H. J. WOODEND

BANG'S AUTOMATIC RIFLE
MODEL B. 1

Manufactured by

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BANG'S AUTOMATIC RIFLE
MODEL B. 1

THE Bang’s Automatic Rifle Model B. 1 is a gas operated, air cooled, magazine-fed, shoulder weapon. The power for operating the mechanism is supplied by the powder gases which issue from the muzzle after the bullet has left the barrel. The breech mechanism is of the bolt type. The magazine holds seven cartridges, which are loaded from a clip of the conventional type, but holding seven instead of five cartridges.

The rifle consists of the following principal assemblies.

- barrel
- receiver assembly
- bolt mechanism
- trigger gear
- magazine
- gas cylinder assembly
- operating mechanism
- stock and handguard assembly

The barrel (fig. 1) is threaded at the rear end (1) for attachment of the receiver. A threaded enlargement (4) just ahead of the breech end is provided for the attachment of the rear sight assembly (fig. 2) and to another, not threaded, about halfway between the breech and muzzle the rear piston rod guide is fastened with a pin. The threaded section (2) near the muzzle, attaches the front piston rod guide (fig. 3–4) to the barrel.

The receiver assembly includes the

- receiver
- cocking piece guide
- thumb shield
- ejector
- cut off

The receiver (fig. 13 to 17 inc.) is an irregularly shaped piece of metal which has a closed forward portion, (1) threaded to receive the barrel, and to the rear an open framework with grooves, guides, lugs, etc. suitably placed to support the various remaining parts of the receiver assembly, the bolt mechanism, trigger gear, magazine, and operating mechanism, and to provide for attachment to the stock. The bolt mechanism slides on the ways (32 fig. 17) being held on these ways in its forward position by the entrance of its front end into the forward closed section and the horns on the middle portion of the receiver, and in its rear position by these horns and the engagement of the guiding lug of the cocking piece in the dovetail guiding groove in the receiver and attached thumb shield. On firing, the thrust of the cartridge case against the bolt
is transmitted to the receiver by the locking lugs which engage with grooves cut into the for­
ward closed portion of the receiver and with the horns on its middle. The trigger gear is con­
nected by pivot pins to lugs located on the under side of the receiver. The magazine is fastened
by bolts which enter threaded holes (23 & 24) in lugs projecting from the under side. The rear
end of the piston rod enters through a hole drilled in the forward end of the right side of the
receiver (16 fig. 14) and immediately to the rear of this under the slot (17 fig. 14) is a cylindrical
cavity to contain the driving spring with its stops and the buffer spring.

The cocking piece guide (fig. 20) has at its forward end a threaded stud (1) which enters the
threaded hole (30) in the rear end of the receiver (fig. 17) and rigidly fastens these two pieces
together with the aid of a pin which prevents unscrewing and insures proper alignment. The
dovetailed groove in the upward projection (2) supports the guiding lug of the cocking piece
when the bolt is in its rearmost position. A spring catch (4) is provided for the attachment of
the thumb shield and a threaded hole in the stud (3) receives the bolt for attaching the stock.

The thumb shield (fig. 21) has a flat projection (3) on its front end which engages in a cor­
responding slot in the rear end of receiver, and on its rear end a shell into which the cocking
piece moves when the bolt opens. This shell prevents the rifleman's hand, when grasping the
stock, from coming forward far enough to be injured by the bolt. On its upper side it has a
dovetailed groove in which the guiding lug of the cocking piece moves as the bolt moves rear­
ward and forward. The thumb shield is held in place by the spring catch (4) in the end of the
cocking piece guide (fig. 20) which engages with a hole in the projection (4) at the rear of the
former. This catch can be released by the point of a cartridge to permit the removal of the
thumb shield when stripping.

The ejector (fig. 34 & 35) is assembled in a slot (19) in the left side of the receiver (fig. 15)
being held in place by a pivot pin. Its motion is controlled by a cam on the bolt so that its for­
ward end will engage the edge of the base of the cartridge case just before the bolt reaches its
rearmost position and thus throw the fired case clear of the rifle.

The cut off (fig. 36) is pivoted on its end between the two lugs (20) on the left side of the
receiver (fig. 15) by a pin which passes through holes in these lugs. When swung into its up­
ward position it engages with the rear end of the cover and the front edge of the cocking lug
thus preventing the firing pin from going forward. On engaging with the cocking lug it pushes
the latter slightly backwards thus giving a clearance for the sear to again engage the sear notch
if the trigger is pulled while the piece is locked.

The bolt mechanism consists of the

- bolt
- extractor
- bolt sleeve
- cocking piece
- firing pin
- firing pin spring
- firing pin sleeve

the bolt (fig. 23—24) is cylindrical in form carrying on its outside three locking lugs (1, 2 & 3),
the operating lug (3) the rotating cam (4) and the ejector cam (7). In it are milled the ejector
slot (6) and the extractor seat (9). The front face of the bolt is counterbored to receive the base
of the cartridge and has in its center a hole through which the firing pin projects when the cartridge is fired. The bolt is bored out from the rear to receive the firing pin assembly. At the rear end it is threaded for a short distance to receive the bolt sleeve (fig. 26). Two holes (5) are provided for the escape of any gas which may reach the cavity in the bolt by way of the firing pin hole in the event a prime cover should rupture. A blunt wedge shaped notch (10) is cut into the rear face of the bolt for the reception of the point of the guiding lug of the cocking piece (2 fig. 27) when the firing pin comes forward to strike the primer.

The extractor (fig. 25) is a flat spring which has at its end a hooked portion (3) for engaging the groove in the cartridge case, and is held in its seat in the bolt by a lug (2) and tongue (1).

The firing pin (fig. 29) is pointed at one end (1) where it strikes the primer and is threaded at the other end for the attachment of the cocking piece. It is machined flat near its front end (2) to provide for the assembly of the firing pin sleeve.

The cocking piece (fig. 27 & 28) has a cylindrical body (1) from which cocking lug (9) and the guiding lug (2) protrudes. The guiding lug carries at its rear end a step (4) which forms the sear notch (5). The cylindrical body is drilled and threaded to receive the firing pin (fig. 29) which is securely fastened in place in the cocking piece by a pin.

The bolt sleeve (fig. 26) has a central hole through which the firing pin passes and a slot to take the guiding lug of the cocking piece. It is attached to the bolt by means of the threads (3) on its front end. Its front face forms the rear seat of the firing pin spring. A notch (4) in its rear face takes the point of the guiding lug of the cocking piece when stripping and assembling the weapon.

The firing pin sleeve (fig. 30 & 31) is cylindrical in shape, slotted longitudinally to fit over the flat section (2) of the firing pin (fig. 29) and counterbored to keep it centered on the firing pin. The firing pin spring is assembled over the firing pin between the front face of the bolt sleeve and the rear face of the firing pin sleeve.

The trigger gear is composed of the following principal parts:

- sear
- sear spring
- connector
- connector spring
- trigger
- trigger spring
- sear release

The sear (fig. 37) is a lever which revolves about a pin passing through a hole (1) in its forward end. This pin attaches the sear to the receiver. The sear is held in its normal position by the small coiled sear spring, which is assembled in a hole drilled in the cylindrical front end (2) of the sear and bears against a lug on the receiver. A sharp cornered projection (3) on the upper side of the sear extends through a slot in the receiver and engages the sear notch (5) of the cocking piece (fig. 27 & 28). A pin passing through a hole (4) in its rear end attaches the sear to the connector. A hole drilled in the cylindrical rear end (5) of the sear contains the connector spring.

The connector (fig. 38) is hinged to the rear end of the sear by the pin which passes through a hole (3) in the upper end of the former. The hook shaped lower end (2) is engaged by the
front end of the trigger when the later is pulled. A round stud (1) projects from each side of the lower end of the connector to engage the sear release. The connector spring pushes the connector to the rear to insure its engagement with the trigger.

The trigger is an L shaped lever (fig. 41) which is attached to the receiver by means of a pivot pin passing through a hole (1) located just forward of the elbow. A round stud (3) engages with the trigger spring. At the forward end of the trigger is a small hook (4) which engages with the hook on the connector and thus operates the sear when pressure is applied on the finger piece (2).

The sear release (fig. 39 & 40) is a fork shaped link which is assembled on the receiver by a pivot pin passing through a hole (3). It is assembled in such a way that the forks straddle the forward end of the trigger and the cams (2) engage with the studs on the connector. The stud (1) extends upward through a slot in the receiver into a position where it is engaged by the guiding lug of the cocking piece when the later moves to the rear with the bolt.

The trigger spring is a small spiral spring supported between the stud on the trigger (3 fig. 41) and a shallow drilled hole in the bottom of the receiver. It holds the trigger in its normal position.

In the magazine, the principal parts are

- magazine frame
- floor plate
- follower
- magazine spring

The magazine frame (fig. 42 & 43) is attached to the under side of the receiver by two bolts and is held in proper alignment by two projections (1 & 2) which enter corresponding slots in the receiver. A groove (5) in the rear inside wall receives the guiding lug of the follower. Two undercut slots (3 & 4) are provided for the attachment of the floor plate.

The floor plate (fig. 44) is provided with tenons (1 & 2) which engage with the undercut slots in the magazine frame to hold the floor plate in place. By depressing a small spring operated catch with the end of a cartridge the floor plate is made free to be moved slightly to the rear thus disengaging its tenons from the undercut in the slots of the magazine frame and detaching the two parts from each other. A slot with undercut sides in the upper face of the floor plate receives the end of the magazine spring and holds it in place.

The follower (fig. 45) has a rib (1) which serves to locate the cartridges and guide the last one into the chamber. A guiding lug (2) which engages in a groove in the magazine frame prevents the following from tipping sideways and holds the bolt open when the last cartridge in the magazine has been fired. A groove with undercut sides on the under surface of the follower serves for the attachment of the magazine spring.

The magazine spring is W shaped and is held in place by its free ends which are caught in the undercut grooves on the floor plate and follower.

The gas cylinder assembly includes the

- front piston rod guide
- muzzle extension
- locking ring
The front piston rod guide (fig. 3 & 4) serves principally to attach the muzzle extension to the barrel and to limit the movement of the piston rod. Incidentally it serves also as a front sight base, the latter being inserted in a dovetailed groove (3), and a support for the front band, the ribs of which are engaged in the slots (6). The front end of the barrel passes through the larger hole (4) which is threaded to receive the threads on the former (2 fig. 1). Having once been assembled to its proper position on the barrel the alignment is held by a pin which engages the two parts. The smaller hole (5) guides the piston rod. The transverse hole (2) holds the piston rod stop pin. On the oval forward portion a single square interrupted thread is provided for engagement with a similar internal interrupted thread in the locking ring.

The muzzle extension (fig. 10 & 11) contains the gas cylinder (2) and the expansion chamber (1). That portion of the barrel which extends beyond the front piston rod guide occupies the rear portion of the expansion chamber serving to hold the muzzle extension in alignment and acting as a closure for the rear end of the chamber. The opening in the front end of the expansion chamber is somewhat larger than the bullet and is in line with the bore of the barrel. The expansion chamber proper is about 0,375" long and 0,59" in diameter. The expansion chamber is connected to the gas cylinder by a port having a cross sectional area of about 80 square millimeters. The gas cylinder in which the gas piston oscillates is closed at its front end. The rear cylindrical portion of the muzzle extension is threaded to enter the locking ring. The radial lug is pierced with a hole (3) to receive the spring operated securing catch of the locking ring.

The locking ring (fig. 12) has in its forward portion female threads to receive the threaded rear portion of the muzzle extension and in its rear portion a single female interrupted thread to engage with a similar male thread on the front piston rod guide. When assembled in place this part holds the muzzle extension tightly against the front piston rod guide. A spring operated catch (1) which can be released with the point of a cartridge, holds the ring in place.

The rear piston rod guide (fig. 5) is mounted on the center reinforcement (3 fig. 1) of the barrel and is held in place by a threaded pin. The triangular section of the piston rod (3 fig. 46) passes through the smaller hole of this guide and is thus prevented from vibrating.

The piston rod (fig. 46) carries on its forward end the piston (1) which oscillates in the gas cylinder (2 fig. 11). The piston is a loose fit in the cylinder and has one circumferential groove to aid in obturation. An elongated notch (2) near the front end engages with the piston rod stop pin (fig. 6) to limit the stroke in the forward direction. The piston rod is cylindrical in cross section except at the enlarged middle portion (3) where its section is triangular with rounded corners. This design reduces the friction in the rear piston rod guide. The rear enlarged portion (4) enters the forward end of the receiver and acts to drive the cover to the rear and thus operate the mechanism.

The piston rod stop pin (fig. 6) which is supported in the transverse hole (2) of the front piston rod guide (fig. 3) besides limiting the stroke of the piston as described above, passes through the holes (2) of the upper band (fig. 7) and helps to secure the latter in position. It is held in place by a locking lug and may be removed by turning it until this lug is in line with the slot of the keyhole in the upper band through which it passes. It is prevented from
unintentional unlocking by the radial spring on one of its ends which engages with a slot in
the side of the upper band.

In the operating mechanism are grouped the

Cover
Driving spring with stops
Buffer spring

The cover (fig. 32 & 33) is attached to the receiver by the grooves (6) which engage the
guides (18 fig. 15, and 15 fig. 14) and is then free to move backwards and forwards with respect
to the receiver under the influence of the piston rod and the driving spring. It operates the bolt
mechanism and in a large measure controls the movements of its parts. The operating handle
(1) is bored out to receive the operating lug which projects into the slot (17) of the receiver
(fig. 14) and there engages with the piston rod and driving spring. By pulling out the milled
knob (2) into the position shown in fig. 22 the operating lug is withdrawn from engagement
with the piston rod and the cover may be moved by hand independently of these parts. A spiral
groove is cut into the concave side of the cover (directly under the raised portion (3) visible in
fig. 32 into which the operating lug (3) of the bolt (fig. 23) engages and forms the connection
between the cover and the bolt proper. The rear edge of the cover (5) engages the cocking piece
(fig. 27 & 28) and forms the connection between the cover and the firing pin assembly.

The driving spring (fig. 18) is a spiral spring which is assembled into the hole under the
slot (17) of the receiver (fig. 14). It is compressed on the rearward motion of the cover and
stores up the energy necessary for the forward movement of that part. The stops assembled
into the opposite ends of this spring are of such length that when the later is compressed to
nearly its solid height they meet and prevent its further compression.

The buffer spring (fig. 19) is a short spiral spring of greater strength than the driving spring.
It is assembled in the receiver immediately behind the driving spring and serves as a buffer to
stop the rearward motion of the cover and bolt mechanism when the driving spring has been
completely compressed and to start these parts moving in a forward direction.

The stock and handguard assembly include the

stock
handguard
butt plate
upper band
locking plate
lower band with swivel
lower band spring
trigger guard
butt swivel

The stock is of wood and extends under the lower part of the barrel up to the front piston
rod guide. It is attached to the receiver and barrel by bolts which pass through the stock and
enter threaded holes in the rear lug (25) of the receiver (fig. 16) the lug (3) of the cocking piece
guide and by the upper and lower bands. The recoil is transmitted to the stock by the forward
lug (22) of the receiver (fig. 16).
The hand guard also of wood, covers the upper part of the barrel between the rear sight assembly and the front piston rod guide. It is held in place by the upper and lower bands.
The upper band (fig. 7—8) is assembled over the front piston rod guide being attached thereto by the two ridges on the top of the former which engage with the two grooves (6) of the latter (fig. 4) and by the piston rod stop pin. This band in addition to holding the stock and handguard in place carries on its lower side a T shaped lug for the attachment of a bayonet.
The locking plate (fig. 9) helps to secure the upper band by engaging in its grooves that portion of the ridges of the band which are not engaged by the front piston rod guide.
The lower band (fig. 47) is located just forward of the rear sight and ties the stock and handguard together in this place. It carries the upper swivel which is provided with two stacking hooks.
The lower band spring (fig. 48) rests in a groove in the stock so that it holds the lower band in its proper position. It is fastened to the stock by its prong.
The trigger guard (fig. 49) covers the trigger and is fastened to the stock by means of two screws.

STRIPPING AND ASSEMBLING

1) The magazine floor plate is removed by depressing the spring catch with the point of a cartridge and then pulling the plate to the rear.
2) The thumb shield is removed by depressing its spring catch with the point of a cartridge and then lifting its rear end upward.
3) The bolt is removed as follows:
   a) The milled knob at the end of the operating handle is drawn out as far as possible and turned so that the key on its shaft is out of line with its key seat. This disconnects the cover from the piston rod and driving spring and holds it so disconnected.
   b) The cover is pulled to the rear until the notch on its left side is in alignment with the cut-off.
   c) The cut-off is engaged in the notch in the side of the cover.
   d) The cocking piece is pulled to the rear until it can be turned to the right when it is so turned until the point of the guiding lug engages with the notch in the rear face of the bolt sleeve.
   e) The cut-off is disengaged from the notch in the side of the cover.
   f) The cover is pulled to the rear until it is clear of the receiver. The bolt is brought with it.
4) The bolt mechanism is stripped as follows:
   a) The guiding lug of the cocking piece is disengaged from the notch in the rear face of the bolt sleeve and allowed to go forward in the guiding lug slot.
   b) The bolt sleeve is unscrewed from the bolt, allowing the firing pin assembly to be withdrawn.
   c) The firing pin spring is compressed toward the rear to free the firing pin sleeve.
   d) The firing pin sleeve, firing pin spring, and bolt sleeve may now be removed from the firing pin.
   e) The extractor is removed by first pushing it to the rear as far as possible, then pushing its forward end radially outward until its lug is clear of its seat, when it may be pulled forward and withdrawn from the bolt.
5) The driving spring is removed by pushing it forward and backward until it can be lifted out through the enlarged portion in its slot. The rest of the spring follows.
6) The muzzle extension is removed by depressing the spring catch of the locking ring with the point of a cartridge, turning the locking ring to the right until its interrupted thread disengage from the corresponding thread on the front piston rod guide, and then pulling the assembled locking ring and muzzle extension forward off the barrel.

7) The locking ring is then unscrewed from the muzzle extension.

8) The piston rod stop pin is removed by lifting the end of its spring clear of its notch, turning it to the right about 270° and withdrawing the pin.

9) The piston rod is removed by pulling it forward.

10) The upper band may now be pulled forward off the rifle releasing at the same time the locking plate.

11) The lower band may now be pulled forward after the lower band spring is depressed into its groove in the stock.

12) The hand guard is now free and may be removed.

13) The magazine frame may be withdrawn after its two attaching bolts are removed.

14) The trigger guard may be detached from the stock by removing its two attaching screws.

15) The barrel and receivers are now free to be detached from the stock.

To assemble the rifle the above operations are carried out in the reverse order.

**FUNCTIONING**

The functioning of Bang's Automatic Rifle Model B.1, is divided into two phases based upon the operation of the mechanism when a shot is fired. The starting point of the cycle is taken as the instant when the powder in the cartridge has been ignited.

The operation in the first phase are those which accompany the rearward motion of the cover and are:

- Action of the gas
- Withdrawal of firing pin
- Unlocking of the bolt
- Extraction of fired cartridge
- Ejection of the fired cartridge

The operations in the second phase are those which accompany the forward motion of the cover and are:

- Feeding the cartridge from magazine to chamber
- Locking the bolt
- Ignition

A cartridge having been ignited, the bullet under the pressure of the powder gases travels through the barrel. When the bullet has left the barrel the powder gases issuing behind it are trapped for an instant, (while the bullet is passing through the front opening of the muzzle extension) in the expansion chamber. The trapped gases under the pressure thus built up in the expansion chamber pass through the port to the gas cylinder where they act upon the piston and push it to the rear. This movement of the piston is transmitted to the cover through the piston rod. The cover is pushed under the direct action of the piston rod through a little less
than one fourth of its total stroke. During this portion, of the stroke the bolt is unlocked, the extraction is begun, the firing pin spring is compressed and the cover and the bolt are given such a rearward velocity that the momentum of these parts is sufficient to carry them through the remainder of the stroke and at the same time complete the compression of the driving spring.

When the cover starts on its rearward stroke its rear end comes in contact with the cocking lug of the cocking piece, pulling the latter rearward with it. The bolt being still in its forward position the firing pin is withdrawn and the firing pin spring is compressed. While the cover is moving backward the spiral groove on its under side acting on the operating lug of the bolt turns the latter to its unlocked position. As the last end of the groove in the cover is perpendicular to the axis of the rifle, the bolt is firmly clamped to the cover by the operating lug and the cocking lug which are under the action of the compressed firing pin sleeve. The bolt and cover therefore move back together completing the extraction.

When the rear end of the stroke has been nearly reached the ejector under the action of the ejector lug on the bolt engages the base of the cartridge case and the latter pivoting about the extractor is trown from the receiver with considerable force.

The cover and bolt having now reached the rear end of their stroke, the direction of their movement is reversed by the buffer spring which is brought into action through the operating spring stops which come into contact with each other.

The cover and bolt then move forward under the action of the driving spring. In its forward movement the face of the bolt engages the base of the top cartridge in the magazine and carries it forward into the chamber. At the same time the extractor engages in the extracting groove. When the bolt has reached a position about one eighth inch from its extreme forward position, its rotating cam comes into contact with a sloping surface on the forward end of the receiver and turns it sufficiently to move the operating lug into the spiral portion of the groove in the cover. The forward motion of the cover through the action of its spiral groove on the operating lug of the bolt then turns the latter into the locked position. During the last part of the forward motion of the bolt the sear engages the sear notch of the cocking piece and holds the firing pins back in the cocked position.

The finger piece of the trigger now being pulled back, the hooked front end engages the lower hooked portion of the connector and a slight resistance to further movement is felt. Further pressure on the trigger however pulls the sear down and releases it from engagement with the sear notch of the cocking piece. The firing pin spring then carries the firing pin forward to strike the primer and fire the cartridge.

PROVISION TO PREVENT FIRING BEFORE THE BOLT IS FULLY CLOSED AND LOCKED

To prevent any possible firing of the cartridge before the bolt is fully closed and locked the firing pin has been made of such length that it cannot project beyond the face of the bolt unless the forward end of the guiding lug of the cocking piece enters the notch on the rear face of the bolt.

This entry can only take place when the notch has been brought into alignment with the guiding lug by turning the bolt to the locked position.
PROVISION TO PREVENT CONTINUOUS FIRE

To prevent more than one shot being fired each time the trigger is pulled, it is necessary that the sear be in its normal position to engage in the sear notch before the bolt reaches the end of its forward stroke. To accomplish this, even though the rifleman hold the trigger back, the guiding lug of the cocking piece, on the rearward stroke of the bolt, actuates the sear release to throw the connector forward out of engagement with the trigger thus allowing the sear to return to its normal position.

PROVISION TO PREVENT DOUBLE LOADING

As soon as the base of the cartridge is released from the magazine, it is gripped by the extractor and should the bolt be opened again before it has been fully closed, the cartridge will be ejected. This prevents an unfired cartridge remaining in the chamber and another being fed in upon it.

PROVISION FOR MAKING THE RIFLE "SAFE"

The rifle being loaded, it can be made safe against firing even though the trigger is pulled, by bringing the cut-off into action. When this part is swung to its upward position and pressed home it rests between the front face of the cocking lug and the rear face of the cover thus preventing a forward movement of the cocking piece even though the latter is released from engagement with the sear. When the cut-off is moved to the "safe" position, it, by a cam action, draws the cocking piece slightly to the rear thus taking the pressure off the sear and making it possible, should the trigger be pulled while the cut-off is set at "safe", for it to move freely back to its normal position to engage in the sear notch. By preventing the rearward movement of the cover, the cut-off when in the "safe" position prevents the opening of the bolt.

USE AS AN ORDINARY REPEATER

The rifle may be used as an ordinary repeater by simply removing the muzzle extension. When so used it is necessary to draw the cover to the rear by hand between each shot. The driving spring will in this case also take care of the forward movement of the cover and bolt.
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Bang's Automatic Rifle. Model B. 1
Bang's Automatic Rifle. Model B.1

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 7

Fig. 8

Fig. 9

Fig. 10

Fig. 11

Fig. 12

Fig. 13

Fig. 14