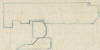


Form 407

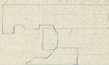
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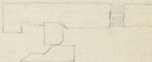
Correctly Bracketed.



Correctly Bracketed.



Incorrectly Bracketed.



BROWNING GUN.

Type of installation 701. Mark II

A. sets a fixed gun. eg. wing installation cockpit installation

B. sets a fixed gun. eg. Turret installation
The gun is automatic in the sense that the continued operation of the firing control will cause all the available ammunition to be expended.

General description.

Overall length 58 in. Length of Barrel 26 in.
Weight (with loaded mag). 22 lbs. 12 oz.
Rate of fire 1100-1500. 8 pm. Range 6000 yds.
Rifling. Left hand 1 in 10

The parts of the gun are divided into two groups thus.

Revolving Parts	Non Revolving Parts
Barrel Block	Barrel Feeding
Barrel Group	Body.
	Buck Plate.
	Barrel Cover
	Lock Frame.
	Return Spring.

3. Action of Recoil. Forward movement
When a round is fired direct recoil action
takes place and gun is momentarily
stopped in the muzzle attachment, returning
from one of flash deflection, springing
on the end of the barrel. These coupling
pieces, containing together, govern the
Recoil, Extension and Barrel Block to
the rear. The latter being locked to the
Barrel Extension due to the locking of
locking pins being held upwards by
the locking pins cam, the T projection
of the Barrel Extension bearing against
the return spring.

4. Unlocking of the Barrel Block.
The Barrel
Block Extension & Barrel Block are forced
to the rear. All locked together as
they move to the rear. The inclined
portion on the locking pins allows the
L.P. to drop down the inclined surface
of the inclined L.P. cam disengaging
the L.P. from the L.P. screw on the B.P.
This action is assisted by the prongs
of the lock frame travelling along
the cam grooves and the inclined
surfaces on the prongs engaging the

locking pins pin and giving it a definite
downward movement. The B.P. is now
free to move to the rear.

5. Backward Acceleration - action of.
As the B.P.E.
move to the rear, the counter force on
the B.E. comes into contact with the
front face of the accelerator. During
the acceleration upward, backwards and
over the centre. The horns of the accel-
erator strike the dent on the B.P. and
assist in the backward movement of
the B.P. with the accelerator moves
backwards and over centre, of the
sumps engage behind the T pins
projection locking the B.P.E. to
the lock frame.

6. Locking Action:-
The end of the locking
bar is engaged in the locking lever
bracket and the nose in the slot in the
locking pin and as the B.P. moves
back, the end of the C.L. is forced
forward causing the nose to move
backwards and withdrawing the firing
pin from the firing hole. This
action causes the T.P. spring to be

compressed. The bent of the F.P. engages the rear pushing it clear and the F.P. continues to the rear, where it is held by the nose of the cocking ~~lever~~ lever.

§ The backward action of the Transporter.

As the R.B. moves to the rear the cam on the transporter which is engaged in the front of the rim of the cartridge withdraws the cartridge from the belt. The round being supported by the ejector. The transporter is prevented from falling by its plunger riding along the top transporter front cam. On reaching the chamfered face the plunger is depressed and the ramp on the cover forces the transporter down bringing a live round down into the face of the R.B.

§ Retention and Ejection

The case in the chamber is held by the cartridge rim guides and as the R.B. moves to the rear, the empty case is withdrawn from the chamber and being unsupported it falls & drops off the cartridge rim guides when sufficiently clear of the

chamber. If it does not fall off, the rim of the live round bears on the rim of the empty case forcing it downwards. In the case of the live round it is ejected by the ejector.

§ First action of Ball Feed.

The stud on the feed lever is engaged in the cam grooves on the top of the feed block and as the R.B. moves to the rear the feed lever is rotated on its axis. The nose of the feed lever is engaged in the recess in the feed slide & moves the slide across the belt. The feed pawl rides over the round held by the retaining pawl and by the action of the feed pawl spring engages the round ready for feeding. During the whole of this action the belt is prevented from leaving the gun by the retaining spower & spring.

§ Second action of Ball feed.

As the R.B. moves forward the stud on the feed lever moves in the cam grooves and rotates the feed lever. This causes the feed ~~lever~~ ^{pawl} to feed into the belt.

so that a line sound is brought against the cartridge stop. During this movement the retaining pawl spring was depressed by the next line sound and when under pressure from the spring the pawl rises and engages behind that sound.

19. First Forward action of the transporter

As the P.B. travels forward the transporter plunges, slides down the sloping face of the rear cam until the transporter arm reaches the transporter stop. During this downward movement the line sound is brought into line with the chamber & firing pin hole. The sound is still supported by the ejector and with continued forward movement of the P.B. the line sound feeds into the chamber.

20. Second Forward action of the transporter

When the ejector is brought abreast of the ejector slide clearance in the P.E. the transporter plunger starts to slide up the transporter front cam. This causes the transporter to rise and so lift

the ejector clear of the sound. The ejector being forced outwards by the contour of the case. When clear of the sound the the ejector spring returns the ejector to its normal position. As the transporter reaches its fully forward (movement) position the slide rides over the rim of the line sound in the belt and under pressure from the transporter guide spring engages in the front of it.

At the same time the ejector, under the influence of its spring, engages the case of the sound, ready to support it when later it is withdrawn from the belt. In this position the nose of the ejector rests on the top of the ejector clearance on the baseplate.

21. Forward rotating action of the baseplate

When the belt on the P.B. strikes the bars of the accelerator the latter is rotated forwards. The accelerator ramp becomes disengaged from the P.E. T piece and the P.B. & P.E. are thus free to be driven forward by the P. main spring.

Return of the Cocking Lever

During the forward travel of the B.B. the tail of the C.L. engages in the C.L. bracket & rotates the C.L. The rotation rotates the lever for cocking engaging the tail of the rear and firing pin and at the same time gives clearance for the firing pin to travel forward when released.

Loading of the Branch Block

As the B. and B.L. move forward under the influence of the B. return spring the B.L. moves away from the springs of the lock frame. This causes the L.P. face to move upwards when the B.B. is down and the B. fully closed. The cocking pin being forced upwards by the slope of the L.P. cam it enters the L.P. recess on the B.B. and so locks the B.B. to the B. and B.L.

The operation of the rear seat.

On coming to operate the controls the rear seat lever is released allowing the rear seat to rise. Thus on the backward movement of the B.B. obtained on

the recoil of the explosion the rear seat of the B.B. depresses the rear seat which is then forced upwards when alone of the seat. On the B.B. being forced forward by the return spring it ^{momentarily} ^{assists} is assisted by the seat engaging the rear seat. The shock of the engagement between the B.B. & rear is absorbed by the buffer spring should the B.B. strike the rear seat before it has fully risen resulting in a partial engagement of the seat. As the rear seat is carried forward in this low position a projection strikes an inclined ramp and forces the seat into full engagement.

Firing of Cartridge

When the B.B. is right forward the lower bay of the seat is brought into line with the firing safe plunger which strikes the rear and drives it inward. The rear then disengages from the F/A bar. The firing pin is forced forward by its spring. This firing the cartridge.

BROWNING

N.O.	IMPERFECT ACTION	RESULT
1	cock's fire gun. won't fire. If feed defective.	If gun fires gun does not fire
2	If feed doesn't take place, trust breast cover & examine feeding.	
3	cock's fire gun	gun doesn't fire
4	Barrel too loose against the bolt. cock's fire	If gun does not fire second time & repeats stoppage.
5	cock's fire.	gun fires.
6		gun repeats stoppage.
7	a defective B.B. Spring. T.Y.S. which is damaged at R.I.B. Rod	

STOPPAGES.

CAUSE	PREVENTION & IMMEDIATE REMEDY	
misfit due to defective barrel	NIL.	
Defective feeding pin or spring	instead, change Barrel Block	
Defective fire & control mechanism	Examine & adjust. Re-adjusted mechanism	
1 Defective feed front spring	} change defective part.	
2 " " " " " " " "		
3 " " " " " " " "		
4 Misfit due to ball jamming feeding	Barrel - ball feeding	
5 misfit. do not edge feeding feeding	correct feeding position	
6 Empty back jamming feeding	ing of cartridge in back	
7 Separated case	reload & all clearing spring.	
8 Defective Transporter.	check for correct loading up	
9 plunger or spring	plunger. barrel block	
10 insufficient screws due to defective cartridge	NIL.	
11 Excessive friction	Barrel maintenance	
12 Defective ejector	} change barrel block.	
13 Defective barrel block		
a misfit of ball feed by dry case & stoppage in various points		

BREACHING W.P.

Breaching up is the correct positioning of the barrel & of the barrel in relation to the front of the B.B. when the L.P. is fully engaged in the locking recess. It is of the greatest importance and must be done very carefully if the gun is to work efficiently.

Assuming the gun to be fully assembled the following is the sequence of operations:

1. See that gun is not loaded
2. Raise barrel cover.
3. Remove back plate & Return Spring
4. Remove locking stud & withdraw B.B.
5. Remove the Transpacer & with plate, plug & spring
6. Withdraw the re-coiling post & coil and the locking notches are clear of the barrel cover
7. Remove L.E. from B.E.
8. Disengage Barrel L. Spring & rest spring on lower side of B.E.
9. Withdraw the barrel slightly to the rear
10. Assemble the B.B. & its components, to the B.E. Turn the assembly upside down

and ensure that the L.P. is fully engaged in the L.P. recess.

11. Hold the L.P. in full engagement ^{to rear} and fully screwing the barrel until the barrel end is fast to bear against the front of the B.B.
12. Engage the B.B. E. in the adjacent locking notch. If one notch is coincident, increase one notch.

N.B.

The locking spring must not be deflected to obtain engagement

13. Push the assembly fully home in the gun until the front end of the B.B. bears against the transpacer block
14. Hold the B.B. firmly in this position and test for fore & aft movement of the B.B. This movement should not be confused with permissible lateral & vertical movement
15. If fore & aft movement is present withdraw the assembly & screw up the barrel one notch.
16. Re-test assembly as in (14) and repeat (15) until all fore & aft movement has been eliminated

17. Test for over-brushing by placing the assembly in gun and pushing fully home, only a normal pressure should be necessary to do this. If the locking, notches are visible between the D.L. & T.B. the gun is over-brushed. (i.e.) The locking piece cannot rise into full engagement.

Stripping of Browning for cleaning.

1. Ensure the gun is unloaded. B.B. in forward position.
2. Remove Lock eliminators
3. " Back plate.
4. " Release Springs Rod
5. Pull back B.L. with draw cocking, Stud & Remove B.B.
6. Disengage lock frame, remove plunger & withdraw lock frame B.B.E. If filled with wear wear release unit it will be removed during the operation.
7. Press forward on bars w/ accelerator and disengage the B. frame the B.L.
8. Raise the barrel locking Spring and

Support on the lower face of B.L. Remove & remove barrel.

9. Remove Barrel L. Spring
10. Push out L.P. pin & Remove L.P.

Do re-assembly, reverse the foregoing procedure, ensuring that:-

1. The firing pin clearance groove is approximately 1/16" that the chamfered edges of the L.P. are forward.
2. That correct brushing up is carried out before assembly.
3. That when assembling that B.D.E. L.T. to the gun body that the wear wear release unit is engaged when the L.T. is, about, one inch from being fully home. Also that the wear wear is depressed in order to clear the wear wear from the bottom plate.
4. That the bar is assembled on the B.L. on the same side as the firing & dog mechanism.
5. That the cocking Stud is assembled on the opposite side to the 7 & 8.
6. That the firing pin is locked.

Cocking lever forward when to placing
Brack B lock.

N.B.

THE GREEN COVER MUST NOT BE
CLOSED UNTIL GREEN BLOCK IS
RIGHT FORWARD.

Stripping of Component Parts.

BREEN BLOCK.

1. Rotate Cocking Lever, & pass firing pin
2. Raise Transporter & withdraw
3. Remove Breech Block & Plunger
4. Remove Cocking Lever, axis pin, & Cocking Lever
5. Bail, Lock Spring, Retainer Spring to control position
& pull out from underneath of N. B.
6. Remove rear spring retainers taking care
not to lose Rear Spring. Remove Rear Spring
7. Remove rear retainers & Rear.
8. Take out Firing pin

To Re-assemble reverse above and
check by Cocking & Firing

Breeching Safety Devices

1. Breech Block must be right forward
before gun can be fired
2. Breech Block is locked before it
reaches its most forward position
3. Breech Block is locked for its
its backward movement to allow
bulk of gases to escape.
4. If the screw is accidentally released
the cocking lever takes the tension
of the Firing Pin Spring
5. Breech Block stays to the rear
due to the action of the Rear
Screw.

- 7 Clean inside of breech casing and clean and oil the moving parts & surfaces.
- 8 Check the correct functioning of the gun if exchanges have been made.
- 9 Check the security of gun and mountings.
- 10 Check empty cartridge case chutes and link chute for security & correct alignment.
- 11 Examine & clean Reflector Sight.
- 12 Enter up the Gun's History Sheet.

C After flight if firing has taken place

- 1 Examine gun is unloaded.
- 2 Remove gun & take to armoury for cleaning.
- 3 Strip & examine gun for burst, wear, damage.
- 4 Lightly oil all parts & Re-assemble.
- 5 Enter up all records found in gun History Sheet.

D Operation before flight when firing is to take place

- 1 Inspect the gun attachment & mountings for security.
- 2 Examine that the flash eliminator and magazine attachment are secure.
- 3 Clean & dry bore.
- 4 Clean & oil the moving parts & working surfaces.
- 5 Test the fire lock mechanism & secure rear release.
- 6 Check the correct functioning of the gun, using drill cartridges in belt.
- 7 Inspect the ammunition box, empty cartridge case chute & link chute for security & correct alignment.
- 8 Check the sights for security & correct alignment & in the case of reflector sight for continuity of device.

E Operation between flights when firing has taken place

- 1 Examine that the gun is unloaded.
- 2 Empty the spent cartridge container.
- 3 Re-fill ammunition tanks.
- 4 Obtain fire report & if necessary make corrections.
- 5 Remove Flash Eliminator & clean any carbon fouling.
- 6 Clean the bore of gun using single patching and flameless.

VICKERS GAS OPERATED .303 GUN

General Description *5 Lines given*

Weight 30 lbs. Overall Length 45 in. lbs.
Length of Barrel 20 in. Left Hand Turning. 1 in 10.
Bore .303. Magazine 60 or 100 rounds.
Rate of Fire 950 rounds per min. (approx)

The Gun is divided into two parts or groups

1. Stationary Parts. 2. Recoiling Parts.

Stationary Parts consist of:

1. Barrel Group.
2. Bolt & Gas Cylinder
3. Return Springs & Rod.
4. Extractor & Extracting Grip
5. Bolt Latching & Lock Grip
6. Magazine

Recoiling Parts consist of:

1. Piston Rod.
2. Breech Block

First Action

Cocking by Hand

On the cocking handle being pulled to the rear the cocking key being engaged in the slot in the Piston Rod draws the Piston & Breech Block to the rear. This movement continues until the hammer on the Piston Rod is engaged by the rear, at the same time the Return Springs are compressed.

Forward Movement.The Release of the Sear

When the Trigger is pressed the Trigger Rod is forced forward & compresses the T.R. Spring the flange, end of the T.R. being engaged against the lower arm of the Sear rotates the Sear on its axis compressing the sear Spring & withdrawing the nose of the sear from the Notch on the P.R. Movable has the flange on the T.R. moves forward & the Sear catch is rotated under the action of its Spring the arms engaging over the Stop on the Sear. When the nose of the Sear is disengaged from the Notch on the P.R. the P.R. is forced forward under the influence of the Return Spring carrying with it the Barrel Block.

Feed of Round into Chamber

As the P.R. moves forward the Feed Piece engages the cartridge held in the lip of the Magazine forcing the bullet end of the cartridge under the bullet Guide, guiding the bullet into the Chamber. At the same time

the base of the cartridge is forced downwards onto the face of the P.R. where it is engaged. The final movement of the P.R. forces the cartridge fully home into the Chamber ^{action of mag}
Loading of the Branch Block

When the P.R. reaches the end of its forward movement the P.R. continues to move forward & the Locking Cam on the rear of the P.R. bears against the corresponding cam on the rear of the P.B. forcing the rear of the P.B. up until it engages in front of the Locking Chamber in Body. The P.R. still continues to move forward and the horizontal surface of the rear bears against the corresponding portion on the underside of the P.B. This retaining the P.B. in its Locked Position.

Firing of Cartridge

During its final forward movement the front of the P.R. projection (Hammer) strikes the firing pin forcing it forward & compressing the firing Spring Pin

Backward Movement

Action of Gases.

When the cartridge is fired the Piston Burns the gases & forces the bullet up the Barrel. After the bullet has passed the Gas Port in the Barrel the Gases pass through the Gas Vent into the Gas Block. These Gases are deflected into the Gas Cylinder where they impinge on the Head of the P.R. driving the P.R. to the rear & compressing the Return Springs.

Backward movement of the Piston Rod & the Unlocking of the Barrel.

As the P.R. is forced to the rear the front of the P.R. projection is disengaged from the Firing Pin, at this time the Horizontal surface of the rear of the P.R. slides bearing against the Horizontal surface of the Barrel B. ensuring that the P.R. remains in the locked position until the Gases have escaped from the Chamber. As the P.R. moves further to the rear the unlocking cam on

the P.R. bears against the corresponding Cam on the B.B. forcing the B.B. down and the Locking Shoulder out of engagement with the Locking Shoulder. The P.R. now carries the B.B. to the rear until the P.R. is brought to rest against the Buffers on the Piston Retention

Extraction & Ejection

As the P.R. moves to the rear the claw of the extractor being engaged with the rim of the empty cartridge case draws the empty case to the rear. The P.R. continues rearward until the tail of the ejector is struck by the ejector cam causing the ejector to rotate on its axis and the nose of the ejector strikes the base of the empty case forcing it through the ejector opening into the deflector bag.

Action of the Feed Pin

As the P.R. moves to the rear the Feed Pin is forced down by the the Cam round head in the Magazine and when pushed past the line sound

the T. Boat is returned to its normal position by the T. Boat Spring

Engagement of the Boat.

When the trigger is released the trigger's trigger Red are returned to their normal position by the T. Boat Spring that forcing the forward end of T. R. from the lower arm of the Boat. The Boat is not made to rise until the T. R. has almost reached the limit of its backward movement when the lugs on the T. R. bears against the Boat Catch rotating it to the rear, & disengaging the arm of the Boat catch from the Plug on the Boat. The Boat is now forced up into position by the Boat Spring & engages the Boat on the P. R. The shock of the engagement between the Boat & the Boat on the P. R. is absorbed by the Trigger Spring through the Boat Lever & the Boat Spring Plunger. In the event of only partial engagement of the Boat the Boat is forced

forward its underside bearing against the Boat Stop that again forces the Boat to Rise into full engagement with the Boat on the P. R.

Machine Gun Maintenance

Powder Fouling:-

Forms as a hard scale on the surface, as in the Blast eliminator, barrel etc. Caused by deposits from the burning of the propellant (corrosive, neonite or nitro-cellulose).

Removal:- Soak in Type 'A' cleaning oil for 10 mins (approx) clean with wire or if necessary 20-40 strands of brass wire 26 gauge soaked in Type A cleaning oil.

Chemical Fouling:-
Is caused by decomposition of the cap compound ^{which} produces a salt like substance ^{which} is rolled out from the air. This acts on the barrel like sea water on a metal ship.
Removal:- as for Powder Fouling.

Metallic Fouling:-

Is caused by nickel deposits from the bullet envelope on the grooves & lands. Detected by use of 708 gauge or visual checking on Group C test inspection.

Removal by:- Two tablets of K.M.N.S.

dissolved in 40 cc. of liquid ammonia at a specific gravity of .95 for a period of (approx) 10 min. If nickel is present the liquid will appear as a deep blue or bluish green liquid. Repeat process until clear or nearly clear liquid appears after treatment with solution. Dry bore & allow with Type A. oil.

Solution
2 Tablets. 40 cc. { 88% ammonia
1 pint of acetone. { 5% water.

Metallic Fouling. Copper. 20 min. Gun.
Detected by use of 20-02 mm gauge at groups & inspection (1 days or 600 rounds).
Removed by using wire brush if fouling is slight.
Copper Solvent.

1½ pints of Ammonia Per sulphate.
5 pints .88 Lg. Ammonia
4 pints of water.

Leave for 3 hours. Reclean repeat if necessary.

Gauges.

- 303 Test for metallic fouling Barrel and
 - 307 " Barrel area must not pass right test
 - 308 " " Cord area at muzzle end. (ball round)
- Play out No 2.

- 6" Reject for air with incendiary ammo
- 1.5" Reject for air operational use
- 7.0" " for air use training station
- 4.5" Reject for ground use.

After every 1000 rounds. Test test of gun by firing 10 rounds on the 25 yard range. If bullet pattern exceeds 4x6 barrel is $\frac{4}{5}$ for all purposes.

- 066 Test for cartridge Rim Quarter seal in magazine with 1000 footer gauge
- 074 Should not enter.
- 080 Heavy gun Should not pass over
- 088 Should pass over Heavy gun
- 070 Test for branching "

Stoppages

NO.	Transverse Action	Result
I	Push back cocking handle part forward 1/ Gun fires 2/ Top plate revolves 3/ Top plate does not revolve 4/ Gun fires single shot	
2	Push back C.H. push forward 1/ Round half forward in mag 2/ Empty case on face of Round 3/ Round half forward in 4/ Empty case in body or ejector chamber.	
3	Ditto 1/ No Round in body or 2/ Live Round in body 3/ Empty case in chamber.	

The main Stoppages are mainly due to
or Defective parts of the Round Block

Rear end of the piston viewed thro' the
back the cocking handle until the cocking
stoppage ① cocking handle fully forward. ② C.H. down in part of Round Way cut

V. 9.0.

	Cause
1	Misfire
2	Probable broken firing pin or spring
3	Empty Magazine
4	Defective Magazine
5	Broken feed piece or spring
6	Insufficient tension on Magazine spring
7	Dirty Gun block ⑧ Broken firing pin
1	Round jammed in lips of magazine
2	Broken ejector
3	Repeated Pass
4	Full deflector Bay.
1	Round jammed in lips of mag
2	Misfeed
3	Broken out sector

Defective Ammunition Defective magazine

cocking handle shot or determined by pulling
out engages the C.H. by shot. will indicate the position
of Round Way cut ③ C.H. down in part of Round Way cut

SIGHTING.

Definition:-

Muzzle Velocity:- is the velocity imparted to the bullet by the charge 2860 ft p s.

1930
ft p s.

Average Velocity:- is the average velocity of the bullet over a particular range.

Point of Intersection:- is that point where the bullet's target meet.

Deflection:- Is the distance moved by the bullet target during the flight of the bullet.

Angle of Deflection:- Is the angle formed by a line through the axis of the barrel to the firing eye and the line from the firing eye to the target.

Trajectory:- Is the actual path of the bullet.

Cone of Fire:- Is that point or portion of space that contains all the trajectories of all the bullets fired.

Relative Speed:- Is the speed of one object in relation to another one or both being in motion.

Point of Harmonization:- Is that point at which the line of sight

intersect the trajectory of the bullet under certain specific conditions.

Construction of 50 mph Ring Sight

$\Delta ABC \sim \Delta ODE$ as similar

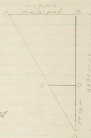
$$\therefore \frac{OC}{AO} = \frac{OD}{AB}$$

$$OD = \frac{OC \times AO}{AB}$$

$$= \frac{23.5 \times 100}{3200}$$

$$= .66 \text{ in.}$$

.66 in being the radius of a 50 mph ring sight.



Relative Speed Sighting

When firing a free gun from 4/c at another one there are two main factors which influence the point of aim.

- a) The velocity of the target w/c.
- b) The movement imparted to the bullet.

by the velocity of the gunner's 4/c. In relative speed sighting, these two factors are combined and only the resultant considered (i.e.). The relative velocity of the target.

Principles of Relative Sighting

In relative speed sighting the gunner is not concerned with the actual velocity of the target but only with its apparent velocity relative to his own 4/c. His only concern is with the speed & direction with which the target appears to move across the ring of his sights.

In short, the gunner allows only for what he sees. The direction of the apparent motion of the target must always be made to pass through the center of the ring, while the amount of deflection to be allowed is determined by the apparent speed of the target across the ring.

The 50 mph Ring Sight substitutes at 20 ft per every 100 yards.

Method of using Ring Sight

- 1 Identify the target
- 2 Place the centre of sight on target hold the sight steady & watch what way the target appears to move across the ring and at the same time estimate its apparent speed
- 3 Move the sight along the line of apparent motion overtaking overtaking the target & position the target so that it appears to move through the centre of the ring & at the same time make the correct deflection allowances for the estimated apparent speed fire a burst & repeat the whole procedure.

35 mph



60 mph

Bottom.



forward of sight

Reflector Sight

See gun reference sight Mark IIIA.

General Description

The sight consists essentially of a flat clear glass screen inclined at an angle of 65° through which the target is seen. The light from the graduated illuminator by a double filament lamp is projected through a lens system into the screen from below and at the same time is reflected at right angles in the direction of the gunners eye. The image of the graduate is projected to infinity & always appears superimposed on any target in the line of sight.

The sight may be used on 12. or 24 volt circuit & is fitted with a dimmer switch for use at night. The hood which is adapted for harmonizing purposes, is provided with a tinted glass screen for use against a bright background.

Advantages of Reflector Sight

- 1/ The sight base is flexible and sideways and vertical movement of the eye - within certain limits - is permissible. As long as the complete graduation can be seen the sight may be considered correct.
- 2/ The head is fixed in the centre of the ring so removing any possibility of error due to the nose alignment of the sight.
- 3/ The Graduation always appears superimposed on the target so the eye hasn't to try and focus itself on near & far objects at the same time.
- 4/ The sight may be used effectively at night time.
- 5/ The Gunner uses both eyes so giving him wider range of vision & also relieving eye strain.

- 4/ The sight may be fixed in the most convenient position in the turret & is also free from shock.

Disadvantages.

- 1/ The sight is an electrical device and is liable to electrical failures.

Precautions

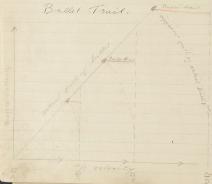
- 1/ See that the correct bulb is fitted and fitted the correct way and make sure that terminals marked A & B are connected for 12 volt system & left out for 24 volt system.
- 2/ See that there are no signs of shorting on top of bulb.
- 3/ See that a supply of spare bulbs is carried.
- 4/ Test the sight for continuity of circuit & the damper switch for correct functioning.
- 5/ Keep Glass surface clean free from scratches.

4/ Make sure the sight is correctly mounted & correctly harmonized

7/ Don't burn lamp any longer than necessary.

N.B. Life of bulb is approx 100 burning hours. when free from gun shock and 1500 hours when under gun shock

Bullet Trail.



Factors Affecting the Amount of Bullet Trail.

1/ Speed of Gunners aircraft.

2/ Range.

3/ Altitude.

4/ Direction of Fire.

Allowances for Bullet Trail. Beam Shot.
Speed of G.A.C. Range.

200 mph.	200 yds.	300 yds.	400 yds.
	8 ft.	16 ft.	24 ft.
	25 mph.	30 mph.	35 mph.

300 mph.	200 yds.	300 yds.	400 yds.
	12 ft.	24 ft.	36 ft.
	40 mph.	45 mph.	50 mph.

The above figures for a distance of 10000 ft.

From 70° to 45°	full allowance
" 45° to 15°	half "
15° to 0°	no allowance.

Tracer

Types of Tracer in use.

1. 1/4 in. 1/4 in. 1/4 in. 1/4 in.

2. 1/4 in. 1/4 in. 1/4 in. 1/4 in.

3. 1/4 in. 1/4 in. 1/4 in. 1/4 in.

4. 1/4 in. 1/4 in. 1/4 in. 1/4 in.

5. 1/4 in. 1/4 in. 1/4 in. 1/4 in.

6. 1/4 in. 1/4 in. 1/4 in. 1/4 in.

7. 1/4 in. 1/4 in. 1/4 in. 1/4 in.



200 yard Range.



400 yard Range.



Gun depressed



Gun elevated



Target Rotated to Left



Target Rotated to Right

R.S. method

Procedure.

Tracer method

Identify g/c.
Estimate Range.
Aim Point Blank.

Obtain the apparent
retains speed of 7 Yds
Estimate both of 8 Yds
Make adjustment of 8 Yds
Wait for 8 Yds drop.
The person together with 8 Yds

Continue aim
point blank and
for a very long burst.
10-15 rounds.

Ranges.

1. Point blank. 0-100 yds. into the range
at which allowance shooting is discontinued
and Rapid point blank aim maintained
2. Effective Range. 150-400 yds. at this
range you have a good chance of hitting
enemy. A large amount of ammo is expended.
3. Long Range. 400-600 yds. use limited
amount of ammo. More likely to report aim
of enemy. 10 and on the off chance of a hit
4. Very Long Range.

At that range at which
under the gunners leaders discretion a
very limited amount of ammo may
be expended.

VECTORS.

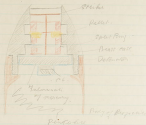
A vector is a line of a certain length in a certain direction.

Triangle of Velocity

Vector Problems.

- 1 Draw a line to represent the $\vec{v}$ or speed & direction.
- 2 From the end of the above $\vec{v}$ pad, draw a line to represent the speed of $\vec{v}_r$ in reverse.
- 3 Complete the triangle, put in all arrows. This side of the triangle is the True Relative Speed.
- 4 Draw in the line of sight.
- 5 Draw a line from the line of sight at right angles to it to the end of the line of True R. Speed. This line is the apparent R. Speed. The length of the line indicates the magnitude of the speed & the direction is always from the line of sight to the true relative speed.

Signature No 352



[illegible]



cap nickel
hole chimney
down chimney



Head.
V 1. white
O 2. red
Q 3. red
Q 4. red



central hole
down



Barrel Position

$$\begin{aligned} 3.51 \times \frac{8}{8} &= 3.51 + 3.51 \times \frac{8}{8} \\ 3.51 \times \frac{8}{8} &= 3.51 + 3.51 \times \frac{8}{8} \\ 3.51 \times \frac{8}{8} &= 3.51 + 3.51 \times \frac{8}{8} \\ 3.51 \times \frac{8}{8} &= 3.51 + 3.51 \times \frac{8}{8} \end{aligned}$$

$$\begin{aligned} 3.51 \times \frac{8}{8} &= 3.51 + 3.51 \times \frac{8}{8} \\ 3.51 \times \frac{8}{8} &= 3.51 + 3.51 \times \frac{8}{8} \end{aligned}$$

$$\frac{8}{8} (R^2 + 2.18 - 6)$$

$$\frac{8}{8} (R^2 + 2.18 - 6)$$

formulas for gunning

Reflector Gun Sight

Errors of Range Broad Sight

1. Incorrect head position. If the sight is to be correct the gunner must maintain a sight base of 18"-19". If, however, his head is too near, or too far away, an incorrect line of sight will be obtained as will be seen in the following diagram.



Maintenance of Reflector. Gun sight

- 1) See that the correct bulb is fitted & fitted the correct way, and make sure that terminals marked A & B are connected for 12 volt system & left open for 24 volt system.
- 2) See that there are no signs of blackening on top of bulb.
- 3) See that a supply of serviceable bulbs are carried.
- 4) Test the sight for continuity of arc with the dimmer switch for correct functioning.
- 5) Keep glass surfaces clean, dry & free from scratches.
- 6) Make sure the sight is securely mounted & correctly harmonized.
- W. A. Change bulb at the end of 30 hrs.

Definitions.

- 1 Muzzle Velocity is the velocity imparted to the bullet by the charge. 2640 ft per sec.
- 2 Average Velocity is the average velocity of the bullet over a particular range. 2200 ft per sec.
- 3 Point of Intersection is that point where the bullet & target meet.
- 4 Deflection is the distance moved by the target during the time of flight of the bullet.
- 5 Angle of Deflection is the angle formed by a line through the axis of the barrel to the firer's eye and aligned from the firer's eye to the target.
- 6 Trajectory is the actual path of the bullet.
- 7 Cone of Fire is that portion of space that contains all the trajectories of all the bullets.
- 8 Relative Speed is the speed of one object in relation to another, one or both being in motion.
- 9 Point of Harmonization is that point at which the line of sight intersects the trajectory of the bullet under certain specified conditions.
- 10 Line of Sight is the straight line from the firer's eye to the target.

Construction of 500 yd. Relative Speed. Right Ring

AB = Leading Speed.
 CB = Average Parallel Speed.
 over flying Range (ind) 3300000
 CD = Sight Base.
 ED = unknown factor, i.e. Relative Ring.

Δ : ABC and CDE are Similar

$$\therefore \frac{ED}{AB} = \frac{CD}{CB}$$

$$ED = \frac{AB \times CD}{CB}$$

$$ED = \frac{50 \times \frac{1}{10} \times 33}{\frac{33 \times 10}{100} \times 15} = \frac{9 \cdot 3}{15} = .6$$

.6 being the Radius of 500 yd. Ring.
 To convert 500 yd. into E.P.S. units. $\frac{33}{100}$
 T_0 = E.P.S. = E.P.S. units $\frac{15}{33}$

$$\text{Rad. of Ring} = \frac{\text{Sight Base} \times \text{Leading Speed}}{\text{Average Parallel Speed}}$$



Range Estimation.

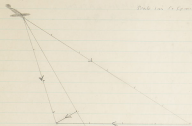
Ring Span. 76

A/c.	Yelling Ring	$\frac{1}{2}$ w/s add 0	180° Range.
A/c.	$\frac{1}{4}$ "	$\frac{3}{4}$ w/s add 0	240° "
A/c.	$\frac{3}{4}$ "	$\frac{1}{4}$ w/s add 0	270° "
A/c.	$\frac{1}{2}$ "	w/s add 0.	360° "
A/c.	$\frac{1}{3}$ "	$1\frac{1}{2}$ w/s add 0	540° "
A/c.	$\frac{1}{6}$ "	2 w/s add 0.	720° "

Groups	Av. w/s.	Whole Ring	$\frac{1}{2}$ Ring	$\frac{1}{4}$ Ring	$\frac{1}{8}$ Ring
S.E.					
Height	30 ft.	150°	300°	450°	600°
T.E. Height	50 ft.	250°	500°		
T.E. Number.	70 ft.	350°	700°		
Number of Probs.	100 ft.	500°			

Enemy 7, 300 mph

Scale 1 in. = 100 miles



True Relative Speed 170 mph
Apparent Relative Speed 35 mph

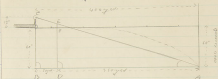


Gunner 7, 300 mph



HARMONIZATION.

Fig 6 Gun.



As $\triangle ABC$ and $\triangle ADE$ are Similar

But AD is $\frac{3}{4}$ of AB which is 400 yds

$\therefore DE$ is $\frac{3}{4}$ of BC which is 12 inches

Then $DE = \frac{3}{4} \times 12 = 9$ inches

$\therefore EF = 63 - 9$

$EF = 54$ inches

TURBLES.

Proper Wash Turbulence:—

Filling of System.

- 1/ See that the Green Run is fully closed
- 2/ Slacken union at Engine Driven Pump.
- 3/ Remove filler cap from Recuperator and with a gauge lined funnel fill top reservoir (100% and weighing oil), at the same time using hand pump.
- 4/ Do not exhaust all the oil in the reservoir before so filling as you will only pump air into the system.
- 5/ Continue to fill & pump until alcohol flows from slackend union nuts.
Tighten unions.
- 6/ Continue to fill & pump until the recuperator spindle protrudes $\frac{1}{4}$ " above in the case of a retractable under barrel in which case spindle should protrude $\frac{3}{4}$ "
Fill reservoir to one inch of the top in all cases.

6/

Operate controls on all machine tools to first remaining paper and units. With gun ram fully closed. Top up at 30. recuperator.

BLEEDING Power Method

4/

Start up engine & as soon as water ram at approx. 1000 R.P.M.

2/

Open bleed screw at top of gun ram body. Open Master valve, set controls to extended ram position. Close bleed screw when clear oil flows.

3/

Open bleed screw at top of gun ram piston rod. Open Master valve, set controls to ram closed position. Close bleed screw when clear oil flows.

4/

Detach ^{rams} rear release from guns, open bleed screws. Open Master Valve, press trigger. Close bleed screw when clear oil flows. Attach ^{rams} rear releases to guns. & with gun ram closed, top up at recuperator.

BLEEDING: Static Method

1/

Inspect system for leaks.

2/

Pump recuperator spindle to its fullest height to expel any air which may have gathered under the plunger.

3/

Open bleed screw at top of gun ram body. Open Master valve, set controls to extended ram position. Close bleed screw when clear oil flows.

4/

Open bleed screw at top of gun ram piston rod. Open Master valve, set controls to ram closed position. Close bleed screw when clear oil flows.

5/

Bled star release also but do not open Master Valve and do not press trigger. With gun ram closed top up at recuperator.

Fractions of Recuperation.

- 1) Means of filling System
- 2) Maintenance of Static Pressure of 16 lbs. per sq. in. when system is at rest
- 3) Maintains Static Pressure of 12-20 lbs. per sq. in. when system is working.
- 4) Acts as a chamber of variable Volume.
- 5) Compensates temperature variations.

Factors of F.M.T.

Engine Wash Turret

For simplicity of instruction in both mechanism & fitting & bleeding of the System it is advisable to take the components in the following order:—

1. Engine Driven Pump.
2. Relief Valve.
3. Regulator.
4. Rotating Service Joint.
5. Valve Box.
6. Vane Oil Motor.
7. Hydraulic Ram.

Engine Driven Pump.

Consists of a cast metal body having two ports of unequal bore, the larger being the suction or inlet, the pressure port has a lip which prevents turbulence inside the pump so as to prevent excessive friction on the pipe walls, which if allowed would affect the efficiency of the pump.

Inside the body are two pistons in mesh with each other. One piston is

attached to a splined shaft which is attached to the engine this is known as the driving pinion. The driven pinion is supported on two short thin rods. Fuel tank system requires a pump in which two pumps are mounted together & termed 'Ganged' pumps. The pumps are separated by a partition & a gland surrounding the driven shaft. If this partition or gland broke down through fracture or wear, oil could be pumped from one system to the other and would be indicated by the position of the 'Indicator Spindles' of the recuperator.

The Relief Valve.

Consists of a metal casing through which runs the main pressure and main exhaust pipe lines attaching there is a smaller passage into which is fitted a steel seating. The Valve itself is made of steel & is known as a 'Poppet' valve, the valve is kept on its seating by means of a

guide & spring. The spring weight is governed by this general rule:—

The weight of the spring pen, the weight of the back pressure in the exhaust pipe line equals the forward pressure in the main pressure pipe line at that point.

Recuperator.

1. Consists of a metal cylinder divided into two compartments by a fixed seal. The top compartment is named the reservoir & has a filler hole & cap at the top and a hole near the bottom to allow communication with the hand pump.
2. The lower compartment is named the Chamber of Variable Volume, inside it has a spring loaded piston & the spindle of which protrudes through the top of the recuperator and is known as the 'Indicating Spindle'.
3. Bored to the bottom is the base running through which are the pressure & main exhaust passages. The main pressure outlet & drain.

immediately & does not normally communicate with the C of V.V. the main exhaust. However, does communicate with the C of V.V. & it is by this means that the Recuperator does its work.

- 4) Secured to the body or barrel of the recuperator by a metal strap is the hand pump. This consists of a cylinder & plunger. The cylinder has a hole near the top and its exit may be closed by a spring loaded non-return ball valve. The plunger has a series of holes drilled from a shoulder which converge on a central passage, this passage may be closed by a spring loaded non-return ball valve on the base of the plunger is another series of holes which if the ball valve was unclosed would communicate with the top hole.

Drilled through the walls of the recuperator are two series of holes which in conjunction with a channel in the strap form the transfer ports. Their object is to prevent overfilling

the system & to allow the escape of air.

Note. In the case of poppet valves & spring loaded non-return ball valves should the valves become unclosed due to grit or foreign matter or should the seating become scored or the spring weaken or break the efficiency of the valves will be greatly impaired.

Function of the Recuperator.

- 1) As a means of filling & bleeding the system.
- 2) To maintain a static pressure of (approx) 16 lbs. per sq. in. throughout the whole system when the system is at rest so as to prevent the entry of air.
- 3) To maintain a pressure of between 12 - 20 lbs per sq. in. on the exhaust side of the system when the turret is in operation so as to ensure a constant supply of liquid to the suction side of the pump & to prevent 'cavitation' and 'Pavitation'.

- 4/ To allow for variation in the capacity of the Hydraulic ram due to an unbalanced piston which means that more oil will enter the ram than will leave it when the ram is being extended & vice-versa.
- 5/ To allow for variation in the temperature of the liquid

Rotating Service Joint

There are two types. The fully R.S.J. & the Partially rotating S.J. They are situated in the vertical axis of the turret either above (top entry) or below (bottom entry). They in no way support the weight of the turret.

The fully R.S.J. conveys into the turret oil, electricity, Oxygen ~~and~~ oil to power the turret, electricity to heat the guns, gunners clothing to light the sight & turret lamps & for inter com. The oxygen for the gunners use at high altitudes.

The partially R.S.J. conveys oil only electricity & oxygen being paid in by flex & tubing

Value Box.

In the value box there are three valves. The Master Valve. Elevation & Depression Valve. & Rotation Valve. each valve moves in a slant. This slant is perforated to give communication with passages & ports in the body. The valves are of the piston type. The master valve having three bands. 1. two positions & one re-positioning spring. The functional valves have two bands, three positions & two centralising springs. Each valve has a spindle which is connected to the rocking handle by means of linkage. On the Rocking handle are the M.V. levers which must be depressed before the turret can be operated. To rotate the turret the R.Hs are turned on their vertical axis in the same manner as steering a ship. To elevate or depress the guns the R.Hs are twisted on their horizontal axis in the same manner as the twist grips on a motor bike, the amount of movement given to

the R.H. controls the amount of movement of the functional valves which in turn controls the rate of flow of liquid and the speed of the thrust movement

Vane Oil Motor

Consists of two main parts. The Rotar & the Stator. The Rotar is cream colored & has six grooves housing six vanes, drilled (vertically) transversally through the rotar are six holes housing six pins whose object is to keep the vanes square & distant. There are two end plates one of which carries a splined shaft on to which is secured the thrust driving pinion. Each end plate has six "L" shaped holes the object of which is to prevent cushioning of liquid behind the vanes & also to preserve a static balance on the vanes. The Rotar is mounted eccentrically to the Stator. The Stator is a steel sleeve pressed into the body of the gun and being ground out on a (pop-saw). There are two parts of the stator which form a true circle the one between

the parts of the body being known as the working surface, on either side of the working surface are two series of holes which communicate with the parts of the body by means of ducts

Hydraulic Ram.

Consists of two main parts a cylinder and a piston, the cylinder has a port at the bottom and one at the top for the entry & exit of liquid. Near the top is a bleed screw for removing air from the system at the top are the means of adjusting the length of the piston stroke. The piston is of the unbalanced type, it has two washers opposed to each other to take the thrust from either direction. The shaft carries a floating sleeve which is part of the adjustment, the shaft is hollow & has a bleed screw near the top for removing air. At the top there is a hole to accept a pin to secure a piston to the gun arm.

Vols.

Volvo Filter

Consists of a cap or inner and outer canister, the cap is secured to the main exhaust pipe line, inside there is a cylinder directly connected with the inlet port. The outlet port communicates directly with the outer canister, secured to the cap by means of a ring is the outer canister which has a clamping ring at the bottom and contains a valve spring which is responsible for holding the inner canister against the cylinder of the cap. The inner canister is a perforated brass cylinder with two end plates held together by a screw and winged nut the top ^{cover} ~~ring~~ cylinder has a cylinder with a series of holes near the bottom which enter the cylinder of the cap when the filter is assembled, between the end plates & the cylinder is fitted a felt valve inside the inner canister is a corrugated felt filter reinforced by a coarse wire mesh.

503. MS. VII.

INTERNAL DEMAND AND ISSUE VOUCHER

DATE FROM 1941

EXHIBIT

Form Number No. 339

Period of Issue: 1941

Divisional Serial No. 118 Date 5-14-41

English in Division PRO Type 8.4.9.8

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1277 Section 29
Packets and bag
9th stop

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for sale as
3) Motor

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English in Division PRO Type 8.4.9.8

Answer to Query

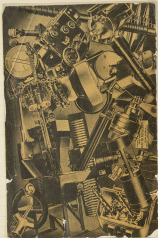
Starting from the top left-hand corner and working from left to right and downwards, the stores are:-

Front store

1. Light (air) bomb carrier, Type E.M., No. II
2. Depth charge, aircraft, 400 lb., Mk. VI, with nose and tail attachments
3. Universal bomb carrier, Type E.M./E.P., No. I, Mk. II
4. Signal charger, 1 1/2 in., Mk. I
5. Signal pistol, 1 1/2 in., No. 5, Mk. II
6. 300 lb. A.S. bomb (Mk. II)
7. Cannon gas turret, R.P., Type A, Mk. II
8. 1 1/2 in. practice bomb
9. 100 in. Browning gun
10. Branch of - 100 in. Browning gun
11. No. 41 bomb, Mk. II
12. Bombing rocket, Mk. III
13. Tail of Mk. XII composite

Rear store

1. Pistol mounting, anti-air, spring and recoil release, Hispano 20 mm. gun.
2. Red lead mortar for Hispano 20 mm. gun
3. -30 in. Browning belt
4. Spray bomb sight, Type 201
5. Recoilless mortar, 4.5 in., Mk. II
6. Cannon mounting bomb sight, Mk. 100
7. Pilot's reference gun sight, Mk. II
8. Double head cable carrier, Mk. VI
9. Barrel and plunger, Hispano 20 mm. gun
10. No. 285 fuse, Mk. II
11. Heavy filling machine for -100 in. Browning belt
12. Jackson positioning machine for -10 in. Browning belt
13. Smoke generator, No. 6, Mk. II
14. Fighter control synchronizing with Dunlop firing button
15. Under defence gun turret, Type F.H.544



248 MS 90

[illegible]

ALL INSTRUCTIONS.
 Copy To:- Chief Instructor.
 Chief Gunnery Instructor.
 Date:- 10th February, 1943.

INSTRUCTION ON THE BROWNING .303

The following notes on Browning 12 are intended to help standardize the method of Gunnery Training at this School.

Strip the Browning Gun by reversing the LOCK PLATE and BREECH BLOCK. BREECH SPRING receiving the BREECH LEAK, LOCK-PISTON and BAREL EXTENSION and BAREL from the Gun.

Next strip the BREECH BLOCK showing the BAREL PLATE, BREECH PLATE, BREECH PLATE BAREL, COCKING LATCH and COCKING LATCH AXIS PIN.

Releasing the BAREL and BAREL EXTENSION, release BAREL LOCKING SPRING and withdraw the BAREL from the BAREL EXTENSION not less than two turns.

Releasing the BAREL and BAREL EXTENSION in the left hand in the normal position place the BREECH BLOCK on the BAREL EXTENSION, with the thumb of the right hand placed in the BAREL PLATE REVERS of the BREECH BLOCK press the LOCKING PIN upwards into the LOCKING PIN REVERS of the BREECH BLOCK, with the middle finger of the right hand, all the time holding the BREECH BLOCK as far as the rear as the BAREL EXTENSION as possible. Move the BAREL in towards the BAREL EXTENSION with the left hand until the BAREL is resting against the face of the CARTRIDGE AND GUIDE of the BREECH BLOCK. Re-engage the BAREL LOCKING SPRING.

If the BAREL LOCKING SPRING does not coincide with the LOCKING NOTCH in the BAREL withdraw until it engages in the next recess.

Replace the BAREL the BAREL EXTENSION and BREECH BLOCK into the gun making sure that the mechanism slides in easily.

Hold the BAREL and BAREL EXTENSION fully inwards with the thumb of the left hand pressing on the ejector top clearance, and with the middle finger of the right hand pressing in the BREECH PLATE REVERS of the BREECH BLOCK test for fore and aft play of the BREECH BLOCK (care must be taken to differentiate between fore and aft play and lateral play, the latter possibly being caused by the way of the BREECH BLOCK).

If there is no fore and aft play the Gun is correctly breeched, if fore and aft play exists remove parts again and repeat BAREL and BAREL notch and test again.

1000
 M. V.

daying, the light vision being
11. If recommended for F.O.C. duties, the "decompression chart" been
carried out with them.

12. In my opinion, this Pilot is in every way suitable for the
operational duties as recommended above.

Date M.C. 1/6 Maying.

13. Certified that O.A. Pilot is medically fit for operational
duty and that his medical category is A.1.B.

Date Station Medical
Officer.

14. Recommendation and remarks of Commanding Officer

Commanding
Royal Air Force.

Date

303. MS VII.

Exp. Composition

Schmidt of Norway

Potassium Chlorate

Antimony Sulphide

Ground Powder.

Sulphur

189.

potassium chlorate { acids during
Antimony sulphide { gas Body.
Ground powder { acids Flame.
Sulphur { Timmerman's Sulfur

Range Standing Orders.

Supervision of Firing.

Firing is only to take place under the supervision of an Officer or Instructor, who has to explain all practice to firing prior to commencing fire.

Red Flag on Order.— Before firing, a flag, 4 ft. x 3 ft. is hoisted on the Range, to indicate that the range is being used & should remain hoisted until firing is completed then removed.

Red Flag at Firing Point & Marked Places.

There is to be hoisted when marksmen are present. Until flags are lowered guns must not be loaded.

Safety Positions of Guns.

V.G.O. must have their magazine removed & guns set at Safe. Known guns to have their covers raised & barrel blank to the rear. Firing, & to Safe. Safety Steps to be taken to mountings so that guns cannot be traversed or raised any further than is necessary.

Quarrying details must stand clear of firing point & should have passed instruction in aiming with camera.

gun as practised.

Issue of Ammunition:— N.C.O. responsible for issue of belts or ammo & magazines to fliers when ready to take up position from the firing point, after red flag has been withdrawn or lowered.

Conduct of Practice:— The pupils will wait for the instructor, to give orders before firing. The instructor will order the Red Flag on a firing point and marksmen station to be well drawn or lowered. (On completion) when practice is completed the Instructor will order "unloaded" immediately whether they have already finished or not.

When firing V.G.O. the Mag. will be removed & gun cleared, cleaning guns unloaded, & R.D. to the rear.

Loading of Guns or Magazine:

If there should be a stoppage & flier cannot clear with immediate action he must leave the gun with the muzzle pointing towards the butt and report to the Instructor. The stoppage to be dealt with at the firing point by qualified personnel. If it cannot be cleared & the gun

contains a live cartridge, move the gun to the rear of the firing point where range is no use.

Inspection of Targets: Red Flag is to be hoisted on firing point after guns cleared as per para. () the target must be inspected. Marksmen wait for permission before leaving places.

Gun Cleaning: Guns will be cleaned at the finish of practice as laid down in the Armament Training Manual. Collection of empty cases & spent probe links. Each flier to collect his own & place them in boxes provided. The N.C.O. will ensure that this is carried out & that no live rounds are mixed with the spent cases.

Carrying Live Rounds:

under no circumstances must live rounds or misfires be carried on person.

Empty Cartridges: As discarded probes only to be used.

Smoking is Prohibited on the range. Loading of Weapons The officer or N.C.O. must be responsible that weapons & target stores are properly locked up. The coast, order to give of any G.C.

attempt to fly over the range.

Night Firing:—

Orders will be read & signed
on the spot where firing is to take place.

Post Light

Ground. Ball. Post. 7 1/2%

Explosives 13%

Miscellaneous. Gun powder 1 1/2%

Ammo. 10 cants. (approx)

Hydraulic Gun

1. Cannon Gun 4 1/2%

2. Cannon Gun 4 1/2%

3. Cannon Gun 4 1/2%

Range

4. Target Manipulator

5. Ammunition Carrier

6. Ammunition Carrier

Boulton Paul Turret.

For the sake of instruction it is advisable to
divide the instruction into 4 parts
1. Hydraulic 2. Electrical
3. Mechanical 4. Pneumatic
followed by such things as re-arming
Gun installation, harmonization &
maintenance

Hydraulic.

Hydraulic Generator or Pump:—

The power which drives the the pump is
generated by an engine driven dynamo
— Supply 1000 watts — this is fed into the
the turret by an electric distributor
situated on the vertical axis of the
turret either above or below, from
there it is carried through switches
to the electric motor which drives
the pump, this motor absorbs 24 amps
on the motor armature shaft is a
pinion which is the "Sun Pinion" of
an epicyclic gear the consists of
three main members:— The Sun
Pinion, The Planetary Pinions with

the carrier or spider & The Planetary
 Ring which in this case is always fixed.
 The drive is carried thro' from the
 sun pinion to the planetary pinion &
 carrier giving a reduction in speed
 of 5 to 3 (approx) The carrier is
 attached to the bank of cylinders
 which is caused to rotate. The
 bank of cylinders has two rows of
 five each, inside each cylinder is
 a heavy steel piston which depends
 on centreugal force for its
 movement. Each cylinder has a port
 at its inner end & is open at its
 outer end so as to allow the piston
 to protrude & contact the guide ring.
 There are two guide rings one for
 each row of cylinders, they are
 connected to the constant column by
 means of linkage, each guide ring
 is set to move at 90° to each other.
 The bank of cylinders embraces our
 hydraulic distributor. The distributor
 has four vertical passages each having
 four holes in the following order: ^{from top to bottom}
 (1) elongated port either suction or
 delivery (2) for the relief valve

- (3 for rotation 3 for elevation) elevation
 750 lbs per sq in Rotation 1200 per sq in
 (3) Relief Valve (4) Pipe lines.

The Pump is the means of filling
 and carries a reserve supply of liquid
 its working houses the Relief & Inlet Valve

The Hydraulic Motor.

Consists of 3 main parts 1. The Elliptical
 Ring 2. A bank of Cylinders
 3. Hydraulic Distributor

The elliptical has a major & minor axis
 which breaks the ring into four arcs,
 these arcs come being uphill or
 downhill according to the direction
 of rotation of the cylinders. There
 are 6 or 7 cylinders each cylinder
 containing a hollow piston, at the outer
 end of the cylinders are two flats
 which prevent piston rotation. At
 the inner end these are ports to
 correspond with ports on the hydraulic
 distributor. The pistons have a spring
 loaded plumb inside the object
 of which is to keep a soft rubber
 washer up to its work in preventing

excessive escape of liquid passed past the piston, in this it is not completely efficient so that an overflow pipe is necessary to carry the excess back to the pump of the hydraulic generator. The outer end of the piston carries two rollers to lessen friction against the elliptical ring. The hydraulic distributor has two ports near the top which correspond with two passages in the body for the entry ~~of~~ or exit of liquid. These communicate by means of 4 passages by means of four beveled ports drilled on the one plain to correspond with the cylinders, they are set in pairs and open 108° to each other. At the top of the hydraulic distributor is a positioning square which ensures correct register between the inlet & outlet passages and the top ports of the distributor, it also prevents the distributor from moving. The pinion attached to the cylinder body is the sun pinion of an epicyclic gear which gives a reduction to the turret driving

pinion. A means is provided for breaking this gear so that the turret can be rotated manually.

Pressure Regulator Box.

Its object is to prevent gun sinkage or creep & to provide a hydraulic lock on either side of the ram piston under all conditions of flight, also to allow oil to be by-passed from one end of the ram to the other when manually operating the gun. It consists of two identical sets of the following:-

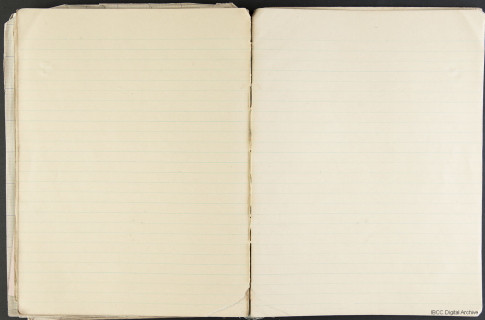
A hollow metal plate with a series of holes drilled through a shoulder held against a poppet valve by means of a spring, the shank of the poppet valve is fluted to permit the passage of oil. This valve is only opened when liquid is leaving the ram at a pressure in excess of 150 lb per sq. in. On a passage above the fluting of the plate is a spring loaded non-return valve which is washed off its seating by the liquid flowing to the ram.

Drilled thro' the center of the bar is
a passage closed at each end by a ball
valve. Boring against each of these
is a fluted needle. Between these is
an egg shaped cam operated by the
Fuel & Engage Lever, the cam can
be rotated & force the fluted
needles outwards & they in turn
force the ball valves off their
seatings so that oil can be supplied
ed from the top of the cam to
the bottom of the two cylinders
when the guns are moved manually.

<u>1</u>	<u>2</u>	<u>2</u>		<u>4</u>	<u>5</u>	<u>6</u>	<u>2</u>	<u>6</u>	<u>9</u>	<u>10</u>
10	10	10		10	10	10	10	10	10	10
9	9	9 small		9	9	9	9	9	9	9
		2 small plus								8

<u>1</u>	<u>2</u>	<u>2</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>
10	10	10	10	10	10	10	10	10	10	10
9	9	9	9	9	9	9	9	9	9	9
8	8	8	8	8	8	8	8	8	8	8

<u>1</u>	<u>2</u>	<u>2</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>
10	10	10	10	10	10	10	10	10	10	10
9	9	9	9	9	9	9	9	9	9	9
8	8	8	8	8	8	8	8	8	8	8



Bullet Head

own Spad

150

200

300

Range of 1000 ft.
 200 1000 2000
 $\frac{1}{4}$ $\frac{1}{2}$ $\frac{3}{4}$
 $\frac{1}{4}$ $\frac{3}{4}$ $\frac{1}{2}$
 $\frac{1}{4}$ $\frac{3}{4}$ $\frac{1}{2}$

the shock of a general blow in.

The ramp or the rear engage the rear can-
on the trigger mechanism plates on each
side the engagement of the barrel. The rear
buffer springs, secure the buffer slide, rear
chase, rear, & R.P. to their normal cocked
position when the energy is expended.

Recoil arrangement

1. If the R.P. moves forward the locking pin cannot be
tripped into engagement with the lock, shoulder.
2. The unloading plate cannot move forward independent
of the R.P. unless L.P. is in full engagement with
the locking shoulder.
3. Positive engagement of the locking pin to L.P.
is insured by the final trip in forward
movement of the unloading plate.
4. Firing the wheel is carried by the cotton barrel
slide the tip of the cartridge until the lock
plate reach the end of their forward travel.
5. The locking pin cannot come out of engagement
with the L.P. until they have traversed the
length of safety distance thus insuring.
- (a) Major portion of gas to have left the barrel.
- (b) The firing pin is withdrawn from the F.P. hole
in case of primed caps allowing the gas to
escape.

for in the backward movement for the ejector
to engage on the base of the round.

If the firing pin has been released the rear
will rise & engage the front of the locking pin
thus locking the R.P. to the rear.

Action of Magazine

As the R.P. moves forward taking with it the round
R.P. in the hope the next round in the mag. is
forced down on to the top of the R.P. where it
resides. This is done by the natural action of the
Mag. spring. When the R.P. has moved sufficiently
to the rear to clear the round it is pushed
forward into the top of the mag.

Action of Rear

If the firing mechanism toward the rear spring
with its auxiliary and can it come to
project into the body of the gun. When the
R.P. travels to the rear the locking pin
will override the rear, depressing it against
the rear spring. As soon as the locking pin is
above the rear will be returned by its spring
ready to engage the L.P. seat, as the R.P. is
brought off the buffer. When the L.P. engages the
rear, the R.P. is drawn forward, causing the rear
plate to compress the rear buffer springs against
the rear plate & force buffer, which allows

on taking place has travelled back thus lifting & allowing the unlatching cone of the unlatching plate to come into engagement with the unlatching cone of the lock, prior to lifting it out of engagement with the locking shoulder.

During this action the rod has now cleared the end of the second extractor. The gasses coming in contact with the recoil extractor are deflected outwards & backward through the 1st & 2nd let. thus assisting the natural recoil of the gun. During this second movement the recoil spring has been compressed against the front mounting unit & the air piston moved backwards uncovering the front part of the front mounting unit. During the natural return of the recoil spring a jamming effect is dropped down by the compression of the air trapped in the air cylinder by the air piston, the preventing damage to the front mounting unit & front mounting.

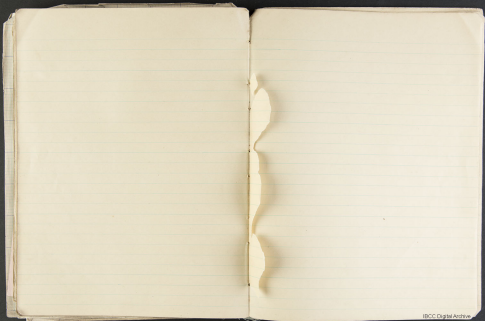
The recoil spring which acts upon the barrel (after the cone has cleared second extractor) acting back through the empty case which is now forced the R/P to the rear compressing the return spring. As the R/P moves to the rear a rod string held by the extractor is withdrawn from the chamber & ejected through the ejection opening, when the R/P has travelled sufficiently

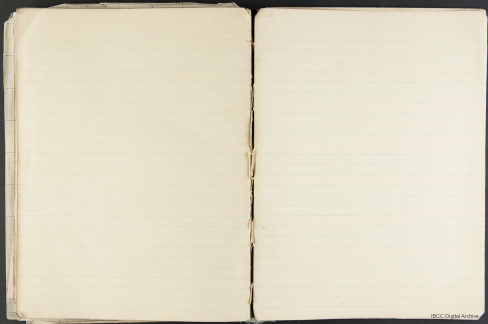
back. By air - After taking piston a force is the rear by air pressure the piston back engaging the stud of the right hand locking plate forcing the R/P to the rear compressing the return spring. The air locking piston is returned to the forward position having been extended during the locking action.

Forward movement

(Magazine) Magazine position - After the firing mechanism is operated the cone is disengaged from a blunt of the locking piece the R/P being forced forward by the return spring. Front face of the R/P engaging the base of the band held in the lips of magazine forcing it forward it is the chamber, the rim of the cartridge being guided down the R/P face & engaging in the extractor, when the R/P comes to rest against the chamber the locking piece is forced down to its engagement with a locking pin held by the locking cone of the R/P guides engaging the locking cone of the locking piece. The unlatching plate is now forced more forward & farther to its making position the locking of the R/P. The air locking plate







ARMAMENT PUBLICATIONS

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- AP 1024 *Armament Stores & Supplies*
- AP 1170 *Supply dropping apparatus*
- 1242 *Armament Stores Manual. Machine guns*
Small Arms Etc (Vol. 1 & 2)
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