May 14, 1957 E. M. HARVEY 2,791,944

GAS REGULATOR FOR A FIREARM

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Fig. 1

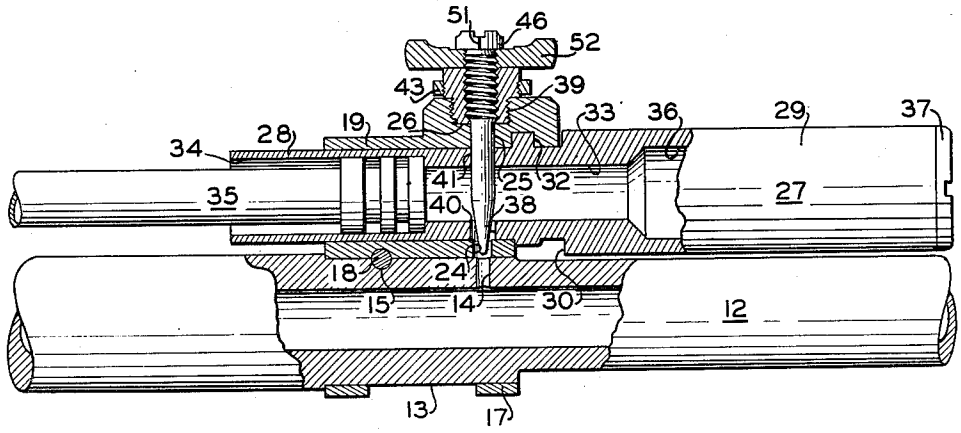
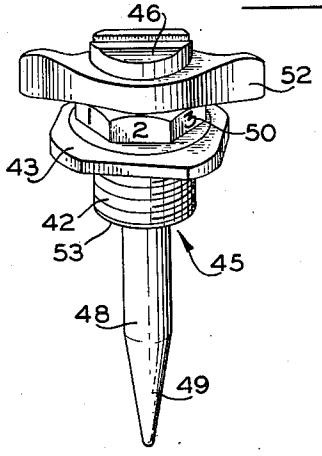



Fig. 2




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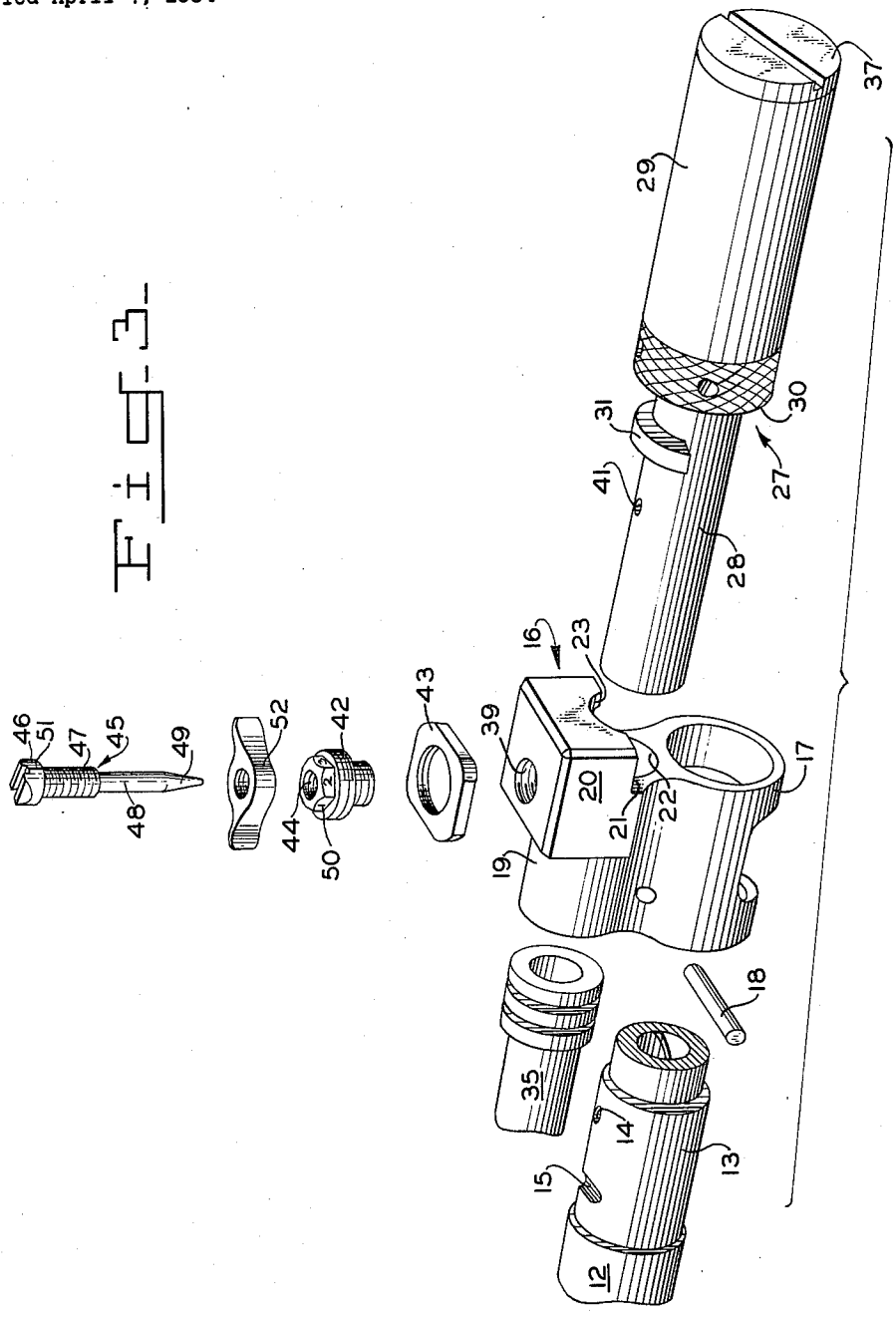
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Fig. 3




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2,791,944

# GAS REGULATOR FOR A FIREARM

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4 Claims. (Cl. 89—193)

(Granted under Title 35, U. S. Code (1952), sec. 266)

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

This invention relates to gas-operated firearms and more particularly to improvements in the gas systems thereof.

It is an object of this invention to provide for firearms, a gas system wherein the parts are easily disassembled and assembled.

It is another object of this invention to provide for gas-operated firearms a gas regulator device which may be removed and replaced without changing the predetermined adjustment setting thereof.

It is a further object of this invention to provide for a firearm gas system, a separately replaceable gas cylinder which is locked in position by the gas regulator device.

It is a still further object of this invention to provide for automatic firearms a gas system wherein the piston is provided with a longer power stroke in terms of time and distance and a lower maximum velocity.

It is the specific object of this invention to provide for firearm systems an easily adjusted gas regulator device wherein the adjustment orifice and valve remain relatively free of harmful carbon and/or metallic deposits.

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

Fig. 1 is a fragmentary partially cross-sectional side view of the gas system of a firearm;

Fig. 2 is an enlarged perspective view of the gas regulator valve assembly; and

Fig. 3 is a perspective exploded view of the gas system.

Shown in the figures is a firearm barrel 12 having a cylindrical bearing portion 13 with a radial gas port 14 and a transverse chordal channel 15 provided therein. Mounted to barrel 12 is a bracket 16 having a cylindrical sleeve portion 17 arranged to snugly encircle bearing portion 13. A tapered pin 18 is mounted transversely through sleeve 17 to be received by channel 15 for fixedly securing bracket 16 to barrel 12. Integral with the top portion of sleeve 17 is a body 19 including a substantially rectangular housing 20 which extends beyond the front end of sleeve 17 to form a forwardly projecting portion 21. Provided through body 19 is a longitudinal hole 22 which forms a semicylindrical channel 23 in the underside of projecting portion 21. A radial passageway 24 of slightly larger diameter than gas port 14 is arranged through the underside of housing 20 for alignment with such gas port. Provided radially through the top portion of housing 20, diametrically opposite passageway 24, is a cylindrical aperture 25 which is of larger diameter than such passageway. Aperture 25 is counterbored and threaded from the top side of housing 20, as noted at 39, to form an annular shoulder 26.

Slidably and rotatably received by hole 22 is a gas cylinder member 27 having a smaller outside diameter portion 28 receivable by such hole and a larger outside diameter portion 29 which extends longitudinally forward from an annular step portion 30. Projecting from the circumference of smaller diameter portion 28 is a semi-annular lug 31 which is arranged to be rotatably received in a mating groove 32, provided in semicylindrical portion 23, when step 30 is in engagement with the front side of housing 20, whereby gas cylinder 27 is secured against linear displacement.

Gas cylinder 27 is provided with a longitudinal bore 33 which is counterbored at both ends to form a rear cylinder portion 34, which cooperates with a piston 35, and a front reservoir chamber 36. The front end of chamber 36 is sealed by a threaded closure member 37. A radial gas port 38 of slightly larger diameter than passageway 24 is arranged through gas cylinder 27 to provide communication between such passageway and bore 33. The junction of gas port 38 with bore 33 forms an orifice 40. Diametrically opposite gas port 38 is a cylindrical hole 41 which is of similar diameter as aperture 25 and is coaxial therewith.

A hexagonal headed bushing 42 is arranged to be threadably received by counterbore 39 and to bottom against shoulder 26, thus, sealing the gases from the threaded portion. Bushing 42 is held in place by a nut 43 threadably engaged therewith which is tightened against housing 20. Extending axially through bushing 42 is a threaded bore 44 which is arranged to threadably receive in clockwise rotation a regulator screw 45. Regulator screw 45 is comprised of a head portion 46, suitably slotted for turning, a threaded portion 47 cooperable with bore 44, a rod portion 48 of smaller diameter than such threaded portion and an annular ledge portion 53 formed by the junction of such threaded and rod portions. Rod portion 48 is arranged to be snugly received by hole 41 and aperture 25, whereby gas cylinder 27 is secured against displacement to bracket 16, and is terminated by a conical portion 49. Conical portion 49 is arranged to be axially received by gas port 38, which is of smaller diameter, for cooperation with orifice 40 to regulate the passage of gases from barrel 12 to bore 33 of gas cylinder 27.

A check nut 52 is threadably engaged to threaded portion 47 for securing regulator screw 45 against rotation after being adjusted. Provided in each face of the hexagonal head of bushing 42 is an inscribed numerical reference 50, which progress serially from 1–6 in counterclockwise direction, and alignable therewith is an index mark 51 on the circumference of head 46 of regulator screw 45.

In operation, the gases from an exploded cartridge enter gas port 14 after the projectile has passed thereby and pass through passageway 24 and gas port 38 to be metered at orifice 40 by conical portion 49 of regulator screw 45. The metered gases enter bore 33 of gas cylinder 27 and proceed to fill such bore and reservoir chamber 36. When the pressure of the gases in chamber 36 and bore 33 is sufficient, piston 35 is actuated thereby to a recoil position. It is obvious that with the comparatively large reservoir provided by bore 33 and chamber 36, an accelerated pressure is applied to piston 35 rather than an instantaneous impact as in most conventional gas systems. Further, after the cartridge projectile has left the muzzle of barrel 12, whereby the gas pressure in the bore thereof is almost instantaneously reduced, the pressurized gases stored in bore 33 and chamber 36 continue to act against piston 35 as the small area between conical portion 49 and orifice 40 hinders the escapement of gases therethrough and out the bore of barrel 12. Therefore, much of the stored gases continue to act against the piston. It is obvious that piston 35 commences its power stroke before the gases in chamber

36 are brought to maximum pressure and continues during the pressurizing of the chamber and after the projectile has left the bore of barrel 12. Thus, the power stroke of piston 35 is increased in terms of time and distance and has a lower maximum velocity than those in conventional gas systems.

Moreover, as bore 33 and chamber 36 receive a comparatively large volume of gases the velocity of the gases passing over conical portion 49 and the associated gas ports into gas cylinder 27 blow the debris of carbon and/or metallic deposits therefrom. Also, as the locations of the adjustment portions of the gas system are relatively close to the bore of barrel 12, the heat of the gases are cooled very little as they pass thereby. Consequently, nearly all of the contamination present in the gases remain in a gaseous state until after passing orifice 40.

If at any time it is necessary to remove gas cylinder 27, nut 43 is unloosened to free bushing 42 which may then be removed from counterbore 39 with regulator screw 45 being withdrawn from aperture 25 and hole 41. Gas cylinder 27 may then be rotated to free lug 31 from groove 32 and withdrawn forwardly from bracket 16. Because regulator screw 45 need not be disturbed from its adjustment relationship with bushing 42 during disassembly of gas cylinder 27, as best shown in Fig. 2, when bushing 42 is reinstalled in counterbore 39 and bottomed against shoulder 26 the gas system is in the same adjustment as before disassembly, thus saving considerable time. In event regulator screw 45 is disassembled from bushing 42, the relationship of index mark 51 with the associated inscribed numerals 50 is a reminder to the operator of the setting to which the regulator screw should be repositioned at assembly.

From the foregoing, it is very apparent that there is here provided a firearm gas system in which the regulating means are kept free of foreign deposits and which is provided with a long power stroke, in terms of time and distance and a low maximum velocity and is easily adjusted, assembled and disassembled.

Although a particular embodiment of the invention has been described in detail herein, it is evident that many variations may be devised within the spirit and scope thereof and the following claims are intended to include such variations.

I claim:

1. A gas system for a firearm having a barrel with a bore, said gas system including a gas cylinder member having an axial bore counterbored at one end to form a reservoir chamber and at the opposite end to form a cylinder arranged for cooperation with a piston, said gas cylinder being replaceably mounted to the barrel by means of a cylindrical bracket, a passageway between the bore of the barrel and said gas cylinder and through said bracket, said passageway forming an orifice at the junction thereof with said axial bore, and a regulatable valve means cooperable with said bracket and said gas cylinder for securing said gas cylinder to said bracket, said valve means being provided with a conical portion extending axially into said passageway for adjustable cooperation with said orifice whereby the high velocity of hot gases passing between said passageway and said conical portion from the bore of the barrel keeps foreign deposits free from said conical portion and said orifice.

2. In a firearm having a barrel with a bore, a bracket securely mounted to the barrel, said bracket being provided with a longitudinal bore arranged to slidably receive a hollow gas cylinder member, said gas cylinder member being provided with a front counterbore portion forming a reservoir chamber and a rear counterbore portion forming a cylinder cooperable with a piston, passage means providing communication between the bore



of the barrel and the interior of said gas cylinder member, a gas regulator device comprised of a bushing threadably mounted in said bracket to bottom against an annular shoulder therein, a regulator screw threadably mounted through said bushing, means for locking said bushing to said bracket and lock means for securing said regulator screw against rotation to said bushing, said bushing being provided with a series of reference marks around the perimeter thereof, said regulator screw being provided with a head portion suitably adapted for turning and an index mark alignable with said reference marks and a rod portion terminated by a conical portion, said rod portion being snugly mounted for rotation through said bracket and said gas cylinder member whereby said gas cylinder is secured against displacement to said bracket, said conical portion extending axially into said passageway to regulate the gases passing from the barrel to the interior of the gas cylinder member and whereby said conical portion and said passageway are kept free of foreign deposits from the gases, and whereby said regulator device is reinstallable after removal from said bracket with the adjustment similar to that determined before removal.

3. In a firearm having a barrel with a radial gas port for passage of gases therefrom, a bracket fixedly mounted to the barrel and provided with a bore disposed longitudinally to the barrel and a passageway extending from said bore to the gas port, a cylindrical aperture extending from said bore through said bracket diametrically opposite said passageway, a shoulder formed by a counterbore portion introduced from the outer end of said aperture, a gas cylinder slidingly received by said bore, an operating piston mounted for sliding movement in said gas cylinder, cylindrical port means extending from said passageway to the interior of said gas cylinder forwardly of the travel of said piston, a cylindrical opening through said gas cylinder diametrically opposite said port means, a bushing threadingly received by said counterbore portion to bottom against said shoulder, a regulator screw threadingly mounted through said bushing and provided with a rod portion received by said opening and said aperture to cooperate therewith for securing said gas cylinder to said bracket, and a conical portion terminating said rod portion, said conical portion being cooperable with said port means for regulating the passage of gases from the barrel to said gas cylinder.

4. In a firearm having a barrel, a bracket fixedly mounted to the barrel and having a bore therethrough, a gas cylinder mounted through said bore, and a cylindrical valve member mounted transversely to said cylinder through mating holes in said cylinder and said bracket for cooperation with a passageway between said gas cylinder and the barrel and directly opposite said holes to regulate the passage of gases to said cylinder from the barrel and for restraining said cylinder against rotational and longitudinal movements in said bore.


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