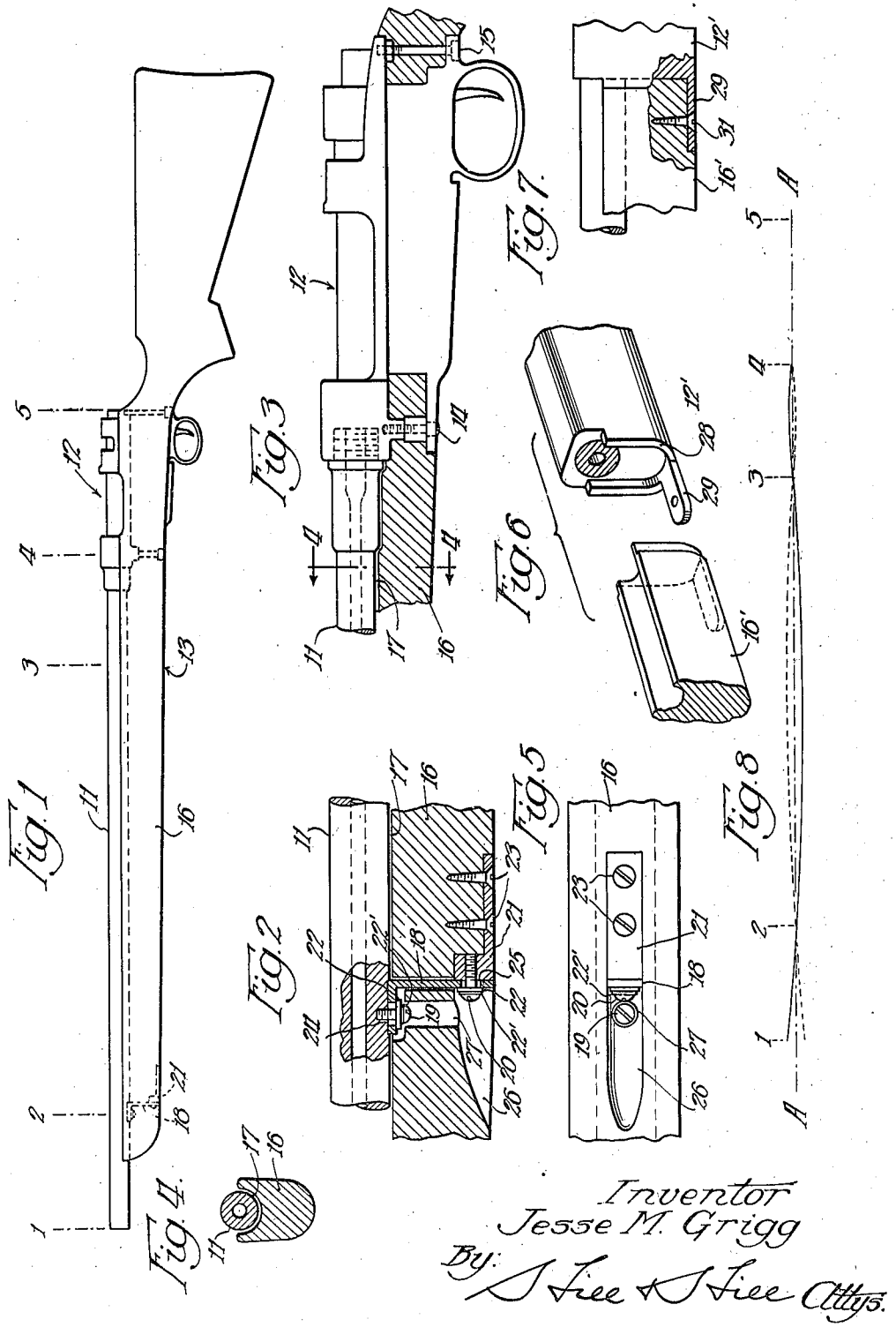
Jan. 18, 1944. J. M. GRIGG 2,339,331

GUN

Filed May 12, 1941



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Patented Jan. 18, 1944 2,339,331

UNITED STATES PATENT OFFICE

2,339,331

GUN

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Application May 12, 1941, Serial No. 393,063

7 Claims. (Cl. 42—75)

The invention relates generally to fire arms, and particularly to a novel method and means for securing the barrel of a shoulder fire arm to the forestock.

The invention has among its objects the production of a fire arm of improved accuracy and of relatively simple, durable, and very efficient construction.

Another object of the invention is the production of a novel method and means for minimizing the normal interference and reactions of the marksman's body upon the fire arm which reaction would reduce the accuracy obtainable therewith.

A further object of the invention is the production of a fire arm having a high degree of accuracy and a relatively light weight, thereby resulting in a saving of the shooter's physical energy.

A further object of the invention is the production of such a fire arm which is so constructed that distortion of the barrel due to temperature changes, stock warpage, etc., is substantially diminished.

A further object of the invention is the production of such a fire arm in which the barrel while secured to the forestock, is free to bend in its natural period during firing.

Many other objects and advantages of the construction herein shown and described will be obvious to those skilled in the art from the disclosure herein given.

To this end my invention consists in the novel construction, arrangement and combination of parts herein shown and described, and more particularly pointed out in the claims.

In the drawing, wherein like reference characters indicate like or corresponding parts:

Fig. 1 is a side elevational view of a rifle embodying the present invention;

Fig. 2 is a longitudinal sectional view through the muzzle end of the forestock, disclosing the manner in which the barrel is secured to the forestock;

Fig. 3 is a longitudinal sectional view through the stock, disclosing the manner in which the receiver is secured to the stock;

Fig. 4 is a sectional view through the barrel and stock taken substantially on the line 4—4 of Fig. 3;

Fig. 5 is a bottom plan view of that portion of the forestock illustrated in Fig. 2;

Fig. 6 is a perspective view of the forward end of a receiver and adjacent end of a separate forestock illustrating one manner in which a separate forestock may be secured to the receiver;

Fig. 7 is a side elevational view of a portion of such a receiver and forestock disclosing the manner of connection therebetween; and

Fig. 8 is a diagram of the normal barrel movement during firing of the fire arm.

A study of the mechanics involved in the aiming and shooting of rifled shoulder arms will disclose that the accurate and consistent placing of a missile in a target or other object is dependent on several related factors, and it is these factors which exercise a considerable influence on the grouping of shots and the skill of the marksman. If it were possible to maintain the gun barrel aimed in a given direction throughout the period from powder ignition to the discharge of the missile or bullet from the barrel, regardless of the forces tending to deflect the barrel from such direction, the accuracy and consistency of marksmanship would be considerably improved.

However, in a rifle when discharged under ordinary firing conditions the barrel is subjected to a number of forces that affect and alter the position of the barrel with respect to the target and therefore, the direction taken by the bullet as it leaves the muzzle. The forces of combustion are primarily exerted on the barrel in two ways, one is a backward thrust or recoil which, owing to the fact that the center of gravity lies below the bore axis, normally exerts an upward torque about the center of percussion. The other is a downward torque or a down thrust exerted mainly during the period of combustion change, this down thrust probably having its origin in the fact that the powder charge initially lies on the bottom of the cartridge case and tends to hug the bottom of the bore as the burning and unburned grains are swept along by the blast.

It will be apparent that as the gun barrel is relatively flexible the resultants of these forces will cause bending of the barrel. The initial bending of the central portion of the barrel is downward and is opposed not only by the upward torque and barrel resiliency but in conventional designed guns, also by the forestock, and as the latter is supported by the hand of the person firing the gun such bending is opposed by such support as well. This downward bending continues until the diminishing applied force is exceeded by the opposing upward force. The latter, supplemented by the kinetic energy in the barrel due to such downward bending and the action of the marksman's hand and wrist, then proceeds to reverse the bending curve. At the time the

bullet or missile leaves the muzzle, the barrel is in such reverse position. Therefore, as the bullet leaves on a line tangent to the bore axis at the muzzle, and as this tangent itself is turning with a slight angular motion, it is obvious that the final direction of the bullet as it leaves the muzzle is not that in which the bore axis was originally aimed.

It is apparent that for one particular direction of departure there corresponds a particular bend of bore axis and a particular angular velocity at which the bore axis is turning. This is to say that the barrel should bend in exactly the same manner each time the rifle is fired, a requirement that needs for fulfillment either a complete freedom of movement, or else a uniformity of interference with the movement.

But in the ordinary rifle neither of these conditions is met. The barrel cannot bend freely because it is in contact with the stock in the region of maximum bend, and in addition, the stock is in contact with the marksman's hand, sling, etc. Neither is the interference with its bending uniform. There are several reasons why the interference may change from time to time, all arising out of the fact that the barrel and stock are in contact in the region of maximum bend. In the first place as the reaction between the barrel and stock in general varies according to the degree of contact between metal and wood, this reaction is subject to momentary changes as the barrel heats with firing, and to seasonal changes as the moisture content of the wood varies. Again, as there is a transmitted reaction between the barrel and the marksman's hand, arm, etc., and as further it is humanly impossible for the marksman to assume the same hold and firing position each time, this transmitted reaction is bound to change. With all, it results in various manners of bend, and in various directions of bullet departure. In the language of the marksman the rifle may either change its zero by small increments with repeated firing, or it may unexpectedly throw an outright wild shot.

To obviate these faults, I have experimentally studied the movement of the barrel and observed that in the rifle of ordinary construction the reactions between barrel and forestock and the marksman's hand occur in the region of maximum bend, and so are at a maximum. Therefore, the object of this invention is to provide a barrel and stock construction in which these reactions are reduced to a minimum; or, in a broader sense, in which all interference due to barrel heating, stock warpage, reaction of the marksman's body, etc., are reduced to a minimum. Insofar as this object is achieved the barrel is thus allowed to move freely and naturally, and therefore, in exactly the same manner each time the rifle is fired.

In accordance with the laws of physics, a given barrel has an inherent period of vibration which may be readily determined by experiment or calculation. This vibratory movement is in the nature of standing waves, of a definite wave length, with accompanying nodes or points of substantially no barrel movement at two or more points along the barrel. In actual practice, though the movement is not a free but a forced oscillation, these nodes follow at substantially corresponding points along the bore axis. Illustrated in Fig. 8 is a diagrammatic view showing the type of waves created in the barrel, the line A—A representing the bore axis, 1 representing the muzzle end of the barrel, 2 the adjacent node, 3 the node at the opposite end of the wave, and 4 and 5 the points at which the receiver and with it the barrel are directionally secured to the stock. It has been found in actual practice that the nodal points 2 and 3 appear at approximately the theoretical 1/6 of the barrel length from the respective ends of the barrel, meaning by the latter the points 1 and 4, to-wit, the muzzle and the point at which the barrel is rigidly secured to the receiver and stock. It has also been determined that the above figure of 1/6 holds approximately true in tapered barrels, but the nodal position of these may be found quite readily by comparison of pitch and intensities of the musical note they emit under proper excitement.

In the gun construction illustrated in Figs. 1 through to 5, 11 represents a barrel of the usual construction which is secured at one end to a receiver, designated by the numeral 12 likewise of general construction. The specific details of the barrel and receiver construction illustrated forms no part of the present invention and therefore will not be described in greater detail. The receiver 12 is secured to the stock 13 by screws 14 and 15 positioned at convenient places under the receiver, thus firmly securing the breech end of the barrel to the stock. The forestock 16 is shaped to provide a clearance space 17 between the barrel 11 and the forestock, so that the latter does not contact the barrel anywhere along the barrel. The space 17 is such as to provide sufficient clearance to permit the barrel to freely move without contacting the stock and it will be obvious that the space 17 may vary in amount along the length of the barrel, that is, it may be smaller adjacent the nodal points 2 and 3 than intermediate said points, where the major bending of the barrel would take place. The barrel 11 is secured to the forestock 16 at substantially the nodal point 2 by an L-shaped member 18 somewhat flexible in a direction parallel to the bore axis and secured to the barrel by means of a screw 19 and to the forestock 16 by means of a screw 20 which is threaded into a base plate 21. Flat washers 22 and lock washers 22' insure a rigid connection between the member and the stock and barrel. The plate 21 may be secured to the forestock 16 by any suitable means such as the wood screws 23. It will be noted that the apertures 24 and 25 in the member 18, through which the screws 19 and 20 extend are considerably larger than the diameters of the respective screws, thereby permitting the member 18 to be shifted with respect to the barrel and forestock. The latter is cut away adjacent the member 18 so that the member does not contact the stock other than at the base block 21. The forestock is also provided with a channel 26 to provide access to the screw 20 and a bore 27 to provide access to the screw 19, thus providing for adjustments of the member 18 with respect to the barrel and stock.

It will be apparent that as the member 18 is secured to the barrel at the nodal point 2 which is a point of substantially no movement of the barrel, the latter is fixed in place, but not in direction and, therefore, the barrel is free to bend without opposition from the stock, it being remembered that the clearance space 17 is of sufficient size to permit full movement of the barrel. Adjustment of the member 18 is provided to eliminate the creation of any stresses between the barrel and stock, this adjustment being accomplished by loosening the screws 19 and 20, and holding the rifle in vertical position thereby per-

mitting the barrel to assume its natural unstressed position, after which the screws may be tightened in the same order, locking the barrel in such position. Variations in temperature also tend to create stresses in the barrel due to expansion and contraction thereof as a result of prolonged firing, etc., and such variations may be readily compensated for by making the adjustments just described. The member 18 is preferably constructed of spring stock so that it will be slightly flexible, thereby insuring that the barrel is fixed in place at the nodal point but not in direction. Likewise, the resiliency of the member 18 will compensate for slight variations in the relative length of the barrel and stock due to changes in moisture and temperature thereby relieving the barrel of major strain. It might be mentioned with respect to the positioning of the member 18 that the nodal point 2 will vary somewhat if the barrel is longitudinally tapered towards the muzzle. Likewise, the provision of sight slots and the inertia of the sights themselves and possible other appurtenances alter the bending curve slightly. The tapering of the barrel causes the node to appear nearer the muzzle while the effect of front sight inertia will result in the appearance of the node farther back from the muzzle.

Illustrated in Figs. 6 and 7 is one form by means of which the forestock may be rigidly secured to the receiver in cases where the stock is formed in two pieces. In this construction the receiver 12' is provided with a flange 28 adjacent the fore end thereof which surrounds the adjacent end of the forestock 16'. The receiver 12' may also be provided with a suitable tongue 29 which is secured to the forestock by a suitable screw or the like 31, the tongue and flange thus securely and rigidly hold the forestock 16' in proper relation to one another. The remainder of the construction would be substantially the same as that illustrated in Figs. 1 to 5.

It will be apparent from the above description that the present construction substantially eliminates the disadvantages of the usual rifle constructions, the reactions between the barrel stock and marksman's body being reduced to a minimum, with a consequent improved accuracy and consistency of performance. These results have been definitely proved by actual tests. It will be noted that I have provided a gun construction wherein the barrel is secured to, or contacts the forestock at a single point, namely the nodal point of bending movement of the barrel when fired, and as well, a novel means for securing the barrel to the forestock, which means fixes the barrel in place but not in direction and also permits field adjustment of barrel alignment to temperature and other conditions.

Having thus described my invention, it is obvious that various immaterial modifications may be made in the same without departing from the spirit of my invention; hence, I do not wish to be understood as limiting myself to the exact form, construction, arrangement and combination of parts herein shown and described or uses mentioned.

What I claim as new and desire to secure by Letters Patent is:

1. In a firearm the combination of a barrel, a forestock extending along a portion thereof, an L-shaped member, means for rigidly securing one of the legs of said member to the barrel adjacent the muzzle end of the latter, and means for securing the other leg to said forestock at a point spaced from said barrel, said leg being sufficiently flexible to permit normal expansion and contraction of said stock and barrel relative one another.

2. In a firearm the combination of a barrel, a forestock extending along a portion thereof but spaced therefrom substantially throughout its length, an L-shaped member, one of the legs of which is rigidly connected to said barrel adjacent the muzzle end thereof, the other leg extending transversely through said forestock and secured adjacent its free end thereto, said member being positioned substantially at a nodal point of the vibratory movement of said barrel during firing of the firearm.

3. In a firearm, the combination of a receiver, a barrel extending therefrom, a forestock secured to said receiver extending along a portion of said barrel but spaced therefrom substantially throughout its length, an L-shaped member having one leg thereof rigidly secured to said barrel adjacent the muzzle end of the latter substantially at a nodal point of the vibratory movement of said barrel during firing of the firearm, the other leg extending transversely through said forestock, and a plate rigidly secured to said forestock and having means thereon for securing the free end of said member thereto, said free leg being sufficiently flexible to permit normal expansion and contraction of said stock relative one another.

4. In a firearm, the combination of a receiver, a barrel extending therefrom, a forestock secured to said receiver and extending along a portion of said barrel but spaced therefrom substantially throughout its length, an L-shaped member constructed of flat stock of a relatively flexible material, said member having an aperture in each leg thereof, a screw extending through one of said apertures and threaded into said barrel for securing one leg of said member thereto, said forestock having an opening extending therethrough in alignment with said screw to permit access to the latter, said forestock having an opening therein through which the other leg of said member extends, and a plate secured to said forestock adjacent the free end of said last mentioned leg, a screw extending through the aperture in said leg and threaded into said plate, said forestock having a recess therein adjacent said screw to permit access to the latter.

5. In a firearm, the combination of a receiver, a barrel extending therefrom, a forestock secured to said receiver and extending along a portion of said barrel but spaced therefrom substantially throughout its length, an L-shaped member having an aperture in each leg thereof, a screw extending through one of said apertures and threaded into said barrel for securing one leg of said member thereto, said forestock having an opening extending therethrough in alignment with said screw to permit access to the latter, said forestock having an opening therein through which the other leg of said member extends, and a plate secured to said forestock adjacent the free end of said last mentioned leg, a screw extending through the aperture in said leg and threaded into said plate, said forestock having a recess therein adjacent said screw to permit access to the latter, said screws being substantially less in diameter than the respective apertures to permit adjustment of said member relative said barrel and stock.

6. In a gun, a barrel and a stock, means for securing one end of the barrel to the stock in spaced relation thereto, comprising a flexible

bracket having a first member disposed at an angle to the barrel and secured to said stock to support said barrel in spaced relation thereto, said bracket having a second member integral with said first member extending parallel with and secured to said barrel at a point spaced from said first member, said second member being secured to said barrel at a nodal point with respect to the vibratory flexible wave of said barrel under fire to minimize the strain of the barrel movement transmitted to said members, and said first member being adapted to permit relative longitudinal movement between the stock and barrel, due to contraction and expansion of the barrel.

7. In a gun, a barrel and a stock, means for securing one end of the barrel to the stock in spaced relation thereto, comprising a flexible bracket having a first member secured to said stock and adapted to flex fore and aft relative to the axis of said barrel, said bracket having a second member extending parallel with and secured to said barrel at a nodal point with respect to the vibratory wave movement of said barrel under fire to permit only a minimum amount of strain from the barrel to be imparted to said bracket, said second member being integral with said first member and adapted to flex relative thereto and said bracket acting to support said barrel in spaced relation to said stock, and said fore and aft flexing of said first member accommodating relative longitudinal movement between the barrel and stock, due to contraction and expansion of the barrel.

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