Nov. 22, 1938. E. PUGSLEY 2,137,808

FIREARM FRAME AND METHOD OF MAKING SAME

Filed Jan. 13, 1937 4 Sheets-Sheet 1

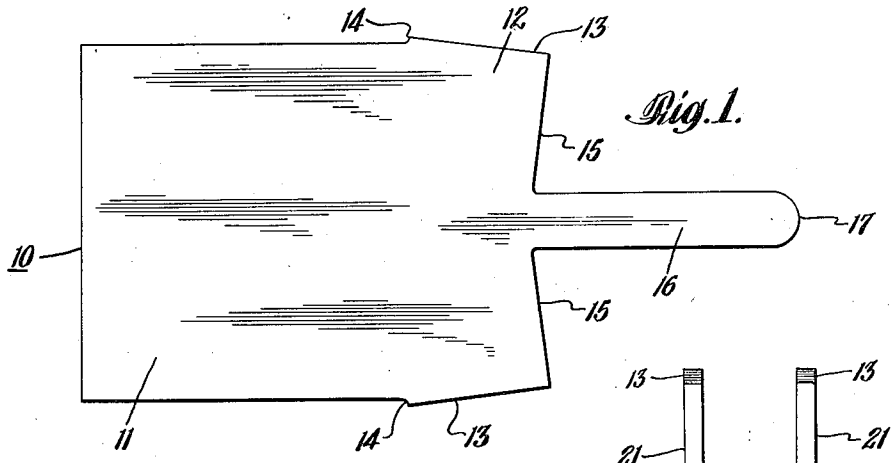

Fig. 1.

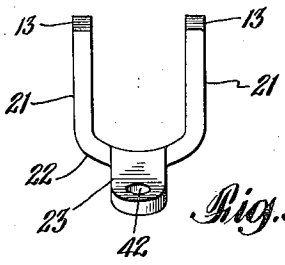

Fig. 3.

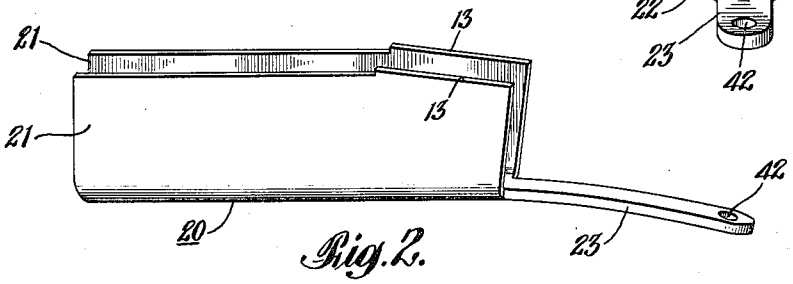

Fig. 2.

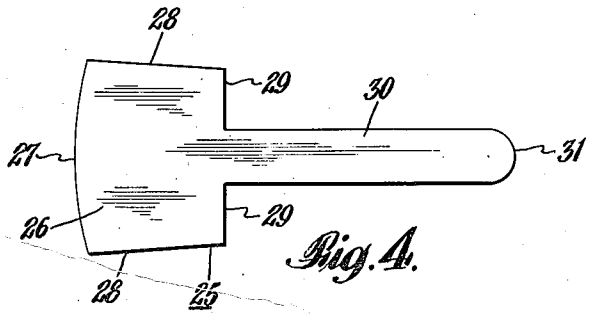

Fig. 4.

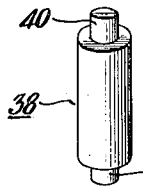

Fig. 7.

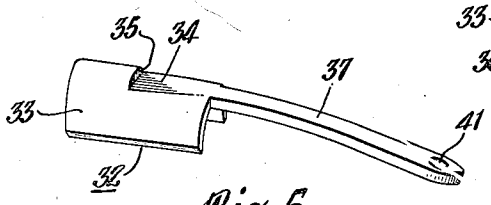

Fig. 5.

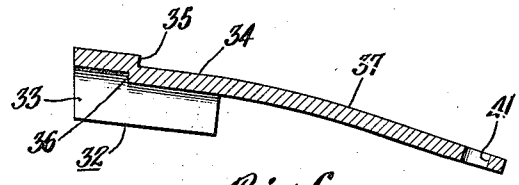

Fig. 6.

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FIREARM FRAME AND METHOD OF MAKING SAME

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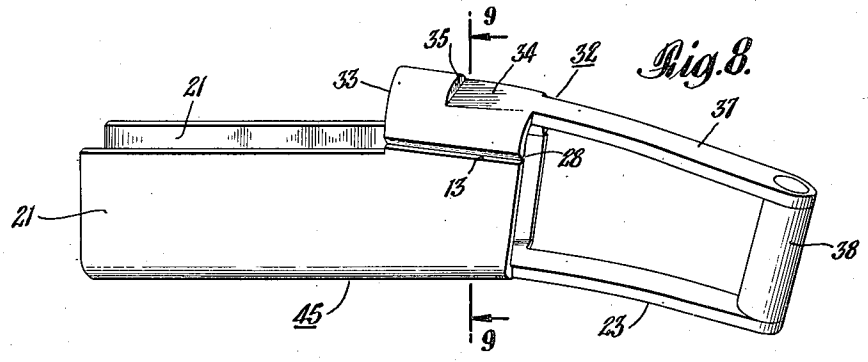

Fig. 8.

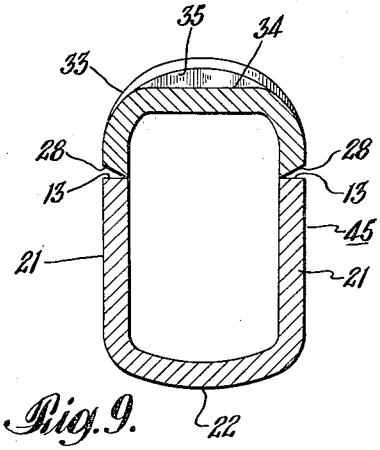

Fig. 9.

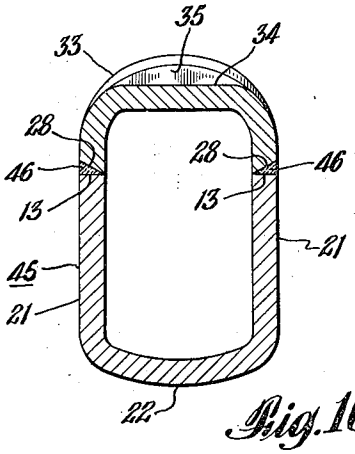

Fig. 10.

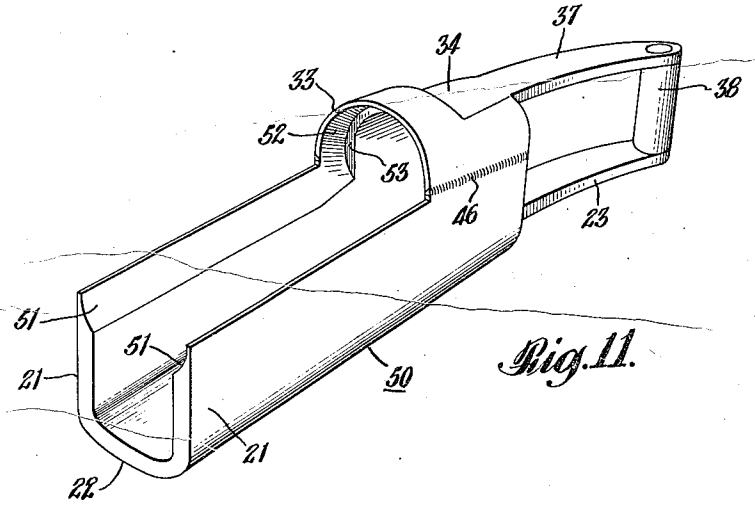

Fig. 11.

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FIREARM FRAME AND METHOD OF MAKING SAME

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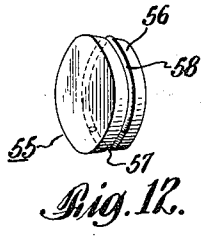


Fig. 12.

Fig. 13.

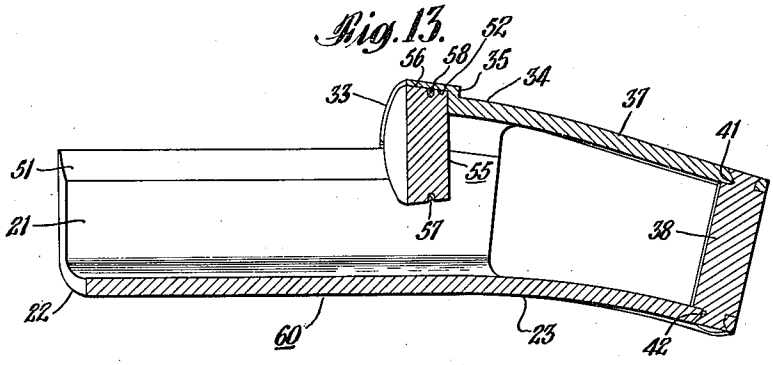


Fig. 14.

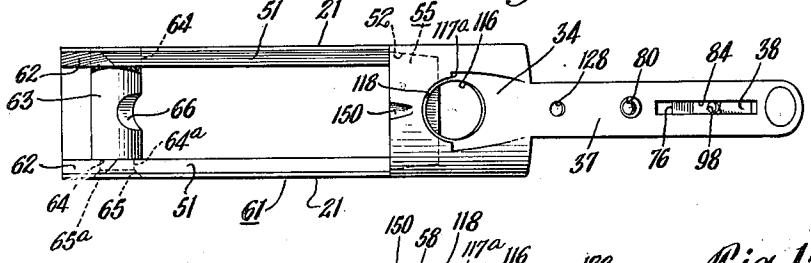


Fig. 15.

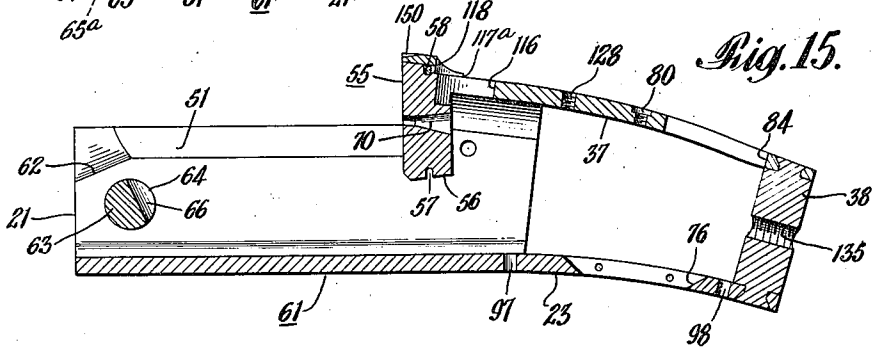
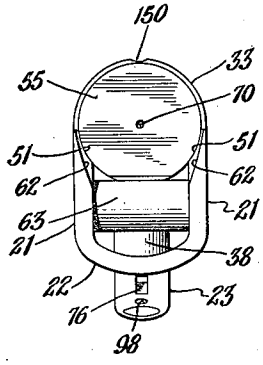


Fig. 16.



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FIREARM FRAME AND METHOD OF MAKING SAME

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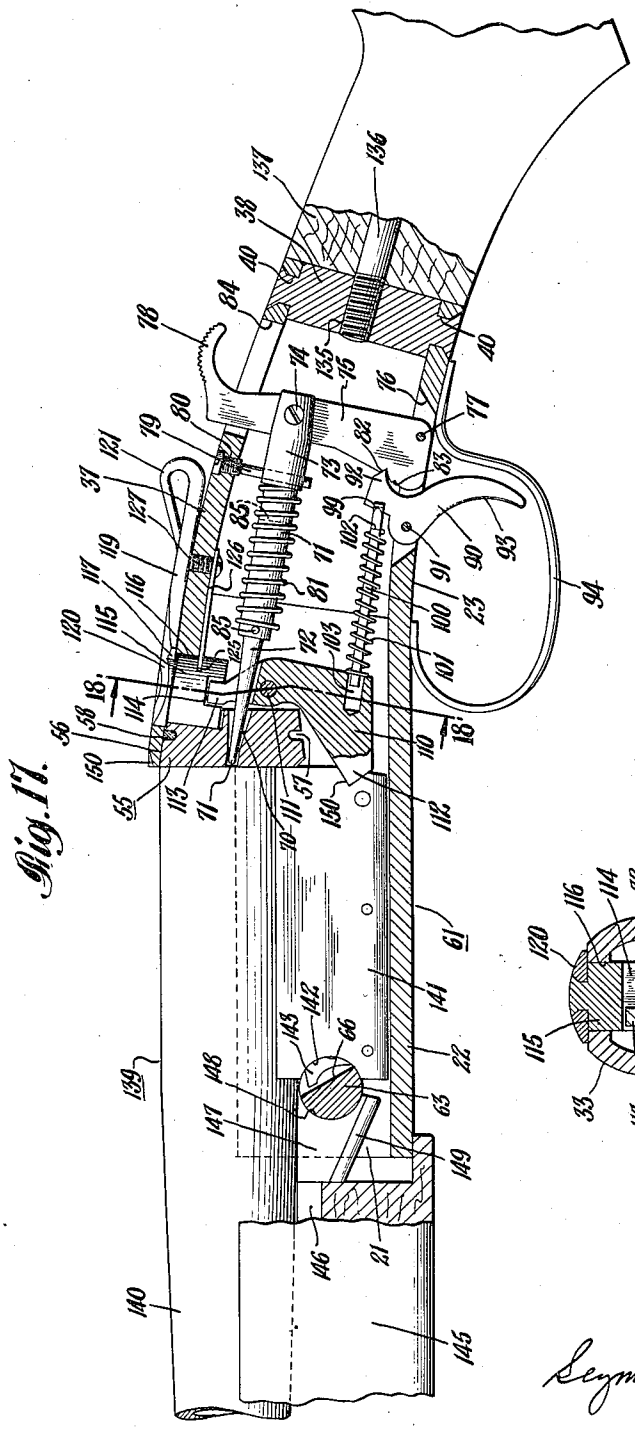

Fig. 17.

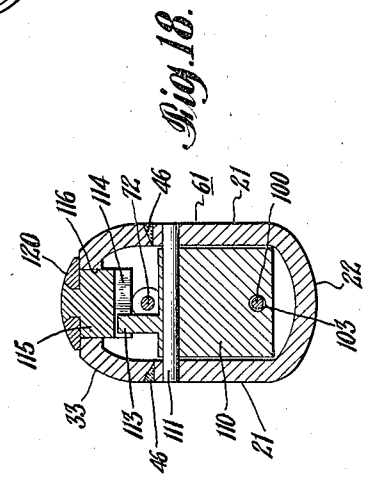

Fig. 18.

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Patented Nov. 22, 1938

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UNITED STATES PATENT OFFICE

2,137,808

FIREARM FRAME AND METHOD OF MAKING SAME

Edwin Pugsley, New Haven, Conn., assignor to Winchester Repeating Arms Company

Application January 13, 1937, Serial No. 120,334

8 Claims. (Cl. 29—148.2)

This invention relates generally to firearms and more particularly to a novel firearm frame structure and method of constructing the same.

In the manufacture of firearms, it has been customary to form the frame or receiver portion by forging or casting the same. Owing to the comparatively irregular shape of the frame or receiver, the forging of this member is a relatively expensive operation, especially since several successive forging operations are usually necessary to form the member satisfactorily to the desired shape. Firearm frames and receivers have also been formed by casting, but these members when thus formed have generally been found to contain blow holes and to be too brittle for satisfactory use in firearms.

It is necessary that a firearm frame be sufficiently strong and tough to withstand the numerous shocks due to firing of the gun and also shocks incident to rough handling. The frame or receiver should be formed of such material that there is little tendency to crystallization by reason of repeated shocks. At the same time, the frame or receiver should be formed of material having a sufficiently hard surface to prevent undue wear on those surface portions which must be smooth and accurately fitted to permit proper functioning of the firearm. Owing to the several conflicting requirements necessary in a satisfactory frame or receiver, it has generally been thought that this member could be formed satisfactorily only by forging.

According to the present invention, the frame or receiver is formed from a blank or blanks of flat sheet or plate metal. The blank or blanks are cut or punched from a sheet or plate of suitable material, such as tool steel, which has been formed by working or rolling metal to provide a sheet or plate having the desired metallurgical and mechanical characteristics. The blank is bent or folded to form an intermediate blank of generally trough shape and an arch portion is bent over a portion of the trough and seamed to the trough to form therewith a tubular portion. If desired, the arch portion may be constituted by a separate blank seamed to the trough-forming blank by welding or brazing, or it may be formed by an integral extension of the trough-forming blank. A breech-closing wall is provided by a breech-closing member which is inserted into the intermediate blank and welded or brazed thereto so as to be integrally united therewith. Thereafter, the assembled intermediate blank and breech-closing member are suitably machined to form a completed frame adapted to receive the remaining members of the firearm, as for example, the cocking and firing mechanism, locking mechanism, butt stock, barrel assembly, etc.

An object of this invention is to provide a firearm having a strong, hard, shock-resisting and durable frame structure which can be economically manufactured and which is not excessively heavy.

Various other features and advantages of the invention will be apparent from the following particular description and from an inspection of the accompanying drawings.

Although the novel features which are believed to be characteristic of this invention will be particularly pointed out in the claims appended hereto, the invention itself, as to its objects and advantages, and the manner in which it may be carried out, may be better understood by referring to the following description taken in connection with the accompanying drawings forming a part thereof, in which:

Fig. 1 is a top plan view of a blank employed in forming a firearm in accordance with the invention;

Fig. 2 is a perspective view showing a trough-shaped intermediate blank formed by bending the blank of Fig. 1 bent to form a trough;

Fig. 3 is a rear end elevational view of the intermediate blank shown in Fig. 2;

Fig. 4 is a top plan view of a blank adapted to form an arch portion of the frame;

Fig. 5 is a perspective view showing an arch member formed from the blank shown in Fig. 4;

Fig. 6 is a longitudinal sectional view of the arch member shown in Fig. 5;

Fig. 7 is a perspective view of a pillar rivet for joining the trough member and the arch member;

Fig. 8 is a perspective view showing an assembled intermediate blank constituted by the trough member, the arch member and the pillar rivet;

Fig. 9 is an enlarged transverse cross-sectional view taken along line 9—9 of Fig. 8;

Fig. 10 is a view similar to Fig. 9 only showing the structure after welding the arch member to the trough member;

Fig. 11 is a perspective view showing the intermediate blank after having been subjected to a preliminary machining operation;

Fig. 12 is a perspective view of a breech-closing member having a ring of brazing material assembled therein;

Fig. 13 is a longitudinal sectional view in per-

spective of the intermediate blank having assembled therewith the breech-closing member;

Fig. 14 is a top plan view of a completed frame;

Fig. 15 is a longitudinal cross sectional view of the structure shown in Fig. 14;

Fig. 16 is a front elevational view of the structure shown in Fig. 14;

Fig. 17 is a fragmentary side elevational view partially in cross section of a complete firearm formed in accordance with the invention including a frame similar to that shown in Fig. 14; and

Fig. 18 is a transverse cross-sectional view taken along line 18—18 of Fig. 17.

In the following description and in the claims, various details will be identified by specific names for convenience, but they are intended to be as generic in their application as the art will permit. Like reference characters denote like parts in the several figures of the drawings.

In the drawings accompanying and forming part of this specification, certain specific disclosure of the invention is made for purposes of explanation, but it will be understood that the details may be modified in various respects without departure from the broad aspect of the invention.

The frame may be constructed of any suitable material which is sufficiently strong and tough to resist the shock of firing, sufficiently malleable to permit bending and to resist crystallization and sufficiently hard to resist wear on accurately machined wearing surfaces. Preferably, a medium carbon steel is used. One example of a steel which has been found to be satisfactory is that known as "S. A. E." 1020. Such steel has a composition as follows: Carbon .15–.25%, manganese .30–60%, phosphorous .045, sulphur .055.

This steel preferably is heat-treated in a molten salt bath at 1700° F. and quenched in oil to give a tensile strength of 78,000 pounds per square inch, an elastic limit of 60,000 pounds per square inch, elongation of 20% and reduction of area of 20%. The steel is preferably rolled into a flat sheet or plate of thickness ranging from around ⅛ to ¼ inch. It has been found that steel of the above composition and about $\frac{3}{16}$ inch in thickness is satisfactory for forming the principal members of the frame.

Referring now to Fig. 1, there is punched or cut from the metal plate, a flat trough-forming blank 10. The blank 10 is formed with a trough-forming portion 11 of generally rectangular shape and a tube-forming portion 12 having inclined side edges 13 which may terminate at their forward ends in shoulders 14. The rearward end edges 15 of the tube-forming portion 12 are inclined as indicated in Fig. 1.

Extending rearwardly from the tube-forming portion 12 is an elongated tang-forming portion 16 which may have a rounded end edge 17.

The blank 10 is subjected to a bending operation, which may be carried out by suitable bending dies, which operation bends the blank 10 into the form shown in Figs. 2 and 3 to provide a trough member 20 having generally parallel upstanding side walls 21 and a transversely arcuate bottom wall 22. At the same time, the tang-forming portion 16 is bent longitudinally into arcuate form to provide a rearwardly extending tang 23.

Referring to Fig. 4, a second and arch-forming blank 25 is also cut or punched from the plate material. The blank 25 includes an arch-forming portion 26 having an arcuate forward edge 27 and a straight rearward edge 29. The side edges 28 of the blank may be inclined as shown. The blank 25 also has the tang-forming portion 30 formed with an arcuate rear edge 31 which member corresponds generally to the tang-forming member 16 of the blank 10.

The blank 25 is subjected to a bending operation which forms the blank into an arch member 32 shown in Figs. 5 and 6. In forming the arch member, the portion 26 is bent transversely to provide an arch portion 33 and the tang-forming portion 30 is arcuately bent longitudinally to provide an upper tang 37.

Simultaneously with, or subsequent to, the bending of the arch 33, the top wall thereof is upset to provide a flat surface 34 and an external shoulder 35, for a purpose which will hereinafter appear.

The trough member 20 and the arch member 32 are assembled (see Fig. 8) so that the inclined edges 28 of the arch member 32 rest upon the inclined edges 13 of the trough member 20, the tangs 37 and 23 extending generally parallel. Perforations 41 and 42 are drilled in the ends of the tangs 37 and 23 either before or after assembly of the arch member 32 and trough member 20 and a pillar 38 (shown in detail in Fig. 7) having reduced ends 40 is inserted in the perforations 41 and 42. The ends of the pillar are riveted to secure the tangs 37 and 23 to the pillar and in spaced relation. This assembly may be designated as the "intermediate blank" 45.

Referring to Fig. 9, it will be noted that the edges 13 and 28 form a generally V-shaped groove extending along the intermediate blank 45. The edges 13 and 28 are seamed together as by welding or brazing, as indicated in Fig. 10, to rigidly and integrally connect the trough member 20 and the arch member 32, the welding material, designated by the reference character 46, filling the V-shaped groove.

The side walls 21 of the assembled blank 45 are machined, as shown in Fig. 11, to provide arcuate surfaces 51 adjacent the upper edges which constitute a seat for a barrel, as will hereinafter appear. The tube formed by the joining of the arch member and the rear portion of the trough member is also machined to provide a generally conical seat 52 for a section of a breech-closing member 55, shown in detail in Fig. 12. Preferably, the conical seat 52 is so formed as to provide at its inner end a seat 53 of substantial width. These operations may be carried out as steps of a single machine operation.

A breech-closing member or plug 55 (Fig. 12) preferably is formed as a disc having a tapered or conical side wall 56 adapted to fit snugly in the seat 52. The side wall 56 is provided with a groove 57 adapted to receive a ring 58 of brazing material, such as copper. Preferably, the ring 58 extends only partially around the periphery of the breech-closing member 55 and it may terminate just beyond the ends of the shoulder 53.

The breech-closing member or plug 55, together with the inserted ring 58 is inserted in the seat 52 of the blank 50, as shown in Fig. 13. The assembled blank and plug are then brazed by subjecting them to a temperature of preferably around 2100° F. in a protective gaseous atmosphere. Preferably, the atmosphere contains from 5 to 30% of one or more reducing components, such as hydrogen or carbon monoxide, etc., and the remainder components, which are inert as to the brazing material, such as nitro-

gen, carbon dioxide, methane, etc. The atmosphere should be free of such materials as sulphur, oxygen, water vapor, etc., which might adversely affect the operation.

The copper ring 58 melts and the copper flows outwardly along the abutting surfaces of the seat 52 and plug 55. When the heating is discontinued and the members cool, the abutting surfaces are firmly and integrally welded together over substantially their entire abutting area.

The frame blank 60 (shown in Fig. 13) thus formed is then suitably machined for the reception of the other firearm mechanisms, such as the cocking and firing mechanism, locking mechanism, butt stock, etc. For the purposes of illustration, these machining operations are described hereinafter in connection with the assembly of the several firearm mechanisms on the frame. It will be understood that these operations will usually all be completed before any associated members are assembled with the frame. The completed, drilled and machined frame 61 is shown in Figs. 14 and 15, as it appears before assembly with the associated members.

The frame blank 60 is drilled at its forward end as at 64 and a pivot or fulcrum pin 63 is inserted between the side walls 21 and is formed with an integral rivet-like extension 64a which is headed-over as at 65 into a conical recess 65a formed in the outer face of the adjacent side wall of the frame blank 60 (Fig. 14). The pivot pin 63 is provided with an arcuate rearwardly facing groove 66, the function of which will hereinafter be described.

The breech-closing member 55 forming a standing breech-block is drilled to provide a central passage 70 for a firing pin or plunger 71 having a tapered firing point 72. The rearward end of the firing pin 71 is formed as a clevis 73 connected by a pin or screw 74 to a cocking lever 75. An elongated slot 76 is cut in the lower tang 23 to accommodate the cocking lever 75 which is pivotally mounted on a pin 77. The upper tang 37 is formed with an elongated slot 84 through which extends the head 78 of the cocking lever 75. Threaded into counter-bored opening 80 in upper tang 37 is a guide pin or stud 79 which extends through a slot 85 in the firing pin 71 and serves as an abutment for a firing pin spring 81 surrounding the firing pin and abutting a thrust pin 85 set in the forward end of the shank of the firing pin 71.

The cocking lever 75 is formed with a cocking notch 83 and a rebound notch 82 which cooperate with a cocking nose 92 on a trigger 90. The trigger 90 extends through the slot 76 and is pivotally mounted on a pin 91. The trigger 90 has an arcuate finger piece 93 which is protected by a trigger guard 94 secured to the lower tang 23 by screws (not shown) threaded into screw holes 97 and 98.

The trigger 90 is provided with a recess 99 which receives a plunger 100, the other end of which conveniently enters a recess 103 in a barrel locking member or bolt 110. Surrounding the plunger 100 is a spring 101 which bears at one end against a shoulder 102 on the plunger and at the other end against the locking bolt 110.

The locking bolt 110 is pivotally mounted on a transversely extending pin 111 secured in the frame 61 and has a locking nose 112 adapted to enter a correspondingly formed locking notch 150 in a barrel locking lug 141. The locking bolt 110 is formed with an eccentrically disposed lug 113 adapted to enter a transverse slot 114 in an operating head 115. The operating head 115 is rotatable in a perforation 116 formed by drilling through the top wall of the frame arch and into the breech block 55.

Rigidly secured to the operating head 115 is a top lever or cocking lever 119 having a head portion 120 guided in an arcuate recess 118 formed in the arch portion of the frame 61. The top lever 119 is formed with a conveniently shaped finger piece 121 for rocking the top lever 119 about the operating head 115 as a pivot; a shoulder 117 is provided and is adapted to abut against a stop shoulder 117a on the frame for limiting the movement of the top lever 119.

The operating head 115 may be secured by a leaf spring 126 secured to the frame by a screw 127 extending through a threaded opening 128. The end of the spring 126 extends into a slot 125 in the operating head 115 and thus prevents removal from the frame.

A butt stock 137 may be secured to the frame 61 by a bolt 136 screwed into a threaded opening 135 in the pillar 38.

A barrel assembly 139 may include a barrel 140 having a barrel locking lug 141 formed with a forwardly facing arcuate recess 142 adapted to engage over the rear side of the pivot pin 63. The barrel 140, when in position, abuts and is closed by the breech block 55 and the barrel lug 141 is disposed in the space below the barrel 140 and between the side walls 21 of the frame 61. An extractor and ejector mechanism, such as that disclosed and claimed in the copending application of George S. Lewis, Serial No. 5417, filed February 7, 1935, may be housed in the barrel lug. The extractor and ejector mechanism may have an operating nose 143 cooperating with the bottom wall of the groove 66 in the fulcrum pin 63.

The barrel assembly 139 may include also a forestock 145 and forestock shoe 146 which are attached to the barrel in a manner not necessarily shown herein. The forestock shoe has a bearing portion 147 formed with an arcuate notch 148 bearing against the fulcrum pin 63 and a transversely curved abutment face 149 substantially conforming in curvature to the transverse curvature of the bottom wall 22 of the frame blank.

As hereinbefore mentioned, the arcuate surfaces 51 of the side walls 21 serve as a seat for the rearward portion of the barrel 139 when the barrel is in firing position, as shown in Fig. 17. For the purpose of obtaining access to the breech end of the barrel for loading the gun or ejecting cartridges or empty cartidge cases, the barrel may be rocked about the pivot pin 63 whereby to expose the breech end of the barrel. This rocking movement may be limited by the striking of the abutment face 149 of the forestock shoe 146 against the bottom wall or floor 22 of the frame 61. In order to permit this rocking movement, the forward ends of the seats 51 may be cut away to provide an inclined seat portion 62, as shown in Fig. 15.

A sight groove 150, serving as a rear sight, may be cut in the forward portion of the frame arch 33.

It is to be understood that the general method disclosed herein may be employed in forming types of frames other than the illustrative form disclosed. For example, this general concept may be embodied in a frame such as is shown in my copending application, Serial No. 5421, filed

February 7, 1935, and in the several types of frames shown in my copending application, Serial No. 45,396, filed October 17, 1935, of which applications the present application is in part a continuation.

While certain novel features of the invention have been disclosed and are pointed out in the annexed claims, it will be understood that various omissions, substitutions and changes may be made by those skilled in the art without departing from the spirit of the invention.

What is claimed is:

1. In a firearm of the stationary breech-block type and wherein the barrel unit and the butt unit are relatively movable for loading, a frame formed from plate metal of substantially uniform thickness bent up to form barrel unit attaching, lock attaching, firing mechanism attaching, and butt stock attaching portions, and a breech-closing portion integrally united with said bent plate member.

2. In a firearm, a frame comprising a bent metal plate constituting a frame member, and a separately formed member seated within said bent plate for forming a breech-closing wall, said separately formed member being in abutment with the plate over a substantial area, and integrally joined to said plate throughout a substantial portion of the area of abutment.

3. In a firearm, a frame comprising a plurality of separately formed members, at least one of which is formed by bending up and joining plate metal to constitute barrel attaching, butt stock attaching, lock attaching, and firing mechanism attaching portions, respectively, and another of which members constitutes a breech-closing portion, said members being in abutment with each other over a substantial area and integrally joined over a substantial portion of the area of abutment.

4. A firearm frame comprising a plate metal member, having portions for attaching a barrel unit, and a butt stock unit, respectively, and a second member substantially embraced by said first member and integrally united therewith said members having adjacent surface portions lying substantially in the same plane and together forming a breech-closing wall.

5. In the method of forming a firearm frame, the steps which include bending up the sides of a flat blank of metal to form an upwardly open trough, fusing to said trough an arch member to form a tubular portion, machining a seat in said tubular portion, inserting a breech-block member in said tubular seat and fusing said breech-block member to said tubular portion to form a breech closing wall.

6. In the method of forming a firearm frame, the steps which include punching, from a metal plate, a flat blank having trough-forming, tube-forming and tang-forming portions, bending the blank laterally to form a trough, then bending the blank longitudinally to arch said tang-forming portion, fusing an arch shaped tang-carrying member to said tube-forming portion to form a tube and fusing a breech-block member to said tube.

7. In a method of forming a firearm frame, the steps which include bending a metal plate to form an essentially trough-shaped member, welding a tang-carrying member to said trough-shaped member to form a tube therewith, inserting a breech closing member in said tube, and brazing said breech closing member to said tube at an internal surface of said tube.

8. The method of forming a firearm frame having a frame shell and an inserted breech block, said process comprising the steps of cutting a blank from metal plate, bending said blank to form a frame shell member having a trough-shaped portion, fusing a tang member to said trough-shaped portion to form a tubular portion, machining the sides and top of said tubular portion to form a seat, grooving the edge of a circular breech block, applying a wire of bonding metal to that part of said groove which is adapted to rest in said seat, heating the assembled frame shell and breech block to a temperature of around 2100° F., in a protective gaseous atmosphere to melt the wire bonding material and to cause it to penetrate between the surface of said breech block and said seat, whereby said frame shell and said breech block are rigidly united.

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