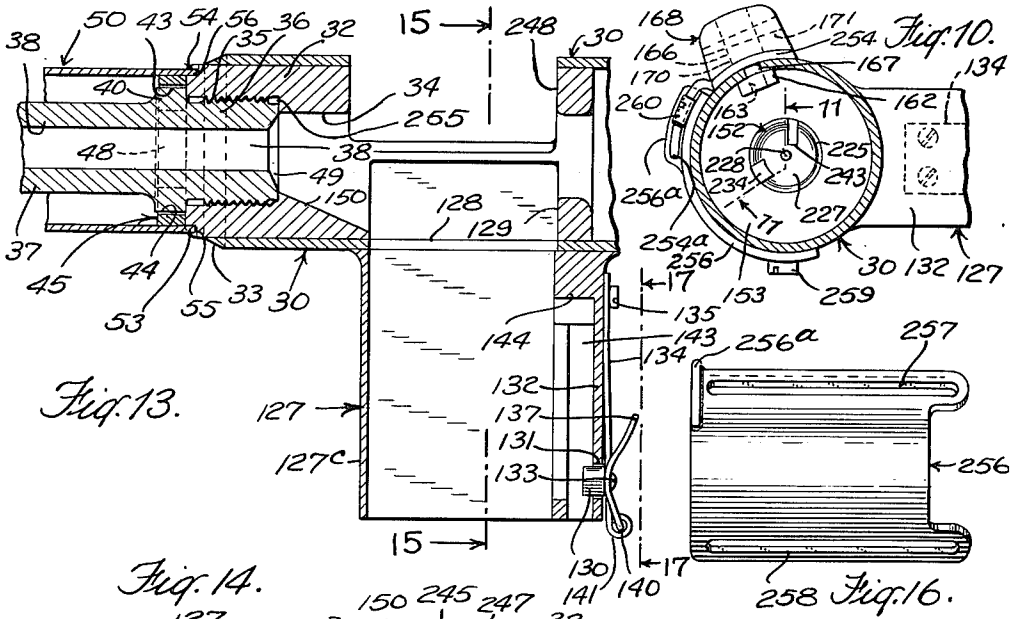

Fig. 13.

Fig. 10.

Fig. 16.

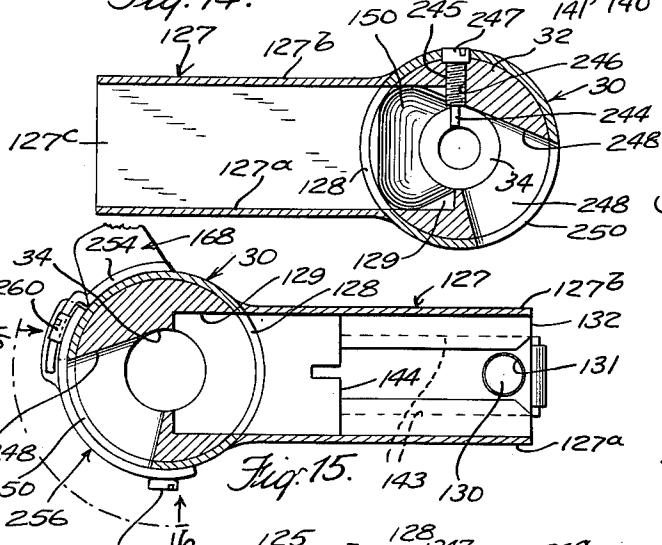

Fig. 14.

Fig. 15.

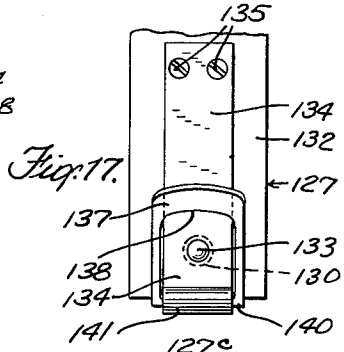

Fig. 17.

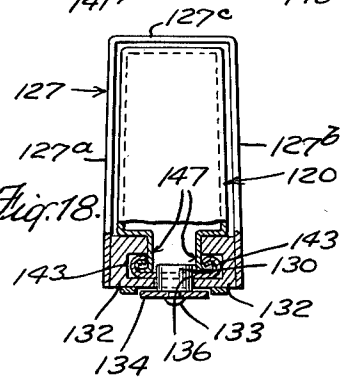

Fig. 18.

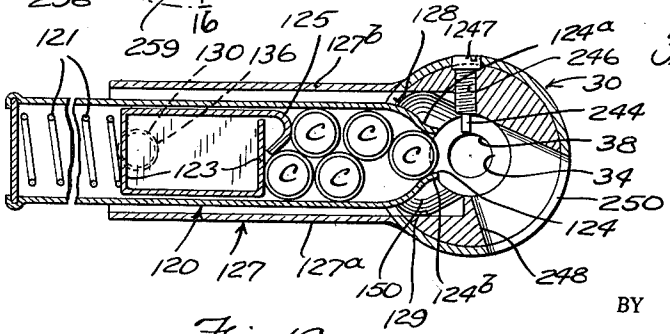

Fig. 19.

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Fig. 21

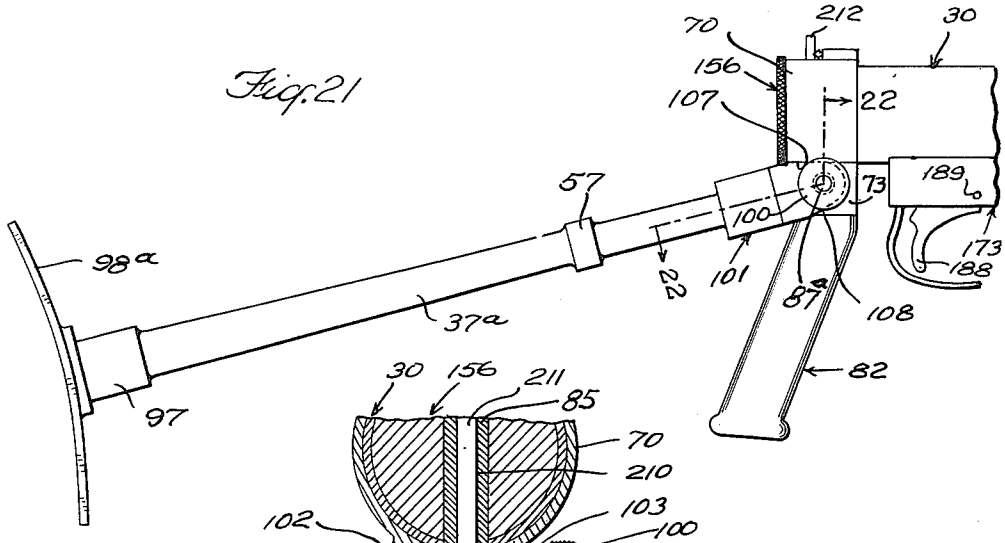


Fig. 22.

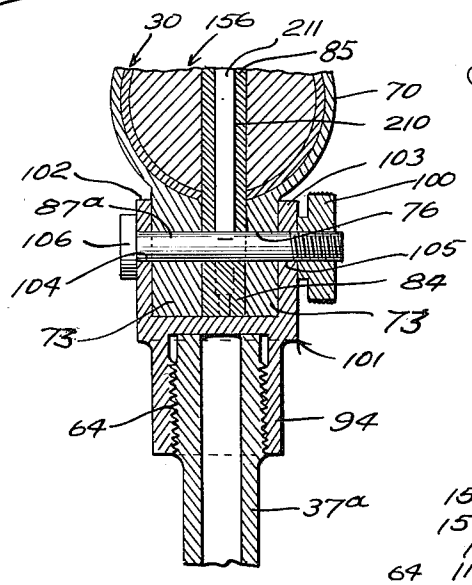
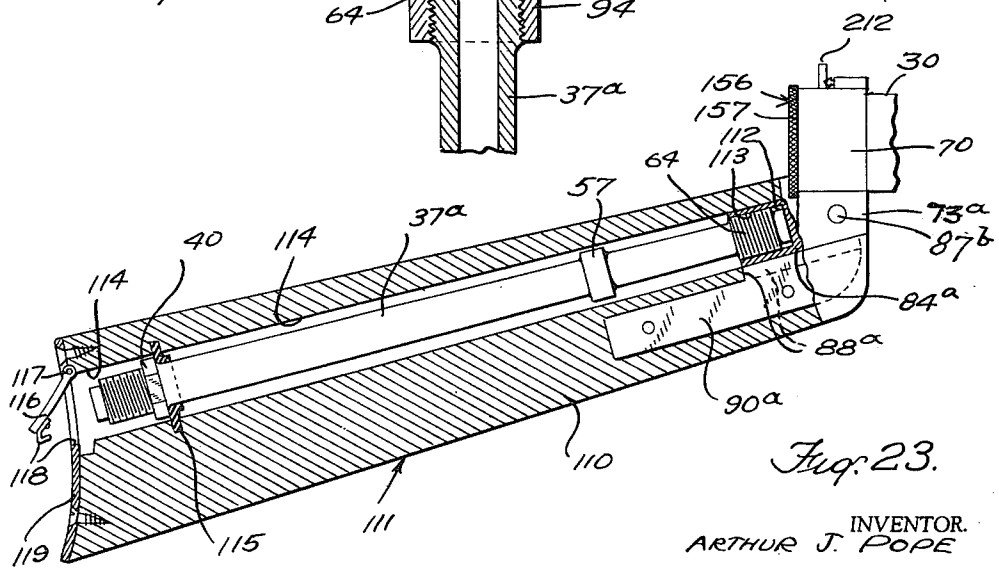


Fig. 23.



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Patented Aug. 17, 1948

2,447,091

UNITED STATES PATENT OFFICE

2,447,091

INTERCHANGEABLE GUN BARREL AND STOCK

Arthur J. Pope, Madison, Conn.

Application September 18, 1943, Serial No. 502,921

2 Claims. (Cl. 42—76)

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This invention relates to gun construction or firearms.

One of the objects of this invention is to provide a firearm that will be of simple, strong and dependable construction, constructed in its individual parts to facilitate manufacture and assembly, that will lend itself to quantity or mass production with efficiency, speed and economy, and capable of a wide variety or flexibility of usage or adaptability of purpose, particularly under the widely varying exigencies of warfare. Another object is to provide a firearm construction in which loading of cartridges, firing, and ejection of shells are effected by mechanisms that are of simple and low cost construction, easily assembled or disassembled, and of reliable and dependably controllable action in practical use, either for single or repeated or successive firing of cartridges or bullets. Another object is to provide a multiple purpose firearm capable of handling, or use with, several calibers of cartridges. Another object is to provide a firearm cartridge-firing mechanism capable of operation with different calibers of cartridges, and provided with gun barrels that are quickly and speedily brought into operative relation to the firing mechanism according to the caliber with which it is desired to charge the firing mechanism; another object is to carry out the last-mentioned object in a manner so that the firing mechanism also comprises loading and ejection mechanism operative upon different calibers of cartridges; thus to avoid necessity of change or alteration to accompany change in caliber of gun barrel. Another object is to provide a firearm construction with a loading, firing and ejection mechanism capable of handling different calibers of cartridges and capable of coacting, without change, with a mechanism or other source of supply of cartridges, regardless of change in caliber of cartridges.

Another object is to provide a firearm with several gun barrels of different calibers, all so constructed, arranged or assembled, or capable of assembly, that the reserve or differently-calibered gun barrel that is not at the moment functioning with the firing mechanism of the gun can be made to serve a functionally useful purpose in the structure. Another object is to provide a gun construction having several gun barrels, all constructed and arranged and assembled so that the gun barrels can alternatively or interchangeably function for different purposes, one of which is in coaction with the firing mechanism for proper projection of the projectile or bullet. Another object is to carry out such

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objects as the last-mentioned in a manner to simplify and facilitate manufacture and provide for ease, speed and facility of assembly so as to facilitate rearrangement of the parts, as in the field.

Another object is to provide a gun construction in which assembly or disassembly of the gun barrel may be effected in a simple and dependable manner, without requiring special tools, and capable of quick and facile assembly or disassembly. Another object is to provide an assembly arrangement for assembling a gun barrel to the rest of the firearm in a structural manner capable of dependable actuation and capable also of functioning as a strengthening, reinforcing or protective means for the assembled gun barrel itself. Another object is to provide a firearm with a foregrip and a gun barrel capable of simple and inexpensive construction and of such coacting structural and functional relationships that the foregrip can function as a protective or reinforcing element for the gun barrel and also as a tool for aiding in assembly or disassembly of the gun barrel to the rest of the construction.

Another object is to provide a simple, strong and easily operated assemblage of a hand-grip, stock, or butt to the gun structure. Another object is to provide a firearm that will provide for a wide range of flexibility of adaptability, according to desire or needs, to various hand-grips, stocks or butts. Another object is to provide a firearm that is provided with more than one gun barrel, in which the spare or extra gun barrel can dependably function as part of the gun stock; another object is to carry out the last-mentioned object with structural features of assembly and disassembly whereby the gun barrel functioning as such and the gun barrel functioning as part of the gun stock may be easily and quickly interchanged. Another object is to carry out the last-mentioned object with structural features, such as firing mechanism, loading or ejecting mechanism, that will be capable of handling different calibers of ammunition, whereby the above-mentioned gun barrels may be interchanged according to change in caliber of ammunition.

Another object is to provide a gun construction of individual parts or units which individually are more economical and speedier to manufacture and which can be quickly, economically and efficiently assembled; another object is to provide in a gun construction of the just-mentioned nature simple, inexpensive and easily operable connecting or assembly mechanisms whereby the various

parts or units may be efficiently assembled for production purposes and quickly disassembled and assembled for replacement of parts, cleaning or re-arrangement of parts as in the field. Another object is to provide a strong, durable gun or firearm construction of good or superior fire power, capable of semi- or full-automatic operation, in which, in the production of its various parts complex, time and expense-consuming and complicated machining operations are either eliminated or vastly reduced, and to include in the construction elements for securing the various parts together that, in turn, can be easily and economically constructed and manipulated for assembly. Other objects will be in part obvious or in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts as will be exemplified in the structure to be hereinafter described and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings in which is shown by way of illustration one of the various possible embodiments of my invention,

Figure 1 is a plan view of a firearm or gun embodying features of my invention;

Figure 1ª is a fragmentary side view showing the gun with a bayonet attachment;

Figure 1ᵇ is a fragmentary side view showing the gun with another form of bayonet;

Figure 2 is a side elevation as seen from the bottom in Figure 1, certain parts being shown in longitudinal central section and certain other parts being broken away;

Figure 3 is a side elevation the gun mechanism of Figure 1, but showing the gun stock in a different or folded position, certain parts being partially broken away;

Figure 4 is a rear end view as seen from the left in Figures 1 and 2 or from the right in Figure 3;

Figure 5 is a central longitudinal vertical sectional view as seen along the line 5—5 of Figure 4;

Figure 6 is a transverse vertical sectional view as seen along the lines 6—6 of Figures 3 and 5;

Figure 6ª is a development on a smaller scale of a sheet metal blank of which one of the gun parts may be made;

Figure 7 is a transverse sectional view as seen along the line 7—7 of Figure 2;

Figure 8 is a transverse sectional view as seen along the line 8—8 of Figure 5;

Figure 9 is a detached side elevation of part of a retractor mechanism;

Figure 10 is a transverse sectional view along the line 10—10 of Figure 5, certain parts being broken away;

Figure 11 is a fragmentary cross-sectional view as seen along the line 11—11 of Figure 10;

Figure 12 is a sectional view as seen along the line 11—11 of Figure 10 showing a modified form of construction;

Figure 13 is a horizontal sectional view along the line 13—13 of Figure 3;

Figure 14 is a transverse sectional view as seen along the line 14—14 of Figure 5 and of Figure 13;

Figure 15 is a transverse sectional view as seen along the line 15—15 of Figure 3 and Figure 13;

Figure 16 is an elevation as seen along the line 16—16 of Figure 15;

Figure 17 is a fragmentary elevation as seen along the line 17—17 of Figure 13, showing in elevation a magazine lock construction;

Figure 18 is an end elevation, partly in transverse section, showing the assemblage to the magazine holder of a magazine;

Figure 19 is a sectional view along the line 14—14 of Figure 5 as it appears with a magazine assembled to the magazine holder;

Figure 20 is an enlarged plan view of a preferred form of ejector;

Figure 21 is a side elevation like that of Figure 2 showing the gun with a modified form of gun stock arrangement and mounting;

Figure 22 is a sectional view along the line 22—22 of Figure 21; and

Figure 23 is a central vertical sectional view through a modified form of gun stock arrangement and mounting.

Similar reference characters refer to similar parts throughout the several views of the drawings.

Referring first to Figures 1, 2, 3 and 5, I first provide a receiver comprising parts 30, 32 and 70 securely joined together. Chamber element 30, which I term the "extension," may be in the form of a tube of any suitable metal or alloy, preferably steel. Tube 30 may be constructed in any suitable way as may be desired, for example, as by boring or turning it out of a solid piece, or by simply cutting off a suitable length of already fabricated steel tubing of suitable cross-sectional dimensions and of suitable compositions, or it might be made out of a substantially rectangular blank 31 (Figure 6ª) of suitably heavy sheet metal and rolled into tubular form, forming a longitudinal seam or joint as by welding. In the latter case, it may be stamped or blanked as by a punch press operation into the desired rectangular blank and at the same time or subsequently it may have stamped or punched in it certain openings, slots, holes or the like, indicated in Figure 6ª and which are hereinafter described in detail as to their relationships, structurally and functionally. If the chamber element or tube 30 is not so blanked out, these openings, holes, slots and the like, are cut in the wall of the tube by any suitable means, and it will be noted that in any case these operations are comparatively simple machine tool operations.

In the front end of the tube 30 I provide a relatively heavy sleeve element 32 of a metal, like steel, and preferably it is a forging, such as drop forging, whereby it can be initially forged and thus shaped and dimensioned to a very close approximation to the desired or ultimate final dimensions, shape and other factors later described, thus leaving very little metal to be machined off and only then where and when necessary to give it its final shape and dimensions as required by other factors of the gun construction. As a piece apart from the tube 30, it thus can be easily and economically fabricated and thereafter assembled to the front end of the tube 30 into which it is rigidly secured in any desired or suitable way. Thus the tolerances may be such that the tube 30, if desired, can be shrunk onto the sleeve-like forging 32, or the fit can be on the order of a force-fit or a tight assembly fit, the parts being preferably welded together about their entire over-lapping end peripheries as at 33 (Figure 5), the sleeve 32 preferably projecting beyond the front end of tube 30 to facilitate such welding.

Excepting where the extension forging or sleeve 32 is cut away or shaped as later described,

it has a cylindrical bore or passage 34 extending coaxially therethrough and hence the bore 34 is coaxial with the extension tube 30; bore 34 is counter-bored at its front end (left-hand end as seen in Figure 5) and is threaded as at 35 to receive the threaded end 36 of a gun barrel 37 of suitable length and provided with a bore 38, preferably rifled (the rifling is not, however, shown) and made of a suitable metal, such as steel, of appropriate characteristics and of preferably substantial thickness. Barrel 37 has a shoulder 40 adjacent its externally threaded end 36 to take up against the end face 41 of the sleeve 32 and thus limit the extent of inward movement of the barrel 37 when it is threaded into place for assembly and also provide, by the coaction of the shoulder 40 and the end face 41, for clamping the barrel 37 to the heavy sleeve 32, under the draw of the threads, and thus also resist tendency of the threaded junction to become loose or unthread the barrel from the part 32.

The bore 38 of barrel 37 is, of course, dimensioned to the selected caliber of ammunition that is to be employed, illustratively 45 caliber, but the radius of the bore 34 in the sleeve forging 32 is materially greater than the radius of the gun barrel bore, somewhat as indicated in Figure 5, and the inner end of the barrel bore 38 is chamfered or suitably bevelled off, as at 42 to substantially merge the faces of the bores 38 and 34 one into the other, for certain parts of the sleeve 32, as later described, are to take part in guiding a cartridge into the barrel bore 38, and the bevelling 42 avoids sharp corners or projections which might interfere with the loading of a cartridge into the barrel.

As is later described, I provide for the ready removal of the gun barrel and for its replacement by another, preferably of different caliber, such as 9 mm. which is about 38 caliber, such a substitution facilitating the meeting of various emergencies or exigencies and having also the advantage of making use of differently calibered enemy ammunition.

To facilitate assembly or disassembly of the gun barrel, the shoulder 40 thereof is milled off to permit it to function like a nut and, illustratively, I may mill it off on two diametrically opposed portions to provide two parallel faces 43 and 44 as is better shown in Figure 7. I then provide a wrench element 45 in the form of a suitably heavy metal collar or ring having therein a hole that may be easily shaped, as by broaching, to snugly fit over the just-described cross-section of the shoulder 40 of the gun barrel, thus providing it with two opposed parallel faces 47 and 48 (Figure 7) with which the wrench element or collar 45 may thus make non-rotary engagement with the shoulder 40.

The external face of the wrench element 45 is preferably cylindrical and is snugly fitted into the end of a tube 50 (Figure 2) which is preferably of materially greater diameter than the outside diameter of the gun barrel 37 and sufficiently so to provide a convenient tubular foregrip of suitable length, to aid in holding the gun when it is manually operated. The wrench or collar element 45 is preferably welded or in any other suitable way secured in position within the inner end of the foregrip tube 50.

The tube 50 may be made of any suitable material, such as steel tubing or of sheet metal stamping rolled and welded into tubular form and it preferably has a suitable number of apertures 51 to permit circulation of air, thus to aid the tube

element 50, which also dissipates heat by radiation, in carrying off heat from the gun barrel 37.

Accordingly, in assembling a gun barrel to the front end of the extension 30, the threaded end 36 (Figure 5) of the gun barrel may be started into the threaded end of the extension sleeve 32 by hand, then the hand grip tube 50 is slipped over the gun barrel and the wrench part 45 (Figure 7) thereof fitted over the squared-off shoulder 40, whence the larger-diametered hand grip tube 50 may be securely grasped by the hand or hands and turned to tighten the threaded connection of the gun barrel with the part 32; removal of a gun barrel is effected by a reverse sequence of steps.

The forward end of the tube 50 (Figures 1 and 2) has mounted upon it as by welding a front gun sight 52 and in order that the top bevelled edge 52a thereof be fixed in the vertical plane through the axis of the gun barrel bore 38, provision is made to fix the rotary position of the hand grip tube 50 correspondingly, and that I prefer to effect by providing upon the inner end of the tube 50 diametrically opposed lugs 53 and 54 receivable, respectively, in two diametrically opposed slots 55 and 56 in the forwardly projecting portion of the sleeve member 32. Lugs 53 and 54 can be welded to the tube 50 to form lug extensions thereof or they might otherwise be formed as by milling or cutting away enough of the peripheral end walls of the tube 50 to just leave these two lugs; the diametrically opposed slots 55 and 56 are easily formed in the sleeve 32 as by milling. Accordingly, the resultant interengagement of these parts insures that the rotary position of tube 50 relative to the gun barrel is properly determined and with the tube 50 fixed against axial movement off of the gun barrel, this interlocking arrangement prevents subsequent rotary movement of the hand grip tube 50 and of the forward gun sight 52.

To secure the tube 50 in place and to achieve other functional advantages, I provide each gun barrel with a shoulder 57 (Figure 2) located adjacent the forward end of the tube 50 and preferably presenting a cylindrical bearing surface of larger diameter than the gun barrel but of lesser diameter than the spacing between the parallel faces 47—48 (Figure 7) in the wrench element 45 (so that the latter can freely pass over the shoulder 57) and in the outer end of tube 50 (Figure 2) and spaced inwardly somewhat I secure, as by welding, brazing, or the like, a ring or collar 58 whose inside diameter is such as to make a snug sliding fit with the cylindrical surface of the gun barrel shoulder 57. Thereby the front end of tube 50 is positioned concentrically with the gun barrel and its bore, the rear end being positioned in similar concentricity by the fit of the collar or wrench element 45 onto the peripheral surface of the gun barrel shoulder 40.

In the annular space thus left forwardly of the internal ring 58 (Figure 2) I now insert a washer 60, of any suitable material, to give a good frictional or yielding action as is later described, and illustratively the washer 60 may be of fiber. It is slid onto the shoulder 57, the parts being proportioned so that there is still left forwardly of the washer 60 a portion of the cylindrical face of shoulder 57. Onto this latter portion is received the flanged end 61 of a tube or sleeve 62 whose forward end is internally threaded as at 63 for threaded engagement with the threads 64 provided in a forward external enlargement or shoulder formed integrally with the gun barrel,

but of lesser diameter than that of the inner shoulder 57. The outer surface of the sleeve 62 is preferably knurled as at 65 (Figure 1) to facilitate turning by hand.

Accordingly, as the sleeve 62 is slipped onto the portion of the gun barrel projecting beyond the hand grip tube 50 and progressed rearwardly (to the left in Figure 2) by the action of the interengaged threads as the sleeve 62 is turned, the inner end of tube 62 becomes centered by the surface of the shoulder 57 and the flange 61 is brought up against the washer 60, the flange 61 being of a radial dimension to enter the hand grip tube 50, if necessary. The washer 60 is thus put under compression and the hand grip 50 becomes tightly clamped against the forward end of the part 32 of the gun extension 30. Aside from the action of the threads 63—64 the compression or frictional action of the washer 60 contributes toward holding the locking tube 62 against loosening up or unthreading. Disassembly of the parts is quickly effected by a reverse sequence of these steps.

With the tight clamping of the parts as above described, particularly where, as in the preferred embodiment, the hand grip tube 50 is placed under compression, the resultant assembly affords a strong, protective reinforcement to and for the gun barrel 37, the structure to the right of the element 32, as viewed in Figure 2, forming in effect a compound cantilever built-up truss, the tubular parts 62 and 50 being in compression and the gun barrel being in tension, and it will be noted that this truss effect exists along a longitudinal section taken through any diameter or plane through the axis of the gun barrel with which axis the tubular parts are as above described coaxial. Aside from this cantilever truss effect, to make the structure strong and capable of withstanding rough usage and the like, it will be noted that the structure also has the advantages that flow from the tubular cross-section of the tubular elements themselves, being greatly resistant to bending and tortional strains.

Such features as these are of further advantage, aside from contributing toward lightness of construction, where the gun is to be employed with a bayonet or the like, and in such case, the sleeve 62 may be fitted with, or have secured thereto as by welding, any desired or standard form of disconnectible bayonet joint, generally indicated in Figure 1[a] at 66 for receiving a bayonet 67 which, of course, carries the counterpart or parts of such a bayonet joint. Or, as shown in Figure 1[b], the sleeve 62 may have permanently secured thereto as by welding 68[a], any suitable form of bayonet blade, generally indicated at 68. The gun structure may thus be furnished with a plain sleeve 62, as in Figure 1, or with the type shown in Figure 1[a], or with a sleeve having the bayonet 68 permanently fixed thereto, as in Figure 1[b], the sleeves 62 being otherwise of identical construction and selectively interchangeable as may be desired.

As earlier above indicated, I prefer to provide the firearm or gun construction with more than one gun barrel, illustratively one more than the gun barrel 37 of Figures 1, 2 and 5, and though, depending upon circumstances, the additional gun barrel or barrels can be of the same caliber, in which case they function as substitutes or replacements, the additional gun barrel or barrels can be, and in accordance with certain features of my invention preferably are, of a different caliber; in the latter case, the additional gun barrel, by way of illustration, could be of a caliber like that of the ammunition used by the enemy and it could be substituted to make use of captured enemy ammunition. The loading, firing and ejecting mechanism, according to my invention, is capable of functioning without change with various different calibers of cartridges, but before considering in detail how I achieve that advantage, I prefer first to describe how, according to certain features of my invention, I arrange for the firearm or gun construction to have with it, preferably as a functional part thereof, the other gun barrel which I furthermore and preferably bring into coaction with other features of construction for quick assembly or disassembly and for rearrangement of the structure.

Thus, referring now to Figure 5, I provide about and at the rear end of the extension tube 30 a relatively heavy collar element 70 of substantial construction or strength, being preferably made of steel and within its bore 71 is telescopically received the rear end portion of the tube 30; the two end faces of parts 30 and 70 preferably fall in the same plane. Collar 70 is securely joined to the tube 30; thus it may be shrunk on, or welded thereto as at 72 throughout the front and rear circumferential extents of the collar 70, or both shrunk on and welded and it has, as better appears in Figure 6, a heavy block-like downward extension 73, presenting two lateral and parallel faces 74 and 75 which are easily machined. Extending transversely through the block 73 is a hole 76, exposed in the two faces 74—75, for the reception of assembly bolts as later described; block 73 is provided with a slot 77, in effect to bifurcate it, slot 77 extending through the block 73 from front to rear and preferably centered with respect to the vertical axis of the gun structure, being, however, preferably not of a sufficient depth to cut into the collar 70 itself in order thereby not to weaken the reinforcing and strengthening action of the collar 70 and also not to weaken the collar 70 itself. Slot 77 is easily made, as by milling.

In the collar 70 (Figures 5 and 6) and hence also the tube 30, I provide, as by drilling, two coaxial holes 80 and 81, the coinciding axes of these holes being vertical and intersecting the axis of the tube extension 30 with which, of course, the gun barrel assembled to it is also coaxial, as above noted.

With the rear end of the extension tube 30 thus constructed or thus provided with the collar 70 and its downward extension block 73, I am enabled to quickly assemble to the construction various other parts, some of them selectively or alternatively, all as about to be and also later described. Thus, let it be assumed that the firearm is to be provided with a pistol grip, such as the grip 82 indicated in Figures 2, 3 and 5. In such case, I make up a mounting member generally indicated by the reference character 83 in Figures 5 and 6, of a suitable metal such as steel, shaping it to provide a block 84 dimensioned to be snugly received in the slot 77 of the collar block 73 and having extending upwardly therefrom and integral therewith a heavy cylindrical stud 85 whose outside diameter is dimensioned so that the stud 85 fits snugly in the collar holes 80 and 81. For maximum strength, the width of the block 84 and the diameter of the stud 85 are of the same dimensions and, accordingly also, the collar holes 80 and 81 are of a diameter that

equals the width (Figure 6) of the slot 77. The vertical length of the stud 85 (Figure 5) is such that when the upper horizontal face of the block 84 rests snugly against the bottom wall 77a of the slot 77, the upper end of the stud 85 is substantially flush with the outer surface of the collar 70 (Figure 6), and the end face of stud 85 can be machined to the same curvature as the outer face of the collar 70. With the mounting member 83 thus assembled to the collar 70 and extension block 73, requiring a simple upward movement of the former relative to the latter, as viewed in Figures 5 and 6, there is brought into registry with the hole 76 in the block 73 a hole 86 that extends transversely through the block portion 84 of the mounting member 83, whence a bolt, indicated at 87 in Figure 6, may be thrust therethrough to maintain the assemblage.

The block portion 84 of the mounting member 83 is constructed in any suitable way to carry an extension which, in the illustrative embodiment now being described, is the pistol grip 82 and an illustrative and preferred structural relationship for this purpose may comprise providing in the underface of the block portion 84 a longitudinally extending slot 88 into which is fitted a steel shank 90 and welded in place to the metal of the block portion 84, and onto shank 90 is secured, in any suitable way, the material, indicated at 91, preferably non-metallic, of which the pistol grip 82 is made. Thus the material can be any moldable, settable plastic, which can be molded in place onto and about the shank 90, preferably after the latter has been welded to the block portion 84 to form part of the mounting unit 83, and the shank 90 may be provided with holes as indicated in Figure 5 which the material enters for interlocking. Or, of course, the material can be of a suitable wood in which case the holes in the shank 90 can be used to secure the wooden part or parts of the grip in place as by rivets, screws, bolts or the like (not shown).

Where the firearm is thus provided with a pistol grip, I preferably make provision for a gun stock and butt and this may be carried out in various ways. Illustratively, referring now to Figures 1 and 2, I provide another gun barrel 37a which is of identical structural features as the gun barrel 37 above described excepting that, according to circumstances, it can be of differently calibered bore than the bore 38 of gun barrel 37. Gun barrel 37a I arrange to take part in forming a gun stock.

Thus I provide a mounting member or fixture, generally indicated by the reference character 92, comprising a relatively heavy flat shank 93 (Figures 3, 4 and 6) that can rest against the face 74 of the block 73 of collar 70 and a cylindrical socket member 94 integrally formed therewith and closed at its end nearest the part 93; the socket member 94 is internally threaded to receive the threads 64 at the outer end of any of the gun barrels, illustratively the gun barrel 37a, and a tight threaded connection can be effected between the threads 64 of the gun barrel and the threads 95 of the member 94 by using the hand grip tube 50 with its wrench element 45, the latter engaged with the squared-off shoulder 40 at the other end of the gun barrel, to securely drive the interengaging threads home in tight relation. Here it might be noted that the holes 51 in the hand grip tube 50 facilitate non-slipping grasping thereof by the hand or hands when it is to function as a wrench.

To the free end of the gun barrel 37a thus mounted is threaded, onto the threaded portion 36, the internally-threaded socket-like part 97 of a butt plate 98, the latter being of any desired or suitable shape or configuration.

As above noted, the part 93 of the mounting fixture 92 rests flat against the face 74 of the collar block 73 and it is secured to the latter by the bolt 87 which in this form is preferably permanently secured at its unthreaded end, in any suitable way, to the flat part 93, the threaded end projecting beyond the opposite parallel face 75 where it receives a nut 100, preferably knurled and of large outside diameter and of suitably small pitch of thread to permit it to be manually tightened up to secure the stock and butt structure 37a—98 to the gun structure. Bolt 87, as above noted, also functions to maintain the assembly of the structure 83 (Figures 5 and 6) with the locking stud 85, to the collar 70 at the rear end of the tube extension 30. Though in this form bolt 87 is shown as secured to the mounting fixture part 93, it will be understood, of course, that the bolt may be headed and separate from the mounting fixture, as illustratively described in connection with another embodiment.

In the embodiment just described in detail, the mounting of the assembled stock and butt structure is purposely offset considerably to one side of the central vertical plane of the gun structure, as appears better in Figures 4 and 6, and this is for the purpose of facilitating swinging of the stock and butt structure 37a—98 from the position shown in Figure 2, where it functions as a stock and butt, to a position alongside and somewhat underneath and in parallel with the extension 30 and gun barrel, as shown in Figure 3, the change from one position to the other being effected quickly and easily by simply loosening up the nut 100 on the bolt 87, then swinging the stock and butt structure with the bolt 87 as the axis to the desired position and then tightening the nut 100.

The gun construction, when thus compacted into the relationship shown in Figure 3, has a number of advantages, such as greater facility of transportation or of carrying, and even though so compacted it can still be used for firing, making use of the pistol grip with one hand and of the foregrip 50 with the other; nevertheless, the stock and butt structure may be quickly swung into the relationship shown in Figures 1 and 2 and clamped in that position, when needed.

Where collapsibility or foldability of the stock structure relative to the rest of the gun is not desired or needed, a I prefer to employ an assembly of the gun barrel 37a to the gun structure proper, such as is shown in Figures 21 and 22, in which the internally threaded socket-like part 94 forms part of a mounting fixture 101 that has integrally formed with the part 94 two spaced flat ears or lugs 102 and 103, apertured in alignment as at 104 and 105, and the spacing between the ears 102—103 is such, as shown in Figure 22, that the downward extension block 74 of the collar 70 is snugly receivable therebetween, whence the bolt 87a, now provided with a head 106 is slipped through the aligned holes 104—76—105, and the nut 100 screwed on to clamp the assembly fixture 101 tightly in place. If desired, the upper and lower edge faces, indicated in Figure 21 at 107 and 108 may be shaped substantially to interfit with the outer cylindrical surface of the collar 70, and these edge faces, whichever ones happen to be brought upwardly upon assembly of the structure, can be thus machined at the right angle so

as substantially to fix the angle of the stock and butt structure, somewhat as indicated in Figure 21, to the axis of the extension 30 and gun barrel 37. In Fig. 21 the butt, preferably formed integrally with the threaded socket part 97, may be given any desired or suitable shape, being illustratively longer in an up and down direction than its transverse width and appropriately curved for engagement with the shoulder, as indicated at 98a.

If it is desired to provide the gun with the conventional type of gun stock and butt, I prefer to employ a construction like that shown in Figure 23. The gun stock, made of any suitable material 110, such as wood or plastic, is generally indicated by the reference character 111, and is secured to or molded onto a suitable shank 90a, like shank 90 of Figures 5 and 6 to which the pistol grip 82 of Figure 5 is secured. The shank 90a may be fitted into slot 88a and welded to a block portion 84a which is like the block portion 84 of Figures 5 and 6 and has the upwardly extending stud 85; preferably it is extended rearwardly and has a cylindrical recess 112 internally threaded as at 113. Part 84a is received in the slot of part 73 and a bolt 87b like bolt 87a of Figure 22 may be used to maintain the assembly. Part 112 forms a threaded socket-like element, analogous to the part 94 of Figures 2 and 21, to receive the threaded portion 64 of the gun barrel 37a, there being formed or molded in the material 110 of the gun stock 111 a long recess 114, preferably of round cross-section and tapered as indicated in Figure 23 to freely accommodate therein the gun barrel 37a.

Preferably, there is fitted or molded into the walls of the recess 114 and adjacent its rear end a metal collar 115 having a bevel-walled hole therein of a diameter to permit the free passage therethrough of the parts 64 and 57 of the gun barrel, but smaller than the maximum diameter of the shoulder 40 of the gun barrel. The gun barrel may thus be inserted into the recess 114, passing partially through the collar 115, and exposing the squared-off shoulder 40 near the outer end of the recess 114; then the wrench element 45 of the hand grip tube 50 may be applied thereto to turn the gun barrel 37a and thread its threaded part 64 into engagement with the threads 113 of the socket-like recess 112; the position of the collar 115 is such that the shoulder 40 of the gun barrel takes against it before the threaded portion 64 can be completely threaded into the socket 112, and, upon tightening up with the hand grip wrench, the gun barrel 37a becomes securely assembled to the gun structure as well as housed in the gun stock 111. Moreover, the gun barrel 37a is placed in tension and in effect clamps the gun stock against the rear or left-hand face of the block part 84a and thus reinforces the assembly of the gun stock part 110 to the part 84a.

The extreme end of the gun stock 111 may be covered with a metal plate 119 secured thereto in any suitable way and in the latter is a hole substantially matching the size of the recess 114, covered by a plate 116, hinged as at 117, and held in closed position in any suitable manner as by a catch or the like, diagrammatically indicated at 118.

Now, assuming that the extra gun barrel 37a, carried as part of the gun construction, is of smaller caliber in its bore than that of the bore 38 of gun barrel 37 in Figures 5 and 13, it is to be noted that thereby the diameter of the bore is simply smaller, but when assembled to the extension sleeve insert 32 in place of the barrel 37, its bore is still coaxial with the extension 30 and with the bore 34 in the part 32, the bevel or chamfering 49 being simply of greater inward radial extent. In either case, it is into the chamfered end that the cartridge is guided when injected, the extent of entry of the cartridge into the gun barrel bore being limited by the engagement of the laterally and peripherally projecting flange or rim at the rear end of the shell of the cartridge.

The cartridges, of whatever caliber, in the earlier above-assumed illustration, either 45 caliber or 9 mm. are preferably supplied from a magazine 120 which may be and preferably is of any standard construction, usually sheet metal, and arranged, under spring pressure, to advance the cartridges in one or more rows to the mouth of the magazine and singly or successively into operative relation to the gun barrel loading device. In Figure 19 I have indicated at 120 a magazine of sheet metal construction having therein a spring 121 which is interposed between the bottom 122 and a slidable plate 123 to move the latter toward the mouth 124 of the magazine; the cartridges, indicated at C, rest against the movable plate 123 and the uppermost of the cartridges is thus always forced or moved into or out of the mouth 124, due to the force of the expansion spring 121. The magazine 120 may be constructed to accommodate two rows of cartridges, as indicated, in which case the movable plate 123 is provided with an upstanding abutment 125 of any construction to underlie one of the two rows of cartridges, so that the cartridges of the two rows are staggered, thus to insure that the endmost cartridges of the two rows are alternately presented to the mouth 124. This is a well known construction of magazine and need not be further described.

Magazine 120 is removably fixed into a magazine holder 127 (Figures 1, 14, 15 and 19) which is essentially an open-ended box-like structure that is secured to the extension tube 30 in registry with a loading port 128 formed in the extension tube 30 in any suitable way and where the latter is made of a sheet metal stamping, rolled and seamed into tube form, the port 128 can be stamped therein as indicated in Figure 6a. Loading port 128 in the tube 30 registers also with a port 129 (see Figures 5, 14 and 15) formed in the forged sleeve insert 32, as by milling, for example, and as better appears in Figure 15, it will be seen that in transverse section the port 129 is parallel-walled and intersects the cylindrical bore 34 in the member 32 almost along a diameter thereof. As shown in Figure 19, the inwardly curved sheet metal parts 124a and 124b project through the port 128 and into the port 129 in such a manner that the extreme ends thereof hardly project into the bore 34, but that a portion of a cartridge held in the mouth 124 by the spring wall parts 124a and 124b projects laterally to an appropriate extent into or beyond the theoretical or geometrical cylinder of the bore 34 where it has been cut away to form the port 129.

The magazine 120 is held in the magazine holder 127 in the just-described position and hence against displacement inwardly or outwardly therefrom by a lock which comprises a cylindrical stud-like lock part 130 (Figures 13, 15 and 18) that projects through a hole 131 in a wall 132 of the magazine holder 120, being carried, as by riveting over, as at 133 (Figure 13), by a leaf spring 134 one end of which is secured as by

screws or rivets 135 flatwise against an inner end of the holder wall 132, the spring being biased to tend to move the locking stud 130 inwardly of the holder 127 to engage in a hole 136 in an outer portion 147 of the sheet metal magazine 120, thus locking it against movement lengthwise of the holder 127.

The locking stud or pin 130 may be withdrawn from the hole in the magazine sufficiently to release the latter for removal or replacement, preferably by means of a lever 137 (Figures 13 and 17) which is cut away as at 138 to laterally span the leaf spring 134 and to provide an end cross-bar portion 140 about which the free end of the leaf spring 134 is looped as at 141, thereby resulting in a simple structure of dependable action. As seen in Figure 13, or in Figure 1, pressing the lever 137 in a direction toward the magazine holder 127, the lever being thus one of the first class, moves the cross-bar portion 140 away from the magazine holder 127, thus withdrawing the locking stud 130 and permitting removal or replacement of the magazine 120, an intermediate curved portion of the lever 137 forming a rocker-like self-accommodating fulcrum as it engages the outer face of the holder wall 132.

The magazine holder 127 is preferably built up of two pieces, one of which may be of sheet metal and bent into a U-shape (Figures 3 and 18) to provide two opposed side walls 127a and 127b and one end wall 127c; the vertical ends of the side walls 127a and 127b are secured as by welding to the other part 132 of the magazine holder which forms the other end wall and which is built up of parts or is preferably in the form of a casting, suitably shaped or machined to provide a guiding T-slot 143 into which slides and is guided the longitudinally extending portion 147 of the magazine. Portion 147 is T-shaped and secured to or formed integrally with one end wall of the magazine 120. T-shaped portion 147 may be built up of sheet metal, as shown in Figure 18. As shown in Figure 15, the T-slot 143 terminates in a transverse wall part or abutment 144 which serves as a stop that is engaged by the inner end of the T-shaped magazine part 137 to limit its inward movement, the parts being so proportioned as to bring the inner end of the magazine into the loading port 129 of part 32 as above described and also bringing the hole in the part 147 into registry with the locking pin 130 which enters it and thus locks the magazine against displacement.

Referring now to the loading port 129 in the part 32 (see Figures 13 and 14), the part 32 is internally cut or finished to merge the greater width, as viewed in Figure 14, of the loading port 129 into the left-hand end of the bore 34, as viewed in Figure 13, where the bore terminates adjacent the innermost end of the gun barrel 37 (or 37a as the case might be); this merging is accomplished by what I shall call a ramp 150 (Figures 13 and 14) and it will be seen to have a gradual upward incline from just about the inner edge of the loading port 128 in the tube 30 to the chamfered or bevelled part 49 of the gun barrel and as is shown in Figure 14, this ramp 150 presents a progressively smaller width of guiding surface, merging in width from that of the registering ports 128—129 to a dimension slightly greater than the maximum diameter of chamfering or bevelling at the region 49 of the gun barrel. It is along this ramp 150, in a direction toward the left in Figure 13, that the ramp 150 insures that the bullet or nose end of the cartridge is dependably guided into the bore of the gun barrel when certain other mechanism engages and shifts the outermost (see Figure 19) cartridge in a general axial direction from in between the opposed spring wall parts 124a—124b.

To effect such barrel-loading shifting of a cartridge, I provide a bolt 152 which in general is cylindrical and of a radius somewhat less than the radius of the bore 34, being mounted for longitudinal movement within the tube extension 30 in a manner to be coaxial therewith and also with the gun barrel bore itself. The bolt 152 can thus enter the bore 34 in the part 32 and a portion of its front end engages so much of the innermost cartridge as projects into the geometric cylinder of the bore 34 as above described, thus sliding that cartridge in the general direction of its axis lengthwise of the spring wall parts 124a—124b to be guided, if necessary, by the ramp 150 and thus injecting it into the rear end of the bore 38 of the gun barrel.

The bolt 152 is preferably integrally formed with a relatively heavy cylindrical part 153 which provides enough weight and hence mass in relation to other factors to achieve certain actions later described. The part 153 is externally machined to a diameter to be receivable within the extension tube 30 with a nice free sliding fit and from its rear or right-hand end it is recessed or drilled, as at 154, to a substantial extent and preferably along its axis to receive an impeller spring 155 capable, after compression and when released, to impel the structure 152—153 to the left at an appropriate velocity.

The spring 155 is a coiled spring and at the rear end of the extension tube 30 I provide a suitable means against which the spring 155 may react and such means I preferably construct also as a safety means or buffer to prevent accidental or unintensional rearward excessive movement of the relatively heavy moving bolt structure 152—153. This means I construct in the form of a relatively heavy cylindrical block 156 of steel or the like machined to be snugly fitted into the rear end of the tube 30 and externally flanged as at 157 (Figure 5) to abut against the rear annular face of the collar 70 and thus fix the extent of inward movement upon assembly of the member 156, which I term a "buffer block," relative to the tube 30.

The buffer block 156 has a hole 158 drilled through it and along a diameter and in such position that, when assembled to the tube 30 as just described, hole 158 registers with the holes 80 and 81 in the collar 70 and tube 30 so that the stud 85 of the mounting unit 83, when the latter is assembled to the tube 30 and, of course, after the bolt structure 152 and 153 and other parts later described, are inserted into the tube 30, passes through the buffer block 156, thus dependably holding and locking it against displacement, the locking stud 85, in turn, being locked by the bolt 87.

If desired, and preferably, I may provide suitable means for guiding or holding substantially straight through its length and particularly during expansion, the spring 155 and such means may comprise two headed telescoping rod-like members 160—161, the larger-diametered one being tubular to telescopically receive therein the smaller-diametered one, with the head of one of them bottoming in the internal end of the hole or bore 154 and the head of the other abutting against the inner face of the buffer block 156. The bore 154 and these two telescoping members 160

and 161 and also the spring 155 are of sufficient length to retain their operative relationships, including the telescopic relation of the two guide members 160—161, throughout the entire length of the stroke of the bolt structure 152—153, the length of stroke being from the position shown in Figure 5 to a position such that the left-hand end of the bolt 152 just about enters the rear end of the bore 38 of the gun barrel.

Suitable means are provided to manually retract the bolt structure 152—153 to compress the spring 155, and such means may comprise a retractor element 162 (Figures 9 and 10) in the form of a bar that is accommodated freely in a longitudinally extending slot 163 in the bolt part 153, the slot being open at its left-hand end as seen in Figure 5, opening in the front end face 164 of the bolt part 153, but terminating in a closed end 165 near the rear or right-hand end of the bolt part 153.

The forward or left-hand end of the retractor bar 162 has secured to it an upstanding shank or stud 166 which projects through a longitudinally-extending slot 167 in the tube extension 30, externally of which there is secured to the stud 166 a knob 168 of dimensions greater than the width of the slot 167; accordingly, for assembly purposes (the buffer block 156 not yet being in position), the retractor bar 162, without the knob 168, is put into the rear end of the tube 30 and the stud 166 made to project out through the slot 167, whence the external knob 168 is secured thereto as by being provided with a suitable hole or recess 170 whence the knob 168 and stud 166 may be pinned together as by a pin 171. The retractor bar 162 is thus supported internally of the tube 30 and close to its internal wall, lengthwise of the slot 167 which it covers over internally, and then the bolt structure 152—153 is inserted into the rear end of the tube 30, the rear end of the retractor bar 162 entering the front open end (in the face 164, Figure 5) of the slot 163, the spring 155 and its guide elements are next slipped into the bolt bore 154, the buffer block 156 put in place, and the mounting structure 83 with its locking stud 85 put in position to lock the buffer block 156 in position, and then the bolt 87 secured.

Accordingly, by manually pushing or pulling the knob 168 rearwardly along the slot 167 (which can be a stamped slot if the tube 30 is made of sheet metal as in Figure 6[a]), the rear end of the retractor bar 162 abuts against the right or rear dead end 165 of the slot 163 in the bolt part 153, thus moving the bolt structure toward the buffer block 156 and compressing the spring 155.

Trigger control means of any suitable construction are provided to hold the bolt structure 152—153 in retracted position and hence to hold the spring 155 compressed and with energy stored therein. Preferably, however, and in accordance with certain other features of my invention I employ, for this purpose, a sub-assembly arrangement which can be separately constructed and easily and quickly attached or detached, thus greatly facilitating manufacture.

Thus I preferably provide a casing structure generally indicated in Figures 2 and 5 by the reference character 173, preferably made of sheet metal so as to facilitate constructing it by stamping or drawing operations. The casing 173 is U-shaped in cross-section having a bottom wall 174, opposed side walls 175—176 (Figures 2, 3, 5 and 8), and at its rear or right-hand end in Figure 5, an end wall 177. It may be easily blanked out, including certain apertures or slots later mentioned, and may also easily be drawn into the just-described shape; if not drawn, the walls 175—176 where they meet with the rear end wall 177 may be brazed or welded together, and the opposed parallel side walls 175—176 may be drilled and threaded as desired to provide such pivot studs, threaded at their outer ends for threaded engagement with holes in one of the side walls, as may be needed to pivotally mount whatever sear, lever, spring, trigger, or other controls it may be desired to provide for controlling the action of the gun mechanism.

By way of illustration, and purely diagrammatically (because this mechanism may take any known or other or desired form) I may provide a sear 178 pivotally mounted on a suitable stud 180 carried by the opposed walls 175—176, shaped to project through a slot 181 in the underside of the extension tube 30 (the slot may be milled or punched, if desired, when the tube 30 is made of sheet metal as in Figure 6[a]) and it is spring-pressed or biased inwardly of the tube 30 through the slot 181 by any spring or spring-actuated lever, to coact with the bolt structure 152—153 of which the part 153 may be provided with a ratchet-like recess 189 conveniently formed by turning a groove of appropriate cross-section, such as indicated in Figure 5, in the part 153.

Upon maximum retraction of the bolt structure as above described, the ratchet or one-way acting recess 189 in the part 153 over-rides the inwardly biased and projecting portion of the sear 178 to enter the recess, a subsequent sliding movement forwardly of the bolt structure under the urge of the spring 155 bringing the right-hand wall of the groove 181 into engagement with the sear, thus holding the bolt 152—153 retracted and the spring compressed. Such action takes place upon an initial manual retraction by way of the retractor knob 168 externally of the gun structure, it may be made to take place also when the bolt structure 152—153 is forced rearwardly by the reaction of the firing or explosion of the cartridge; in either case, that action takes place if the sear 178 is not held against sufficient movement inwardly of the tube 30 to function as a catch and here any suitable mechanism, preferably a member pivotally mounted upon a stud bridged across the walls 175—176 and operable from the outside as by a control knob 182 (Figures 2 and 8) may be used to operate upon the sear 178 so as to lock it either in the catching position with the bolt structure retracted, in which case the trigger mechanism cannot be actuated and the gun is in a "safety" condition, or to forcibly retract the sear 178 and hold it retracted after it has been first actuated by the trigger to permit an initial propulsion of the bolt structure by the energy stored in the spring 155, in which case the gun operates repeatedly and fully automatic so long as there are cartridges in the magazine, as is more fully described later. With the knob 182 in a neutral position, the sear is free to catch and hold the bolt structure as for initially compressing the spring manually or to hold the bolt retracted when it is propelled rearwardly by the reaction of the explosion of the cartridge. Any known or suitable detailed form of mechanism may be employed to be actuated by the knob 182 for the just-described purposes and in Figure 5 such a mechanism is only diagrammatically indicated by the reference character 184 and it functions, of course, in coaction with a trigger 188 pivotally mounted in the casing structure 173 and exposed

downwardly below the bottom wall 174 through a slot 190 formed in the wall 174.

A trigger guard generally indicated at 191 comprises a curved part 192 of relatively heavy, strong and rigid metal, being bent over into an L-shape at one end as at 193 so that that end may be snaked through a suitable aperture 194 in the bottom wall 174, whereby when thereafter swung into the position shown in Figure 5, the transverse part 193 overlies internally the bottom wall 174 of the trigger casing and is locked against removal.

The forward end part 195 of the trigger guard 191 is preferably more massive than the part 192 and is faced off to rest flat against the wall 174 to which it is secured as by a screw 196. It will be noted that preferably the screw 196 passes through a hole in the bottom wall 174 of the trigger casing and is threaded into the heavy guard part 195, thus providing a strong assembly, easily made in constructing the trigger assembly itself and not accessible for tampering or the like from the exterior of the casing.

This complete and unitary sub-assembly I arrange to be quickly and easily attached to the extension tube 30 to which, near its rear end and on its underside I secure as by welding a heavy lug 197 constructed to present, spaced downwardly from the wall of tube 30, a rearwardly extending projection 198 onto which the rear end of the sub-assembly casing 173 is virtually hooked, the rear wall 177 being provided with a hole 200 with which the rearward projection 198 snugly interfits so as to accurately align the rear end of the sub-assembly and its internal parts properly to the axis of the gun structure.

Spaced forwardly of the lug 197 and secured to the tube 30 as by welding is a downwardly projecting lug 201 of substantial dimensions, dimensioned in effect to form the front closing end wall of the trigger casing 173 between the side walls 175—176 of which the lug 201 snugly fits, the length of the latter being such that when the bottom wall 174 abuts against the bottom face of lug 201, the upper edges of the side walls 175-176 rest snugly against the tube 30 to the curvature of which they may be conformed in cross-section as indicated in Figure 8.

To this lug 201, the front end of the casing 173 is now secured and preferably I employ a screw 202 (see Figure 8) with a knurled head 203 and stepped to provide differently-diametered cylindrical portions or shoulders 204 and 205 to take into correspondingly-diametered holes in the casing side walls 175–176, the intermediate portion of the screw being threaded as at 206 for threaded engagement with a threaded hole 207 in the lug 201. The lug will be seen thus to provide threads of substantial axial extent with which the threads of the screw can coact and I am thus enabled to avoid possible weaknesses or disadvantages that might result from having to thread parts into relatively thin sheet metal.

When so assembled to the tube 30, the sear 178 of the sub-assembly is properly positioned both lengthwise of the gun structure for proper coaction with the bolt structure and also circumferentially for proper freedom of entry into or movement out of the slot 181 in the underside of the tube 30. It will be noted that thus the trigger and sear mechanism may be easily fabricated as a sub-unit, regardless of what detailed or specific form that the sear and its control mechanism might take, and that the unit may be easily and quickly assembled to or disassembled from the gun structure. Moreover, the placement of the unit immediately ahead of the axis of the holes 80 and 81 that receive the locking stud 85 and immediately ahead of the block part 73 of the collar 70 permits of ready and appropriate association of the trigger relative to whatever type of hand grip or gun stock is associated with or assembled to the rear end of the extension 30, as by way of a mounting unit like the unit 83 above described and to which a pistol grip 82 may be related or a gun stock 111, as in Figure 23, or gun stocks like that shown in Figures 1 and 2, or in Figures 21 and 22.

A preferred mounting of a front sight, namely, sight 52 in Figure 2 for example, is above described. I am enabled to simplify the construction and assembly of the extension 30 and related parts by a preferred construction and mounting of rear gun sight of the kind better shown in Figures 3, 5 and 6, and for this purpose I prefer to drill a recess 210, preferably coaxial with and into the locking stud 85 of the mounting unit 83, proportioning the inside and outside diameters of the resultant tubular cross-section of the locking stud 85 so that the latter, of increased resistance to bending because of its tubular cross-section, is of ample strength to resist any strains or sudden shocks to which it might be subjected during recoil movement of the heavy bolt structure 152–153. Slidably received in this cylindrical recess 210 is the cylindrical shank 211 of the rear sight 212 which is mounted at the upper end of the shank 211 and which may be of any suitable or desired construction. Illustratively, it may be in the form of a disk as indicated, provided with a sighting hole 213 of suitable size and it preferably is integrally formed as part of the shank or stem 211.

One side of the stem 211 is milled off or flattened as at 214 (Figure 5) preferably along a plane transverse to the optical axis of the sight 212 and in that flattened face 214 I provide a suitable number of spaced V-shaped slots or notches 215 to coact selectively, to provide for different manual adjustments of elevation of the sight 212, with a pointed or V-headed element 216 preferably spring-biased by any suitable construction as, for example, by providing the member 216 with a stem 217 slidably received in a cylindrical housing 218 secured to the collar 70 and with a spring 220 interposed between the bottom of the housing 218 and the inner end of the stem 217, the cylindrical housing 218 conveniently extending lengthwise of the cylindrical collar 70. The spring-pressed member 216, though V-shaped, is broad-faced to engage into any slot 215 throughout substantially its entire length transversely of the stem 211 and thus it acts also to hold the stem and hence the sight 212 against rotary movement about a vertical axis and it acts also to hold the sight and its stem from withdrawal from the recess 210, the milled or cut-away part 214 terminating at its lower end in a shoulder 221 in the path of upward movement of which is the catch member 216 which thus has to be forcibly moved to the left in Figure 5 against the bias of the spring 220 if and when the sight is desired to be removed. The part 216—217 is prevented from complete removal by a suitable pin 219 working in a slot in the wall of housing 218, and thus cannot be lost. The rear cylindrical face of the stem 211 can bear graduations or indicia indicating the different ranges corresponding to different vertical settings of the sight, if desired.

The forward end of the bolt 152 is recessed as at 224, as by a lathe operation, to provide a peripheral lip 225 whose inside face 226 is tapered or gradually curved to form an appropriate transition from the outside diameter of the bolt 152 to the diameter of the circular recessed face 227, as is better shown in Figures 5, 11 and 12. This is to aid in centering, or bringing coaxially therewith, a cartridge that is, at high velocity, pushed out of the magazine (Figure 19) as above described, by the forward end of the bolt 152, the action of centering taking place completely and finally after the projectile has been guided by the ramp 150 (Figure 13) into the rear end of the gun barrel, and the peripheral lip 225 insures that, during the injecting movement of the cartridge and forced by the forward end of the bolt 152, a firing point 228 projecting from the center of the face 227 (Figures 11 and 12) need not or does not take part in or interfere with the pushing of the cartridge up the ramp 150 (Figure 13) and into the gun barrel.

The firing point 228 may be formed integrally with the bolt 152 as indicated at 230 in Figure 12, but preferably, to permit replacement it is in the form of a separate stud or pin 231, as shown in Figure 11, force-fitted into a drilled hole 232.

The diameter of the face 227 (Figures 5 and 11) is equal to the diameter of the rear end part of the shell of the largest calibered cartridge which the gun construction is desired to handle, that being of course the diameter of the peripherally projecting part 233 (Figure 11) that forms part of the rear wall of the shell of the cartridge C. Accordingly, with whatever caliber of cartridge already injected and seated in the rear end of the gun barrel, the continued forward movement of the bolt structure 152—153, under the expenditure of the energy stored in the spring 155 coupled with the momentum of the substantial mass of this moving bolt structure, can impact the front recessed face 227 of the bolt 152 flatwise against the rear face of the cartridge C; in so doing several actions take place.

Thus, a catch element 234 (Figures 10, 11 and 12), which I hereafter call an extractor, projects through a cut-away portion in the lip 225 in a direction toward the center point of the face 227, and it is shaped somewhat like a detent or ratchet tooth so that under the impact of the bolt 152 against the rear end of the cartridge, its front inclined face or surface (Figures 11 and 12) cams it radially outwardly to let the cartridge seat itself against the face 227, whereupon, being biased inwardly toward the center, it takes over the peripheral flange 233 of the cartridge C, thus to take part in withdrawing the empty shell of the cartridge C when the bolt starts moving rearwardly.

A preferred mounting for the extractor 234 is to form it as part of a lever shaped as indicated in Figures 11 and 12 at 236, being accommodated in a slot 237 milled in the side of the bolt 152 to which it is pivoted by a pin 238 and about the axis of which pin it is biased to move the extractor 234 radially inwardly by means of a spring 240 conveniently housed in a drilled recess 241 in the bolt 152. The parts may be proportioned substantially as shown in Figures 10, 11 and 12, the depth of the forward end of the slot 237 limiting the inward movement of the extractor 234 which, as seen in Figure 10, is of an inward radial extent preferably sufficient to coact to catch over the rim flange of whatever

caliber or different calibers of cartridges that the gun is to handle.

Also, as the extractor 234 catches over the front side of the flange 233 of the cartridge shell, the impact of the firing point 228 in the face 227 of the bolt against the usual centrally positioned detonating center or cap of the cartridge causes the latter to be substantially impaled upon the firing point, thus additionally securing the shell to the front end of the bolt and in effect fixing the shell coaxially on and to the front end of the bolt 152 against lateral displacement by any pressure inward radially caused by the extractor 234, and in this respect the peripheral lip 225 may, under certain circumstances, coact also.

The resultant explosion or detonation of the explosive in the shell of the cartridge expels the projectile from the shell and out through whatever gun barrel is assembled to the front end of the extension 30, the relatively heavy mass of the bolt structure 152—153 backing up the shell during this action, which of course takes place with extreme rapidity, the bolt structure remaining in effect and for the moment practically stationary due to its inertia, for it takes such time for the reaction of the explosion to start the heavy mass of the bolt moving rearwardly that the projectile is well on its way at high velocity outwardly of the gun barrel; some continued expansive force of the spring 155 might aid in this action.

But with the overcoming of the inertia of the bolt mass, that is, its tendency to remain in practically motionless position, the reaction of the forces caused by the gases of combustion impel the bolt structure rearwardly at a good velocity, compressing the spring 155 and, depending upon the position of the mechanism 184 controlling the sear 178, the bolt is or is not held in retracted position by the sear.

During the above-described rearward and relatively high velocity movement of the bolt 152, the empty shell, fastened or held to the front end of the bolt 152 as above described is carried along with the bolt. In a side of the bolt 152, angularly related in a suitable way as indicated in Figure 10 and hence also related as later described to an ejector port in the gun extension, is a longitudinally-extending slot 243 (see also Figure 8) and projecting into that slot is a stud or pin 244; this I call an ejector and it preferably takes the form of a stud-like end of a screw having a threaded shank 145 threaded into an almost radially-extending threaded hole 246 in the heavy sleeve insert 32 at the front end of the tube 30, suitably headed and slotted as at 247 for convenient assembly and replacement if necessary, the head being countersunk appropriately by countersinking or drilling into the wall of the tube 30 (see also Figure 1). As appears from Figures 1, 5 and 14, the ejector 244 projects into the bore 34 almost along a radius, displaced slightly to one side of the vertical plane through the axis of the bore, and on the other side of that bore, the sleeve insert 32 is cut away as shown at 248 in Figures 5, 13, 14, 15 and 2, the axial length of the opening 248 in the bore 34 being slightly longer and forwardly spaced than and relative to the infeed port 128, and in transverse section the cut-away part 248 flares outwardly as better appears in Figures 14 and 15, thus forming an ejector port with which a corresponding opening 250 in the wall of the tube 30 registers. The opening 250 may be stamped if the tube 30 is made of a sheet metal stamping as in Figure 6a.

The position along an axial direction of the

ejector 244 relative to the ejector port 248 and other parts is about as indicated in Figure 5 and the empty shell, carried rearwardly or to the right in Figure 5 with the retrograde movement of the bolt 152 finds the ejector stud 244 in its path. The stud, however, is of a length (see Figure 14) to strike the rearwardly moving rear end of the empty shell preferably only to one side of its axis and preferably on a side thereof opposite to the side where the extractor or catch 234 grips the flange of the shell; a line joining the two points or locations finds on it or close to it also the point in the shell where the firing point 228 also holds the shell onto the end of the bolt. The resultant impact of the empty shell against the ejector stud 244 is like an off-center blow that has the effect of initially tilting the shell out of coaxial relationship to the bolt 152, thus also disengaging the shell from any grip which it may have upon the firing point or stud 228, and this tilting, and control of its direction, is aided also by the relative location of the extractor 234 about which the empty shell begins to tilt with the extractor 234 acting in effect like a pivot point or fulcrum. The resultant direction of tilt is downwardly to the left as viewed in Figure 10 and downwardly to the right as viewed in Figure 14, being in effect along the center line of the outwardly and downwardly flaring ejector port 248—250.

These actions take place with such rapidity that the empty shell is in effect flipped downwardly and laterally and out through the just-mentioned ejector port. It might at this point be noted that, as indicated in Figure 5, there is adequate difference in the diameters or radii of the bore 34 of the insert 32 and of the bolt 152 to provide appropriate clearance or space in which to accommodate any outward radial projection of either the extractor 234 or of its lever and hence the latter has adequate freedom of movement. Moreover, the extractor structure can easily be replaced, if necessary, disassembly to withdraw the bolt structure being easily accomplished as above described. Also, it will be noted that the slot 243 in the bolt 152, in which the ejector 244 rides during relative movement between it and the bolt, acts like a spline to prevent rotational movement of the bolt, and thus the extractor 234 is always maintained in the right position to tilt the empty shell for outward flipping always at the right angle and hence always through the ejector port 248—250. The retractor bar 162 (Figures 9, 10 and 5), seated in the bolt slot 163, is prevented from partaking of rotational movement about the axis of the gun because of the slot 167 in the tube 30, and these and other parts are so related that when the bolt 152 is slid into the open rear end of the tube 30 upon assembly, the slot 143 is properly aligned with respect to the inwardly projecting ejector 244 in the bore 34. Also, the retractor bar 162 in coaction with the slot 163 acts also to prevent rotational movement of the bolt structure during its strokes of movement.

The inward radial extent of the overhanging part of the extractor 234 is sufficient as above noted to engage and hold the smallest-calibered cartridge that the gun is to handle and its range of outward radial movement, plus the clearance provided between the bore 34 and the bolt 152, are sufficient to achieve its appropriate coaction to grip the flange of the largest-calibered cartridge shell that the gun is to handle, and as a result, the only material change that need be made in the structure to accommodate several calibers of cartridges, such as those earlier above mentioned, need be no more than changing the gun barrels in the manner above described.

With the empty shell thus removed from the front end of the bolt 152, the ensuing forward propulsion of the bolt 152 by the energy stored in the spring 155 commences a repetition of the above-described cycle, the front end of the bolt 152 sliding a projectile in a general axial direction out from in between the magazine parts 124a—124b (Figure 19), the ramp 150 guiding it into the gun barrel, it being noted that the bolt part 152, while still well within the bore 34 in effect closes off the mouth 124 of the magazine, uncovering it adequately only after such rearward movement of the bolt has taken place as to eject the empty shell from the bolt, and hence possible interference of the foremost of the spring-pressed cartridges in the magazine with the empty shell, or vice versa, is prevented.

As above noted, if the mechanism 184 in the trigger assembly, controlled by the knob or lever 182, is set to leave the sear 178 biased by the spring, the above described retrograde movement under the reaction of the gases of combustion is of sufficient extent to cause the bolt structure to be held by the sear 178 in retracted position, whence the above-described cycle may be again initiated upon actuating the trigger 188; in such case, the mechanism is adjusted for single fire, a trigger actuation being required for each firing.

The control mechanism 182—184 may, however, also be set to hold the sear 178 in retracted position after the first actuation of the trigger, and in such case, the gun mechanism operates automatically to repeat the above-described cycle for as many times as there are cartridges in the magazine 120. Or the mechanism 182—184 may be so constructed and set so that the retraction of the sear 178 (to release the retracted bolt) and its subsequent release to be spring-biased into position to catch the bolt in retracted position may be under the direct control of the trigger 188 so that as many repetitions of the cycle may be had depending upon the length of time that the trigger 188 is held in actuated position.

As above described, the retractor knob 168 is exposed exteriorly of the slot 167 in the tube 30; preferably, the knob 168 is provided with extensions 253 and 254 of a length somewhat greater than the length of the slot 167 in the tube 30 so that the slot 167 is covered up and substantially closed, whether the knob 168 is at one end of the slot or the other, it being noted that after an initial retraction of the bolt to compress the spring 155 (Figure 5), the subsequent release of the bolt by actuation of the sear 178 carries the knob 168 forwardly along the slot 167; in retracted position of the bolt, the slot is covered by the extension 254 and in projected position it is covered by the extension 253. Preferably, the rear end of the heavy tube insert 32 (see Figure 5) acts as a stop to limit forward movement of the bolt structure 152—153, the forward annular face 164 of the part 153 abutting against the rear face of the part 32; this limiting action takes place should the mechanism be actuated without a cartridge, and thus the impacting of the front end of the bolt 152 against the rear end portions of the barrel 37 is prevented; as shown in Figures 5 and 13, the gun barrels and the forward end of the part 32 are so constructed that the inner end faces or surfaces of the gun barrel, whichever one is used,

always occupy the same position. The shoulder 40 and the front face 42 as well as internal shoulder 255 in the part 32 in coaction with the annular end face of the gun barrel insure such proper positioning always of whatever gun barrel is employed.

Desirably, the ejector port 248—250 is also provided with a cover and this preferably comprises an arcuate sheet metal cover plate 256 (Figures 2, 15, 14 and 16) of sufficient expanse in a peripheral and longitudinal direction to close over the port; it is preferably mounted for movement, for example, by being provided with parallel slots 257 and 258 through which extend the shanks of headed studs or screws 259 and 260 secured in or threaded into the tube 30 and underlying part 32, so that the closure plate 256 may be slidably guided into or out of ejector-port closing position.

Preferably, I provide mechanism to insure that the closure plate 256 is moved to open position upon manual actuation of the retractor knob 168 and left in open position even through the retractor moves forwardly with the bolt. A convenient mechanism comprises a curved transverse extension 254a of the cover part 254 of the retractor knob 168, part 254a overlying the plate 256 which has an upstanding ear 256a with which the part 254a coacts. These parts are so interrelated that, with the plate 256 in closing position, movement of the retractor knob 168 rearwardly to retractible position draws and slides the plate 256 into port-uncovering position, for the plate 256 is taken along by the engagement of the part 254a of the retractor slide with the part 256a of the closure plate. Subsequent movement of the retractor forwardly leaves the closure plate 256 in open position, however, for the part 254a is free to move forwardly independently of the closure slide. It is, therefore, impossible for the gun to operate without the ejector port being open. The sheet metal of the closure plate 256 can be made of a suitable springy metal so that, in coaction with the heads or shanks of the guides 259 and 260 there is sufficient frictional engagement therewith or with the curved outer face of the tube 30 to hold the plate 256 in whatever position it is moved; it may thus be retained in open position, it being noted that after an initial retraction of the bolt through the retractor knob 168, a subsequent forward propulsion of the bolt carries the retractor bar 162 and the knob 168 forwardly, where the knob 168 can remain thus forwardly positioned even though the internal bolt structure subsequently goes through subsequent cycles of operation; at the conclusion of any cycle, the plate 256 may be put in port-closing position manually, the upstanding part 256a functioning as a thumb piece.

The construction of the firearm will be seen to be strong yet capable of embodiment in a manner to achieve lightness of weight. For example, the collar 70 (Figures 3, 5 and 6), with its block-like downward extension 73 strengthens and reinforces the rear end of the tube 30 and makes for strength and sturdiness of mounting to the rear end of the structure a pistol grip, gun butt structure or the like, as may be desired; the mounting member 83 with its stud 85 (Figures 5 and 6) snugly interfits as above described with the bifurcated downward collar extension 73 and with the aligned holes 80 and 81 in both the collar 70 and the tube 30, and by this arrangement also the buffer block 156, through which the stud 85 passes is strongly and dependably held in place. For example, any unintentional, accidental or abnormal action as might impact the bolt structure 152—153 rearwardly (to the right in Figure 5) and against the buffer block 156 is dependably resisted by the anchorage which the stud 85 has, not only in the tube 30 but also in the collar 70.

If desired, the inner face of the buffer block 156 may be provided with a cushioning member indicated at 159 in Figure 5, made of preferably any suitable non-metallic material, such as rubber, fibre or the like, and hence preferably resilient or yieldable, to absorb some of the energy of a rearward impact thereagainst by the bolt structure 152—153. The cushioning member 159 is conveniently in the form of a disk or washer substantially matching in area the rear annular face of the bolt part 153, and may be secured in place in any suitable manner as by fitting it into a counterbore 265 in the end face of buffer block 156 as indicated in Figure 5. Preferably also, the inner end of the spring-guiding member 161 is seated in a recess 266 as indicated in Figure 5, thus to hold the rear end of the member 161 coaxial with the bore 154 in the bolt part 153 throughout the length of the working strokes of the bolt structure.

The various parts will also be seen, in view of the foregoing, to be capable of ease or facility of fabrication and many of them will also be seen to be capable of ready adaptability to various fabrication techniques. For example, the member 32 that is assembled to the forward end of the extension tube 30 (as seen at the left in Figure 5) may be made of a single piece of metal throughout and may, for example, be cast; in such case, it can be cast to appropriate tolerances so as to require a minimum of machine tool metal-removing or finishing operations. Even if machined out of an initial solid cylindical blank of steel or other suitable metal, its conformation is such as materially to facilitate machining. If made initially by forging, it is preferably made in two halves as, for example, by so selecting a plane of cleavage or division along such a diameter as viewed in Figures 14, 15 and 18, for example, illustratively the vertical central plane as seen in these figures, as will permit economical and substantial preforming of each half as by drop-forging. Each half may then be machined, the sub-division facilitating machining of the various infeed and ejector port and ramp surfaces, whence the two halves may be welded together, their assembly being furthermore insured, strengthened and maintained by the envelopment thereof by the forward end portion of the tube 30 which, as above noted, may if desired be shrunk over the element 32.

It will thus be seen that there has been provided in this invention a gun construction and assembly and sub-assemblies in which the several objects heretofore noted together with many thoroughly practical advantages are successfully achieved. The construction lends itself to efficient and rapid manufacture, to rapid assembly or disassembly and hence speedy replacement of parts or for cleaning or inspection, and moreover, is rugged and strong and of wide adaptability to meet the widely varying conditions and exigencies of practical use.

As many possible embodiments may be made of the mechanical features of the above invention and as the art herein described might be varied in various parts, all without departing from the scope of the invention, it is to be un-

derstood that all matter hereinabove set forth, or shown in the accompanying drawings, is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. A firearm comprising a receiver having a bore at one end, two gun barrels, each having threaded means at one end, threaded means on said receiver adjacent said bore for receiving the threaded means of either one of said gun barrels for assembling the latter to said bore, second threaded means at the opposite end of each barrel, and threaded means at the other end of said receiver for receiving the second threaded means of either of said gun barrels whereby when assembled, one of said gun barrels forms the firing barrel of the firearm and said other gun barrel forms the, or part of a, gun stock.

2. A firearm comprising a receiver and a pair of tubular elements constructed and arranged for interchangeable gun barrel and butt stock use, the front end of said receiver having a bore opening formed therein, means for selectively and detachably securing the rear end of either of said tubular elements in said bore opening, the rear end of said receiver having formed thereon a socket, means for selectively and detachably securing a front end of either of said tubular elements in said receiver socket, whereby when the firearm is assembled either of said tubular

elements is selectively secured in said bore opening of the receiver to function as a gun barrel and the other is secured in the receiver socket to function as a butt stock.

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