July 29, 1958 I. H. ATWOOD, JR 2,845,008

VALVE ADJUSTMENT MEANS FOR A GAS-OPERATED FIREARM

Filed April 15, 1957 2 Sheets-Sheet 1

Fig. 1.

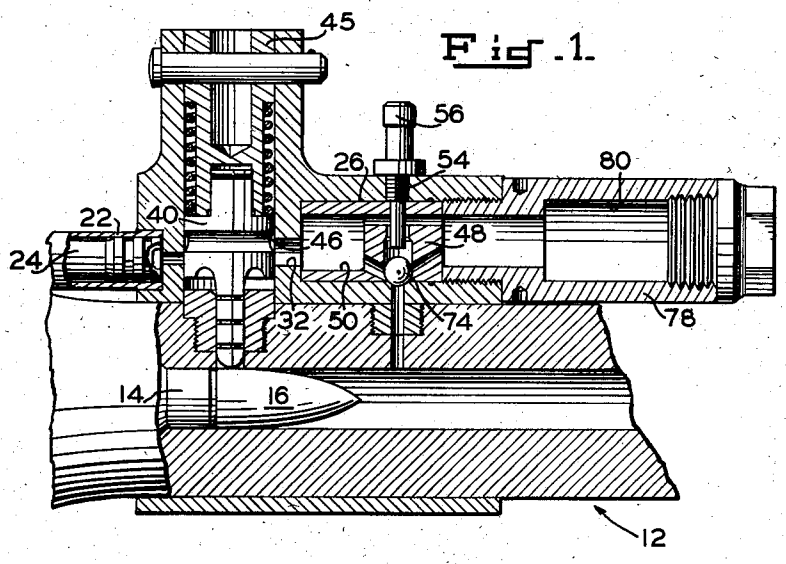
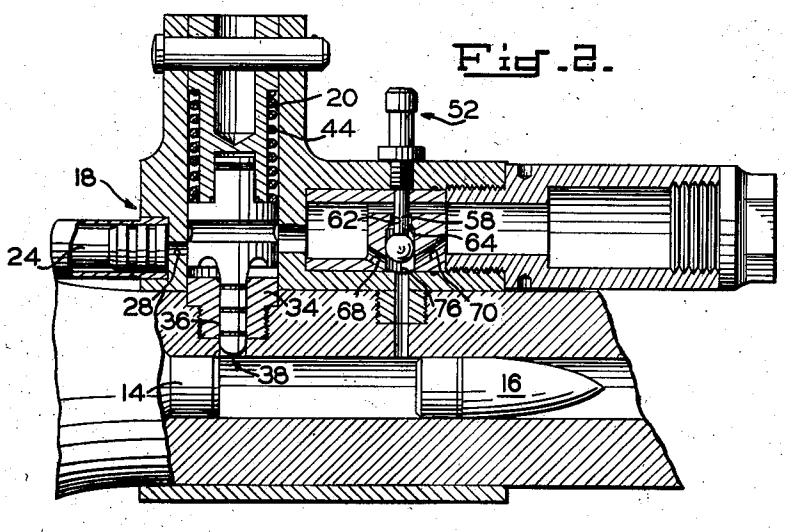



Fig. 2.



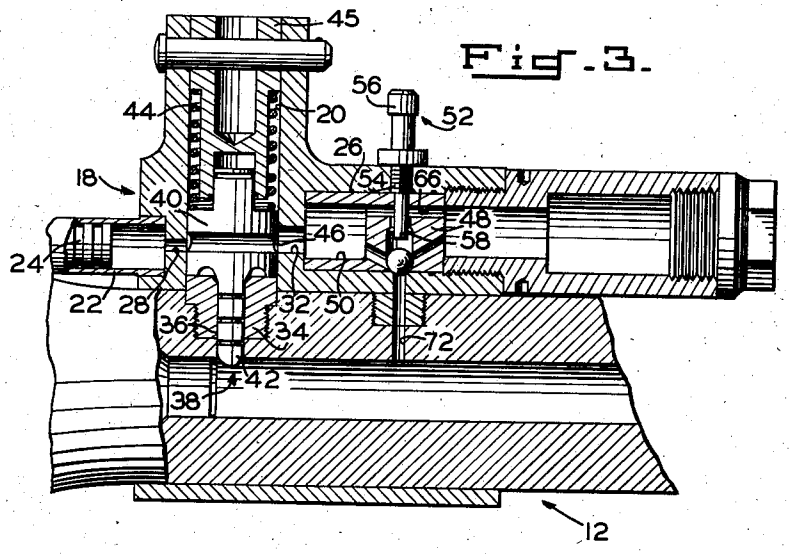

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Filed April 15, 1957 2 Sheets-Sheet 2

Fig. 3.




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2,845,008

# VALVE ADJUSTMENT MEANS FOR A GAS-OPERATED FIREARM

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Application April 15, 1957, Serial No. 653,046

1 Claim. (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 firearms and more particularly to gas systems for actuating the operating mechanisms thereof.

One of the objects of this invention is to provide a gas-actuated operating system whereby none of the parts of the operating mechanism is actuated while the projectile of a discharged cartridge is in flight along the barrel to disturb the aim thereof.

Another object is to provide a gas system whereby gases from the discharge of a cartridge are stored in a chamber during flight of a projectile along the barrel and are released for actuating the operating mechanism of the firearm after the projectile has left the bore.

It is a further object of this invention to provide a gas system for a firearm whereby a ball check is used to trap gases in an expansion chamber for later use in actuating the operating mechanism of the firearm and to regulate the amount of gases received by such expansion chamber.

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

Fig. 1 is a side view of the gas system cross-sectioned to show the relationship of the parts when a cartridge is chambered in the barrel;

Fig. 2 is similar to Fig. 1 but showing the relationship of the parts during flight of the projectile along the barrel; and

Fig. 3 is a view similar to Figs. 1 and 2 but showing the relationship of the parts after the projectile has left the barrel.

Shown in the figures is a firearm barrel **12** having a conventional bore and a chamber for receiving a cartridge **14** provided with a projectile **16**. A housing **18** is mounted to barrel **12** adjacent the chamber therein and is provided with a vertical bore **20**, a rearwardly disposed cylinder **22** having a piston **24** slidingly mounted therein, and a cylindrical hole **26** longitudinally disposed in the front end of the housing. Bore **20** communicates with cylinder **22** by means of a passageway **28** and with hole **26** by means of a bore **32** which is axially aligned with such passageway. A bushing **34** is mounted in barrel **12** so as to extend partially into bore **20** to assist in fixing housing **18** against displacement to barrel **12** and a passageway **36** extends through bushing **34** and barrel **12** to communicate with the bore therein.

Slidingly mounted in bore **20** is a valve member **38** which is provided with a body portion **40** having sliding engagement with the walls of the bore and a stem portion **42** which extends through hole **36** to project into the barrel bore when the bottom of body portion **40** is in contact with the top of bushing **34**. The bottom of stem portion **42** is slidingly engaged by the ogive of projectile **16** when cartridge **14** is chambered whereby valve member **38** is cammed to an up position. A coil spring **44** is disposed between the top of body portion **40** and a plug **45** inclosing the top of bore **20** to bias valve member **38** to a down position when the pressure in the bore of barrel **12** is reduced by the exit of projectile **16** from barrel **12**. Provided around body portion **40** is an annular channel **46** which aligns with passageway **28** and bore **32** to provide communication therebetween when valve member **38** is in down position and is moved away therefrom, permitting body portion **40** to block such communication when the valve member is in the up position.



Mounted in hole **26** is a cylindrical sleeve **48** having in the rear end a cylindrical recess **50** which communicates with bore **32**. An adjustment pin **52** is adjustably mounted to housing **18** by a threaded portion **54** so as to extend through such housing into sleeve **48** forwardly of recess **50** and normal to the axis of such sleeve. Such adjustment pin is provided also with a head portion **56** and a rod portion **58**. The lower portion of rod portion **58** is received in sleeve **48** by a stepped recess having a smaller diameter portion **62**, which is of larger diameter than such rod portion, and a larger diameter portion **64** which extends from such smaller diameter portion through such sleeve. An aperture **66** extends forwardly through sleeve **48** from recess **50** to join with the top of smaller diameter portion **62** and a pair of ducts extends obliquely upward in opposite directions from the bottom of larger diameter portion **64** in the vertical plane of the firearm. The rear one of such ducts, noted at **68**, provides communication between larger diameter portion **64** and recess **50** and the front one of such ducts, noted at **70**, exits at the front end of sleeve **48**. A port **72** of smaller diameter than larger diameter portion **64** extends axially from such larger diameter portion to the bore of barrel **12**.

Installed in larger diameter portion **64** is a ball **74** which is slidable therein between contact with the bottom of rod portion **58** and a semispherical mouth portion **76** provided at the upward end of port **72**, whereby, ball **74** releasably blocks communication between such larger diameter portion and port. Ball **74** in cooperation with adjustment pin **52** also serves to regulate the passage of gases from the bore of barrel **12** through port **72** into ducts **68** and **70** as such adjustment pin regulates the upper position of ball **74** and thereby the opening between such port and ducts. Threadably mounted to the front end of hole **26** is an extension member **78** having an expansion chamber **80** therein which is in communication with front duct **70** and aperture **76**.

Thus, when cartridge **14** is moved into the chamber of barrel **12**, the ogive of projectile **16** cammingly engages the bottom of stem portion **42** to move valve member **38** upwardly to block communication between passageway **28** and bore **32**. When cartridge **14** is discharged and projectile **16** is expelled therefrom, valve member **38** remains in the up position by the pressure of the gases in back of such projectile acting against the bottom of stem portion **42**.

After projectile **16** passes port **72**, the gases proceed therealong to enter expansion chamber **80** by means of front duct **70**. The adjustment of adjustment pin **52** determines the amount of gases which will be permitted to enter expansion chamber **80** past ball **74** before projectile **16** exits from barrel **12** and the gas pressure drops therein.

When the gas pressure in the bore of barrel **12** drops after the exit of projectile **16** therefrom, ball **74** is seated in mouth portion **76** to block port **72** by the superior pressure of the gases in expansion chamber **80** which pass through aperture **66** into smaller diameter portion **62** to act downwardly on ball **74**. At the same time, valve member **38** is biased to downward position by spring **44**,

vhen the pressure in barrel **12** is reduced sufficiently o align annular channel **46** with passageway **28** and ›ore **32**. Whereby the gases in expansion chamber **80** ıre permitted to pass into cylinder **22** to energize piston ;4 after projectile **16** has left barrel **12**.

From the foregoing, it is clearly apparent that there s provided herein a simple, rugged and easily manufac-ured gas system which actuates the operating mechanism ıf a firearm after the exit of the projectile from the ıarrel so that the aim of the firearm will not be disturbed ıy movement of the moving parts and the vibration set ıp in the barrel therefrom.

Although a particular embodiment of the invention has ıeen described in detail herein, it is evident that many ariations may be devised within the spirit and scope hereof and the following claim is intended to include uch variations.

I claim:

In a firearm having a barrel with a bore and an operat-ıg mechanism provided with a piston, a gas system for ctuating the operating mechanism including a valve lidingly mounted in a housing fixed to the barrel, a stem ortion extending from said valve into the bore for en-



gagement by the projectile of a cartridge chambered in the barrel, an end portion on said stem portion exposed to the gas pressure in the bore resulting from the discharge of the chambered cartridge for maintaining said valve in the closed position until after the projectile exits from the bore, a spring for biasing said valve to an open position after the projectile exits from the bore, a chamber for storing gases, passage means for bleeding gases from the bore to said chamber during flight of the projectile along the bore, ball check means cooperating with said passage means for trapping the gases in said chamber after the projectile exits from the bore, adjustment means cooperating with said ball check means for regulating the amount of gases bled from the bore to said chamber, and communicating means cooperating with said valve member for discharging the gases in said chamber against the piston when said valve member is in the open position.

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