

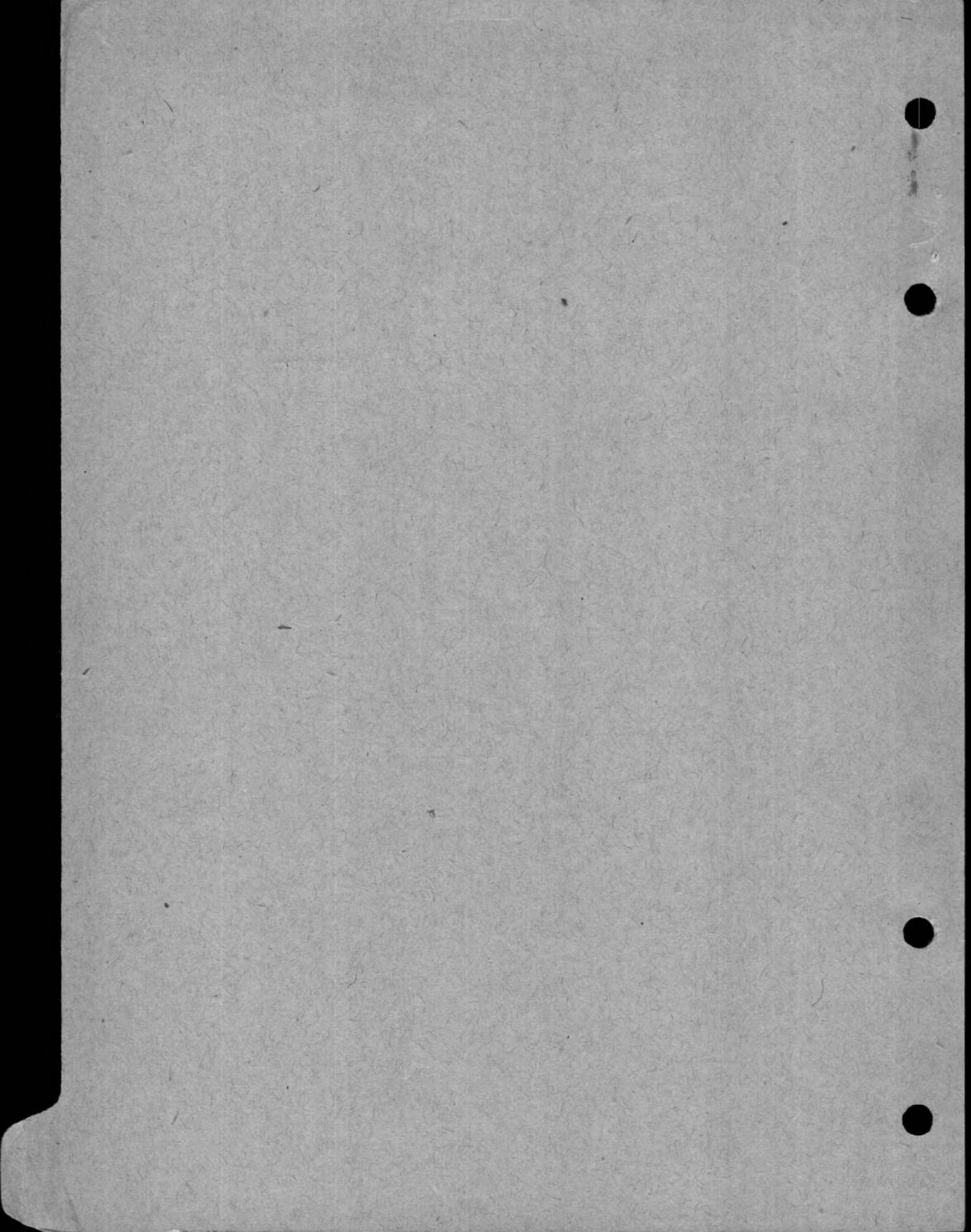
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SECTION

**12**

**ARMAMENT INSTALLATIONS AND SERVICING**



## SECTION 12

# ARMAMENT INSTALLATIONS AND SERVICING

### LIST OF CONTENTS

	PARA.
<b>Introduction</b> .....	1
<b>DESCRIPTION OF EQUIPMENT</b>	
<b>Guns</b> .....	2
<b>Front mountings</b> .....	3
<b>Rear mountings</b> .....	4
<b>Ammunition boxes</b> .....	5
Feed .....	7
Ejection .....	8
<b>Firing mechanism</b> .....	9
Cocking .....	10
<b>Blast tubes</b> .....	11
<b>Tie-rods</b> .....	12
<b>Gun sight</b> .....	13
<b>Cine camera gun</b> .....	14
<b>Gun heating</b> .....	15
<b>REMOVAL AND INSTALLATION DETAILS</b>	
<b>Access to guns</b> .....	16
<b>Sear release units—</b>	
Removal .....	17
Installation .....	18
<b>Guns—</b>	
Removal .....	19
Installation .....	21
<b>SERVICING</b>	
<b>Servicing creeper</b> .....	22
<b>Re-arming—</b>	
Equipment and personnel required .....	24
Procedure .....	25
<b>Harmonization and butt tests—</b>	
Equipment required .....	26
Harmonization procedure .....	27
Butt tests .....	28

### LIST OF ILLUSTRATIONS

	FIG
Vampire servicing creeper .....	1
Installation of 20 mm. guns .....	2
Details of 20 mm. gun installation .....	3
20 mm. gun mountings, front and rear .....	4
Assembly of 20 mm. gun bay doors and spout fairing .....	5

### Introduction

1. This section describes the gun installation, together with notes on servicing and removal operations. Reference is made in the text to tools provided specially for this installation, but further details will be found on reference to Vol. III, Part 1 of this publication. The following Air Publications deal fully with specific components:—

Cine camera .....	A.P.1355 Series
Hispano guns .....	A.P.1641 F
Gun sights .....	A.P.1730 B
Gun firing gear .....	A.P.1641 E

### DESCRIPTION OF EQUIPMENT

#### Guns

2. The aircraft is armed with four No. 2 Mark V 20 mm. Hispano guns (Stores Ref. 7G/786) fitted with No. 3 Mark I front mounting units (Stores Ref. 7G/787). The guns are positioned in the underside of the fuselage, the outboard guns being situated approximately 9½ in. further rearward than the inboard guns. The guns are belt fed by the Mark V belt feed mechanism (Stores Ref. (L.H.) 7G/924, (R.H.) 7G/925) (see fig. 2).

#### Front mountings

3. These are of the ball and socket type fitted with inner and outer eccentrics (see fig. 4); a dashpot unit is provided to accommodate the front mounting piston of the gun.

(i) *Outer eccentric.* The outer eccentric is machined with 24 V-shaped grooves spaced at 15 deg. intervals around the periphery.

These grooves run fore-and-aft in relation to the gun, and a locking stud is fitted at the bottom of the mounting to lock the outer eccentric in the sighting position.

(ii) *Inner eccentric.* The inner eccentric is locked to the outer eccentric by a spring-loaded locking tab which engages one tooth of the inner eccentric and one tooth of the outer eccentric locking rims.

(iii) *Gun adjustment.* Gun adjustment for harmonization purposes is effected by unlocking the inner and outer eccentrics, and rotating them independently with two spanners (Stores Ref. 8D/2715 and 8D/2714 respectively), until the gun is correctly aligned. The eccentrics are then relocked.

### Rear mountings

4. These mountings work on the "swinging link" system and consist of an inverted U-shaped bracket pivoted at its apex (*see fig. 4*), the lower end of which accommodates the round spring-loaded quick-release plungers of the slide assembly rear mounting. This slide assembly rear mounting is bolted to the locking shoulder of the gun which, being thus supported, is capable of free reciprocal movement when recoil takes place.

### Ammunition boxes

5. Two ammunition boxes (*see fig. 3*) are provided above the guns forward of bulkhead No. 3. Each box is partitioned to form a port and starboard compartment, and each compartment has a vertical duct down which the belt runs to its gun. The forward box feeds the inner guns and the rear box the outer guns. Each compartment has provision for approximately 150 rounds of ammunition.

6. An ammunition loading diagram is positioned on the bottom of each box. Access to the two boxes is obtained by means of a door which is hinged along its top edge, and can thus be secured in the open position by means of a strut attached to each door. In the closed position, the door is secured by two quick-release fasteners. The ammunition is retained in the box by means of a tubular quick-release frame which must be removed before the aircraft can be re-armed.

**Note . . .** In some early aircraft it may be found that the ammunition access panels are retained in the open position by a Bowden cable instead of a hinged strut.

### Feed

7. The ammunition passes over rollers, which are built into the airframe (*see fig. 3*), through vertical fixed chutes and then on into detachable chutes, and turns through 180 deg. for the inboard guns, or 150 deg. for the outboard guns, finally entering the feed opening of the belt feed mechanism (referred to henceforth as the B.F.M.). The detachable feed chutes are secured in position by a pin which passes through two lugs on the clip feed unit. Each B.F.M. must be provided with a clip feed unit, in addition to a link chute extension, in order to fix the feed chutes to the B.F.M. feed openings. The detachable feed chutes are provided with a flap in order that the belts may be made and broken, as required, when re-arming etc. The pin, which secures the flap in the closed position, is attached to the chute by a short length of light chain.

### Ejection

8. Empty case ejection chutes (*see fig. 3 and 5*) are fitted in the gun bay panels. The link chute extension also projects into an enlarged portion of the ejection chute.

### Firing mechanism

9. Maxiflux electric firing units are used, and are operated by a Selectric firing button on the control column (*see Sect. 1*). This button allows the guns to be fired in pairs or in salvo. Briefly, the firing unit consists of a base plate, which is screwed and lockwired to the gun. The sear release unit, including the operating coils, is held to the plate by a quick-release device operated by a knurled-headed screw.

### WARNING

It should be noted that there is no fire-and-safe mechanism on the guns excepting that embodied in the firing button safety flap, and the only master switch is the "AIR-GROUND" switch in the cockpit which controls the entire aircraft electrical system. Therefore, before attending to the guns in any way, the electrical lead plugs should be disconnected from the firing units and only replaced when aircraft are "at readiness."

### Cocking

10. This is carried out with a No. 6 hand-cocking unit (*see fig. 5*), a stowage for which

is provided on the gun bay access doors. One cocking unit (Stores Ref. 7G/798) is provided with each aircraft. Further details of this unit will be found in A.P.1641F, Vol. I (Second Edition), Chap. 10.

**Note . . .** Owing to the restricted space between the rear mounting bracket and the side of the gun body, it is necessary to modify the No. 6 hand-cocking unit in accordance with A.P.1641F, Vol. II, leaflet E.5.

### Blast tubes

11. Blast tubes (*see fig. 2*) which are of the Martin Baker telescopic spring type, are fitted to the four guns and the rear ends of the tubes, and are secured to the front mounting unit housing by a Jubilee clip.

### Tie-rods

12. Adjustable tie-rods are provided for setting the rack roller clearance, the amount of adjustment being approximately  $\frac{3}{8}$  in. The tie-rods are fixed by their forward end to the gun bay bulkhead, and are attached to the outboard side of the magazine carrier in each instance. The two port magazine carrier tie-rods are on the left-hand side of the magazine carrier, and the two starboard magazine carrier tie-rods are on the right-hand side of the carrier.

### Gun sight

13. The aircraft is fitted with a Mk. IID gyro gun sight.

### Cine camera gun

14. The G45B cine camera, with type 27 mounting and No. 32 adaptor, is situated in the nose of the aircraft. Access to the camera is obtained by a panel which is locked with a spring-loaded plunger.

### Gun heating

15. Heating of the guns is provided by two hot air pipes leading from the engine, one of which is for the port and the other for the starboard pair of guns. The pipes are a fixture in the aircraft, but do not interfere with the removal and installation of the guns.

## REMOVAL AND INSTALLATION DETAILS

### WARNING

Unless the external locks are fitted to the undercarriage legs and the trestles in position, personnel must not work underneath the aircraft when the cockpit is occupied nor (vice versa) enter the cockpit when personnel are at work underneath the aircraft.

### Access to guns

16. Access to the guns is obtained by removing two forward and two rear panels from the underside of the aircraft. The two forward panels are shaped to accommodate the blast tubes and are secured to the aircraft by Dzus fasteners. The two rear panels form part of the lower skin of the fuselage and incorporate the empty case chutes and link ejection openings.

### Sear release units

#### Removal

17. The removal of the sear release units from the guns can be done with the guns installed; it is effected as follows:—

- (i) Ensure the breech block is in the fired position.
- (ii) Release the gun back block catch and ease up the back block about  $\frac{3}{16}$  in.
- (iii) Support the weight of the sear release unit, and unscrew the knurled-headed screw on the underside until the unit has free vertical movement.
- (iv) Slide the sear release unit to the rear and downwards (out of engagement with sear).

#### Installation

18. For installing the sear release units, the sequence of operations described in para. 17 is followed in reverse.

### Guns

### WARNING

Before unloading the guns a "Safety Man" must be posted in a position commanding an unobstructed view; his duty is to prevent all persons and vehicles from crossing the immediate danger area until all the guns are cleared.

#### Removal

19. For gun removal, two Armourers are required (A and B as referenced below). Before any guns are removed all guns must be unloaded (*see para. 25 (i) to (xx)*), a "Safety Man" (C) being posted as described in warning above.

20. At the completion of the unloading operations, all guns are in the loaded position and suspended from their respective lowering tools (see para. 22). Proceed as follows, working on the S.O. gun first :—

- (i) (B) Remove the blast tube by unscrewing the Jubilee clip.
- (ii) (B) Fit the wooden muzzle plug (Stores Ref. 26FC/1960).
- (iii) (B) Unscrew the muzzle thread protector of the front mounting unit and remove the front mounting unit.
- (iv) (A)\* (B)\* (C) Disconnect the magazine carrier tie-rod by removing the nut and bolt between the tie-rod and the extension.
- (v) (A)\* (B)\* (C) Withdraw the gun to the rear and clear of the aircraft.  
The above procedure is repeated for the P.O. gun and then for both inner guns.

### **Installation**

21. For installing the guns, the sequence of operations described in para. 20 is followed in reverse.

## **SERVICING**

### **Servicing creeper**

22. A special servicing creeper, Stores Ref. 4G/4033 (see fig. 1) is available to facilitate gun servicing. Operations (in para. 20 and 25) which call for the use of this creeper have been annotated by an asterisk (\*). The headrest cover is detachable and should be changed at frequent intervals.

### **Re-arming**

23. To re-arm the guns, the safety precautions given in A.P.4099A, Vol. II, Part 2, must be adopted, an Armament assistant being posted as described in para. 24.

### **Equipment and personnel required**

24. The following equipment and personnel are required for re-arming the guns :—

#### **Equipment**

- 4 B.F.Ms. (2 L.H. and 2 R.H.) loaded with 16 rounds and fully tensioned.
- Sufficient boxed ammunition, in belts of 25 rounds.
- 1 Vampire servicing creeper.
- 1 Low platform or steps.
- 4 Gun lowering tools (Stores Ref. 26FC/1985).
- 1 Tool for opening gun bay panels (Stores Ref. 26FC/9106).
- 1 No. 6 cocking unit (carried on aircraft). Armourer's tools as necessary.

#### **Personnel**

Two Armourers (A) and (B) and one assistant (C) as referenced below. The assistant is to act as "Safety Man" (see WARNING para. 19), until (A) has reported that all guns are unloaded. He then assists in the re-arming.

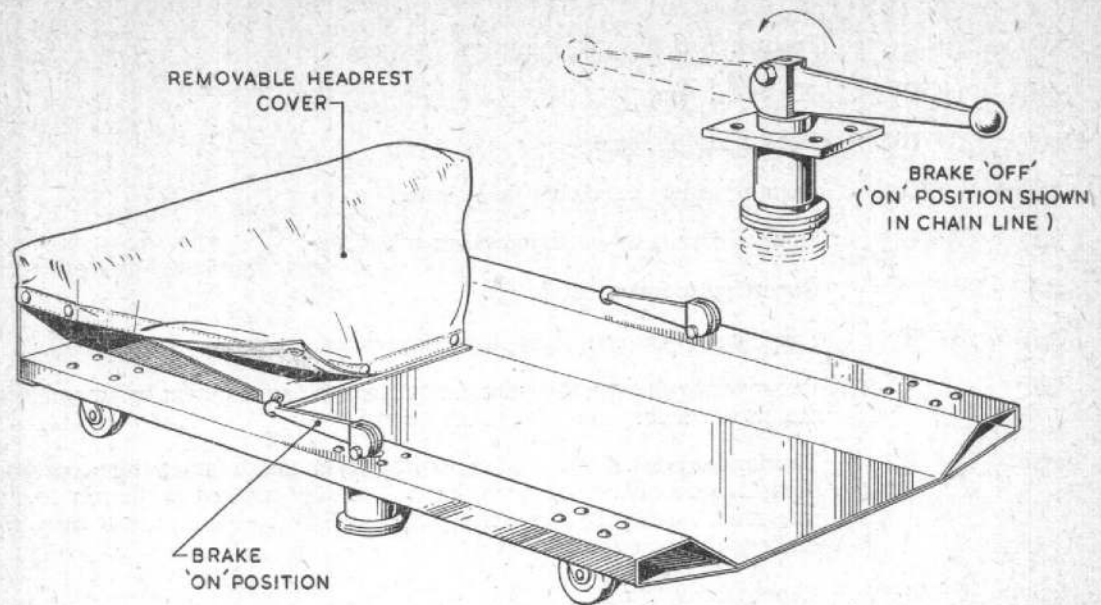


FIG. 1. VAMPIRE SERVICING CREEPER (Stores Ref. 4G/4033).

**Procedure**

25. The re-arming drill for the personnel detailed in para. 24 has been provisionally agreed as follows :—

- (i) (C) Maintain constant vigilance in his capacity as "Safety Man" until (A) reports that all guns are unloaded (*item xx*).
- (ii) (A) Set gun-firing button safety flap to "SAFE."
- (iii) (A) (B) Open and remove rear gun bay panels.
- (iv) (A)\* Remove plug from port and starboard gun firing units.
- (v) (B) Open ammunition box access doors, remove ammunition box tubular frames. Should there be any unexpended ammunition, pull the ends of the belts back into the boxes after (A) has broken the belts.
- (vi) (A) Open the flaps in the detachable feed chutes of any guns which have not expended all their ammunition, break the ammunition belts and instruct (B) to pull the remaining ammunition back into the box.

**Note . . .** If the belt remaining in any feed chute is too short for (B) to be able to withdraw it, it must be steadied down the feed chute and removed.

- (vii) (A)\* Insert tools breech stoppage No. 2 Mk. I on all guns.
- (viii) (A)\* Position No. 6 cocking unit on S.O. gun.
- (ix) (B) Cock S.O. gun.
- (x) (A)\* (B)\* Repeat for P.O. gun.
- (xi) (A)\* Remove P.O. detachable feed chute.
- (xii) (B)\* Remove S.O. detachable feed chute.
- (xiii) (A)\* (B)\* Lower S.O. gun, using a lowering tool, and remove S.O. B.F.M.
- (xiv) (A)\* (B)\* Repeat for P.O. gun.

- (xv) (A)\* Position No. 6 cocking unit on S.I. gun.
- (xvi) (B)\* Cock S.I. gun.
- (xvii) (A)\* (B)\* Repeat for P.I. gun.
- (xviii) (A)\* (B)\* Remove inner detachable feed chutes.
- (xix) (A)\* (B)\* Lower inner guns and remove inner B.F.Ms.
- (xx) (A)\* Report guns unloaded to (C).
- (xxi) (A)\* (B)\* Carry out "between flight inspections" as necessary.
- (xxii) (C) Remove any unexpended ammunition from the ammunition boxes and refill the boxes, joining the belts as necessary.
- (xxiii) (A)\* (B)\* Position loaded B.F.M. on S.I. gun, lift gun and lock it into position, ensuring that the quick-release locking plungers are fully engaged in the rear stirrup mounting. Complete fitment of S.I. B.F.M., ensuring that magazine catch is fully engaged.
- (xxiv) (A)\* (B)\* Repeat for P.I. gun.
- (xxv) (A)\* (B)\* Repeat for outer guns.
- (xxvi) (A)\* Replace inner detachable feed chutes, feeding the rounds hanging from the B.F.M. through the open flaps.
- (xxvii) (B)\* Replace outer detachable feed chutes, feeding the rounds hanging from the B.F.M. through the open flaps.
- (xxviii) (C) Feed ammunition belt to S.I. gun, and pull up slack in the belt when the belt has been joined by (A).
- (xxix) (A)\* Join S.I. ammunition belt, and close and secure flap of S.I. detachable feed chute.
- (xxx) (C) Feed ammunition to S.O. gun, and pull up slack in the belt when the belt has been joined by (B).
- (xxxi) (B)\* Join S.O. ammunition belt, and close and secure flap of S.O. detachable feed chute.
- (xxxii) (A)\* (B)\* (C) Repeat in same sequence on port side.
- (xxxiii) (A)\* Replace plugs in gun firing units (if aircraft is "at readiness.")
- (xxxiv) (C) Replace port ammunition box tubular frames, and close and secure port ammunition box access door.
- (xxxv) (B) Replace starboard ammunition box tubular frames, and close and secure starboard ammunition box access door.
- (xxxvi) (A) (B) Remove servicing creeper, replace cocking unit and lowering tools in respective stowages.
- (xxxvii) (A) (B) (C) Re-fit and secure rear gun bay panels.

**Note . . .** If stoppages have occurred, the causes should be ascertained, the necessary remedial action taken and the details reported to the senior armament N.C.O.

## Harmonization and butt tests

### Equipment required

26. For harmonization of the guns the following tools and equipment are required:—

Instrument, gun aligning, type C (IE/5157) fitted with adapter 20 mm. gun (IE/5206).

Adjustable spirit level (Stores Ref. 1B/4235).

Datum boards—Part Nos. Y0075 and Y0076.

Two plumb lines.

Harmonization stand.

Inner eccentric spanner (8D/2715).

Outer eccentric spanner (8D/2714).

### Harmonization procedure

*Warning* — Before carrying out the operations below, check that the aircraft is correctly levelled and supported on its trestles and ensure that the external locks are correctly fitted to the main undercarriage legs (see Sect. 4, Chap. 2).

27. Before harmonizing the guns, all guns must be unloaded (see para. 25 (i) to (xx)); then proceed as follows:—

(i) Disengage the solenoid-operated selector lever stop by hand and select undercarriage "UP". This will retract the nose wheel only, the main wheels being retained down by the external locks. (The solenoid-operated selector lever stop is a safety device to ensure that the main wheels cannot be retracted accidentally whilst the aircraft is on the ground).

(ii) Remove the forward gun bay fairing and the blast tubes.

**Note** . . . Either of the two outboard guns are used as "master guns" for the horizontal sighting line.

(iii) Drop plumb lines from points marked on the port wing leading edge, and the port side of tail plane leading edge.

(iv) Place harmonization stand in position 50 yds. in front of aircraft.

(v) Take a "sight" through the two plumb lines from rear of aircraft and line up harmonization stand outer vertical line, i.e., the line 48 in. from the aircraft centre line.

(vi) Place an adjustable spirit level on the top of the breech block of the master gun, and level the gun (see para. 3 (iii)).

(vii) Insert the gun-aligning instrument in gun and sight on to the harmonization stand.

(viii) Adjust the height of the harmonization stand until the height of the horizontal line crosses the centre of the bore, and secure the stand in that position ensuring that the horizontal line is level.

(ix) Adjust the master gun until it is correctly aligned on its respective mark to the harmonization stand (see para. 3 (iii)) and lock the front mounting eccentrics.

(x) Align each gun in turn on its respective mark on the harmonization stand, and lock all the front mountings.

(xi) Check all guns for correct alignment after locking front mounting.

(xii) Adjust the sight as necessary. Ensure that all adjustments are locked and re-check the sight harmonization.

(xiii) Refit blast tubes and fairings.

(xiv) Before removing the trestles and external locks from the main undercarriage wheels, the undercarriage selector lever MUST be placed in the "DOWN" position and the nose wheel lowered.

### Butt tests

28. When the gun installation is butt tested, it is essential that the aircraft is lashed down and that the following instructions are rigidly adhered to:—

(i) Before the guns are fired, the front under panels MUST be fitted. Failure to comply with this instruction will result in extensive damage to the forward structure of the aircraft, due to "blast" from the guns.

(ii) The nose wheel must be retracted (see para. 27 *WARNING* and (i)).

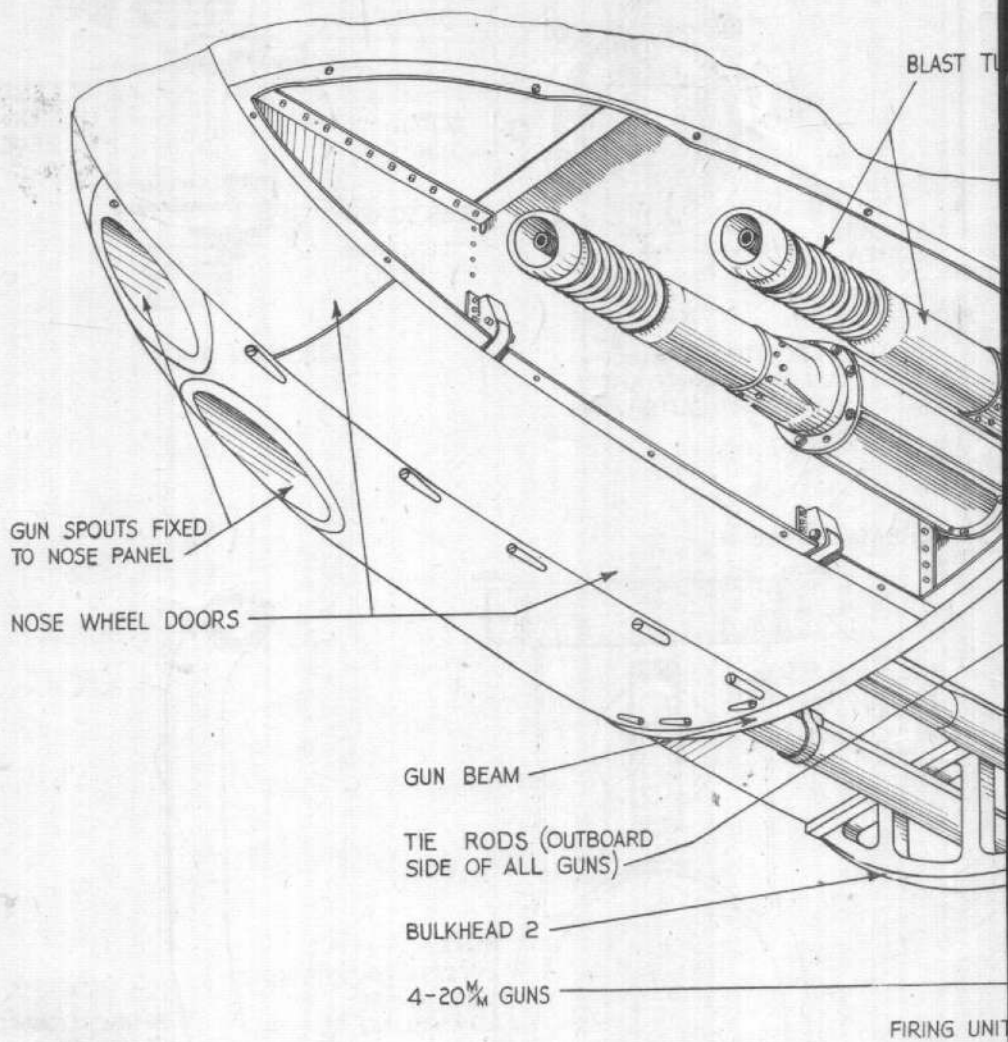


FIG. 2

INSTALLATION

ROCKERS AND SPRINGS

AMMUNITION BOXES (2 OFF)

FRAMES (AMMUNITION BOX)

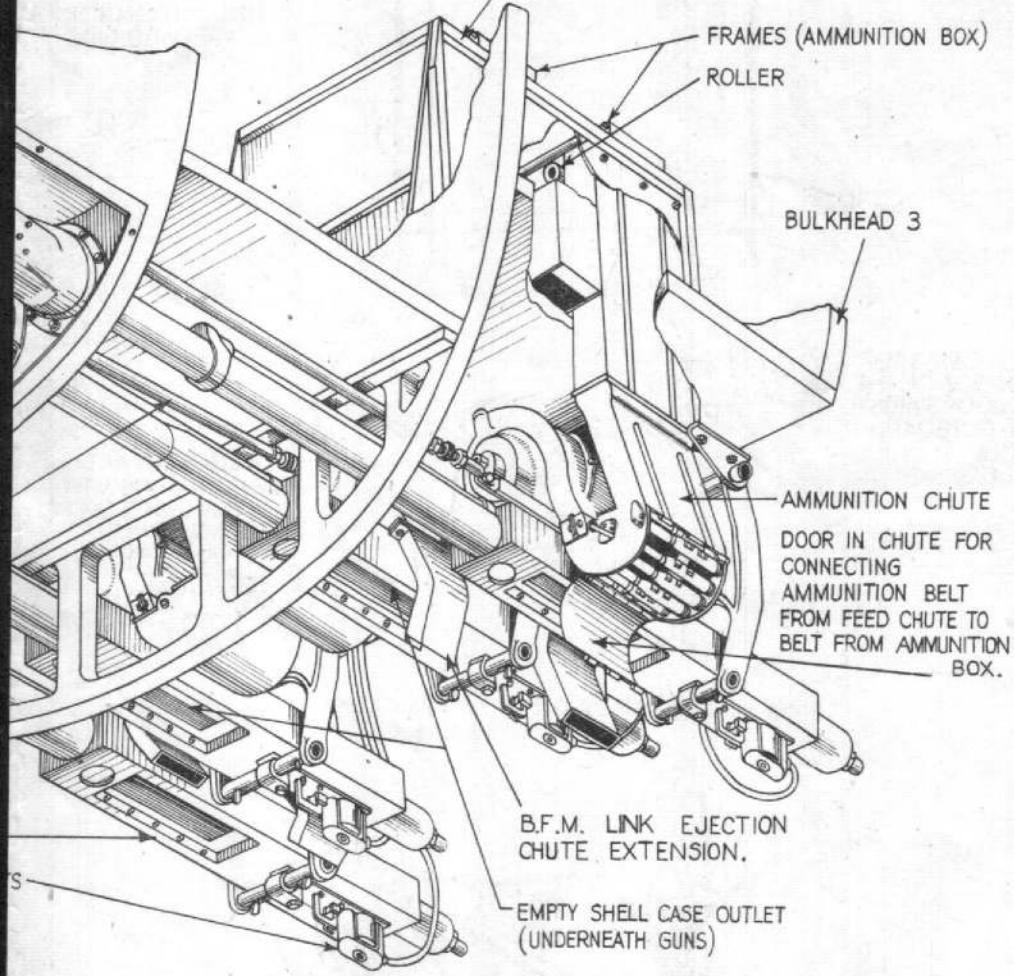
ROLLER

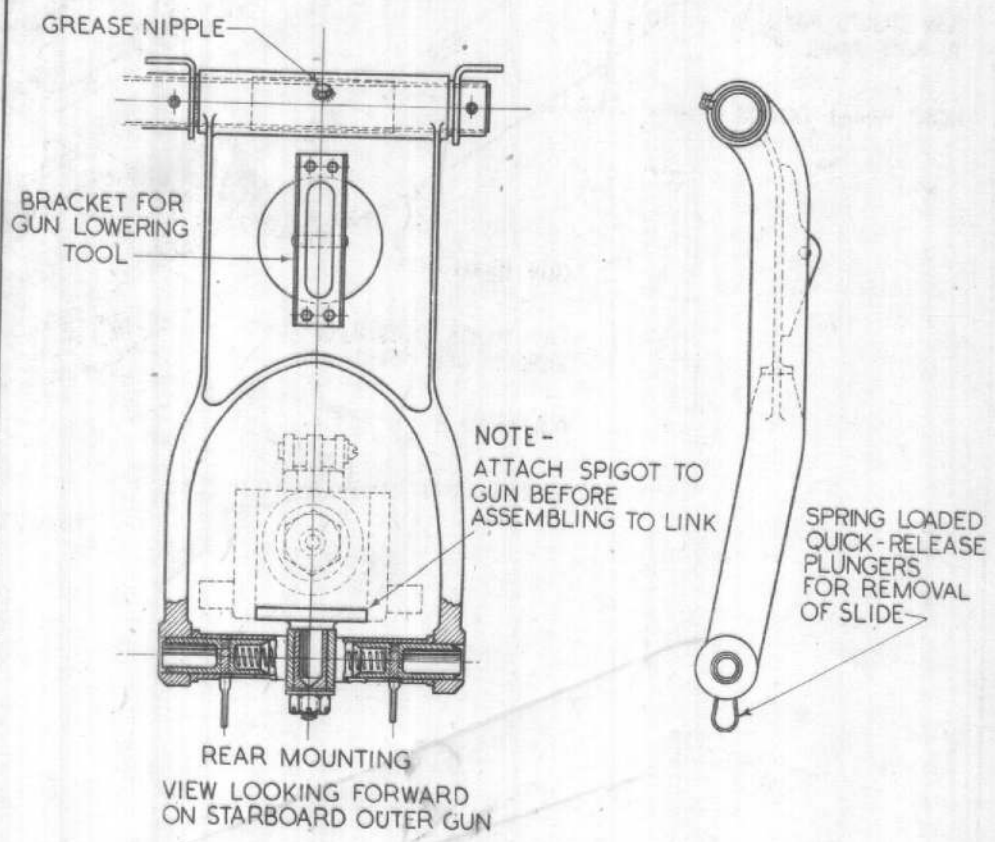
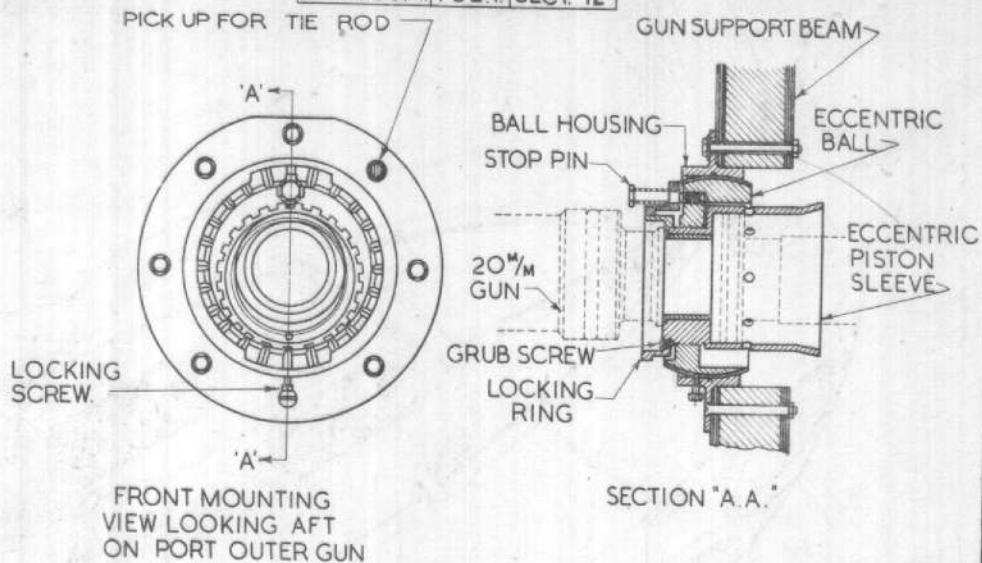
BULKHEAD 3

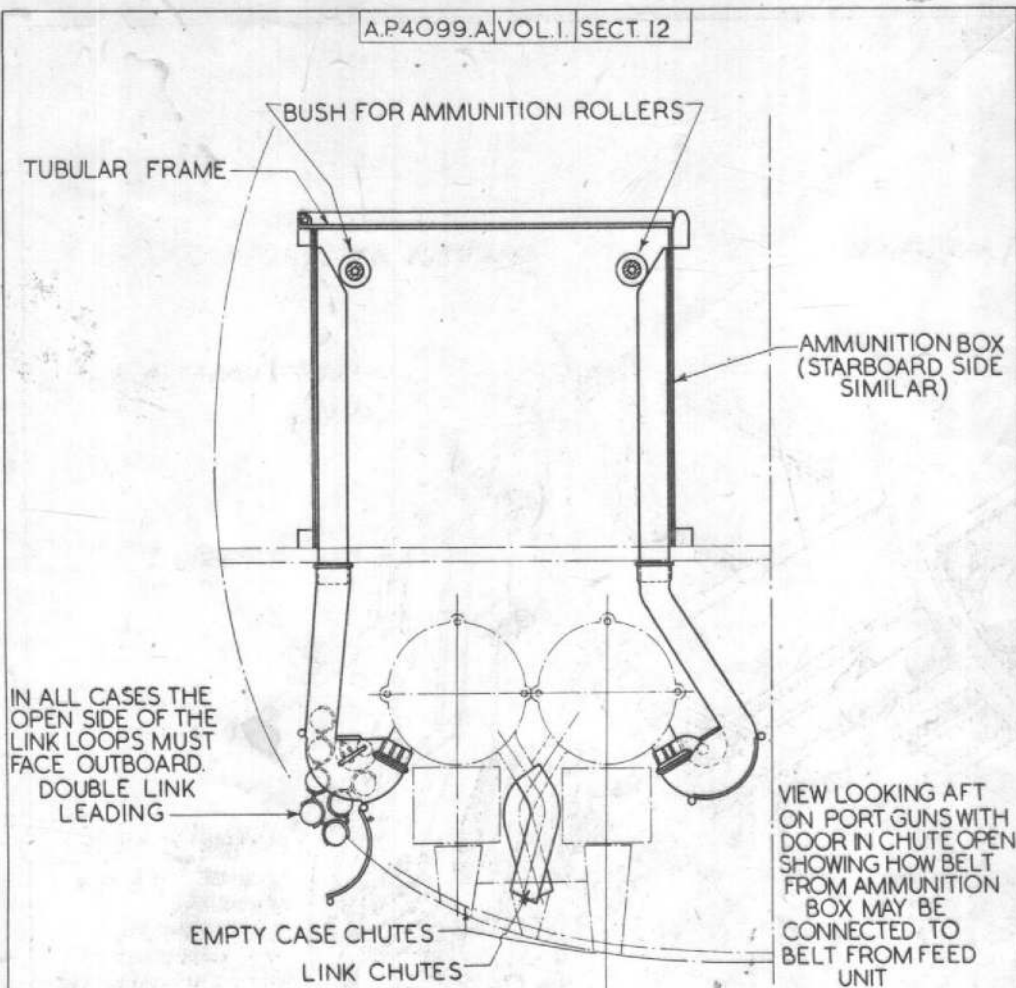
AMMUNITION CHUTE  
DOOR IN CHUTE FOR  
CONNECTING  
AMMUNITION BELT  
FROM FEED CHUTE TO  
BELT FROM AMMUNITION  
BOX.

B.F.M. LINK EJECTION  
CHUTE EXTENSION.

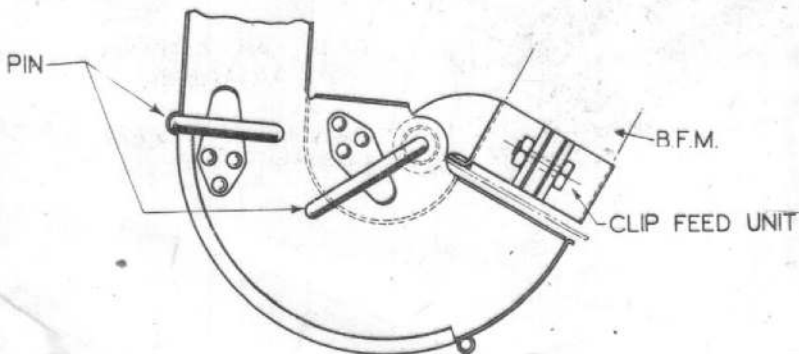
EMPTY SHELL CASE OUTLET  
(UNDERNEATH GUNS)







AMMUNITION LOADING FOR 20<sup>M</sup>/<sub>M</sub> GUNS



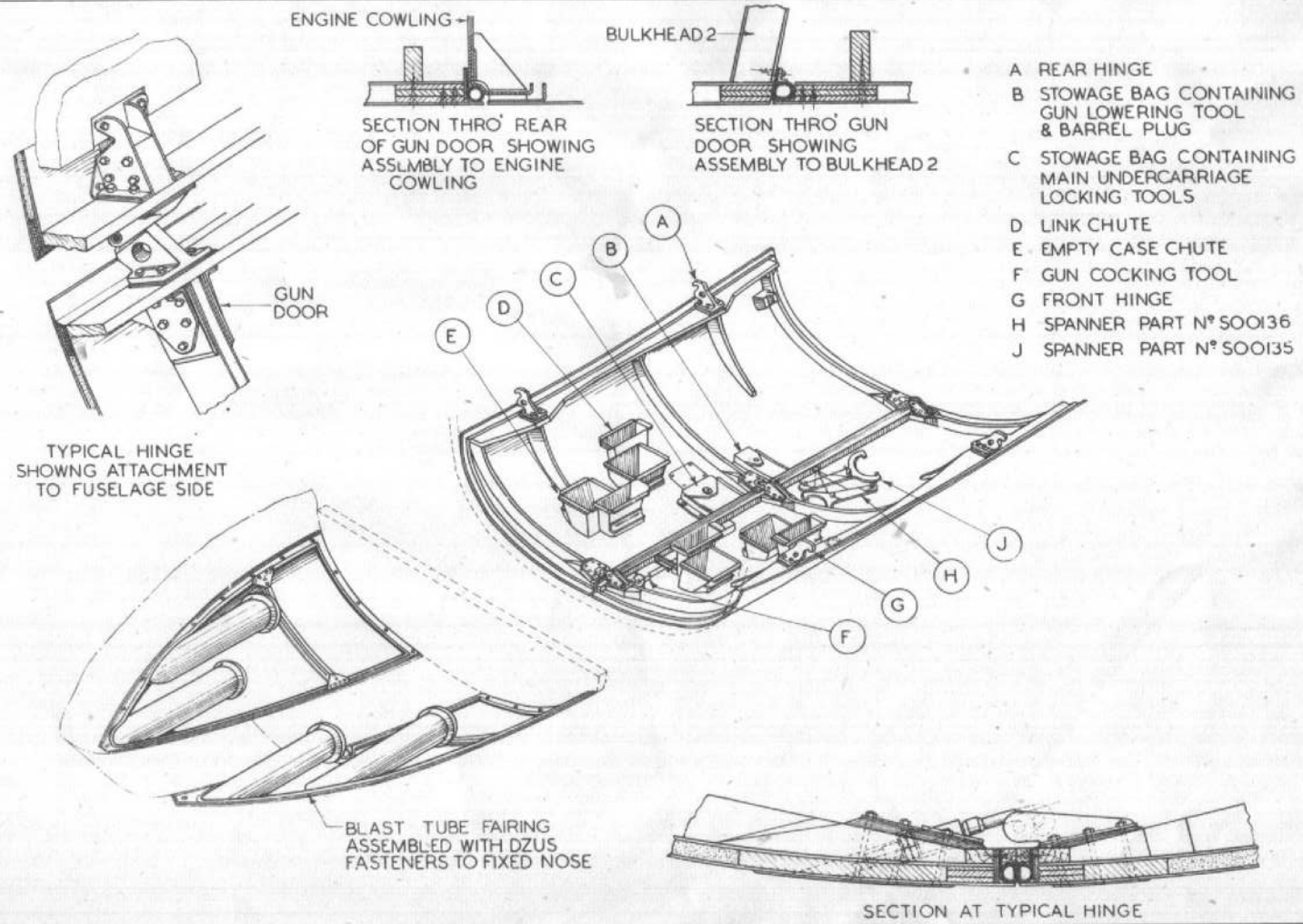
DETAIL SHOWING FIXING OF CHUTES TO FEED UNITS

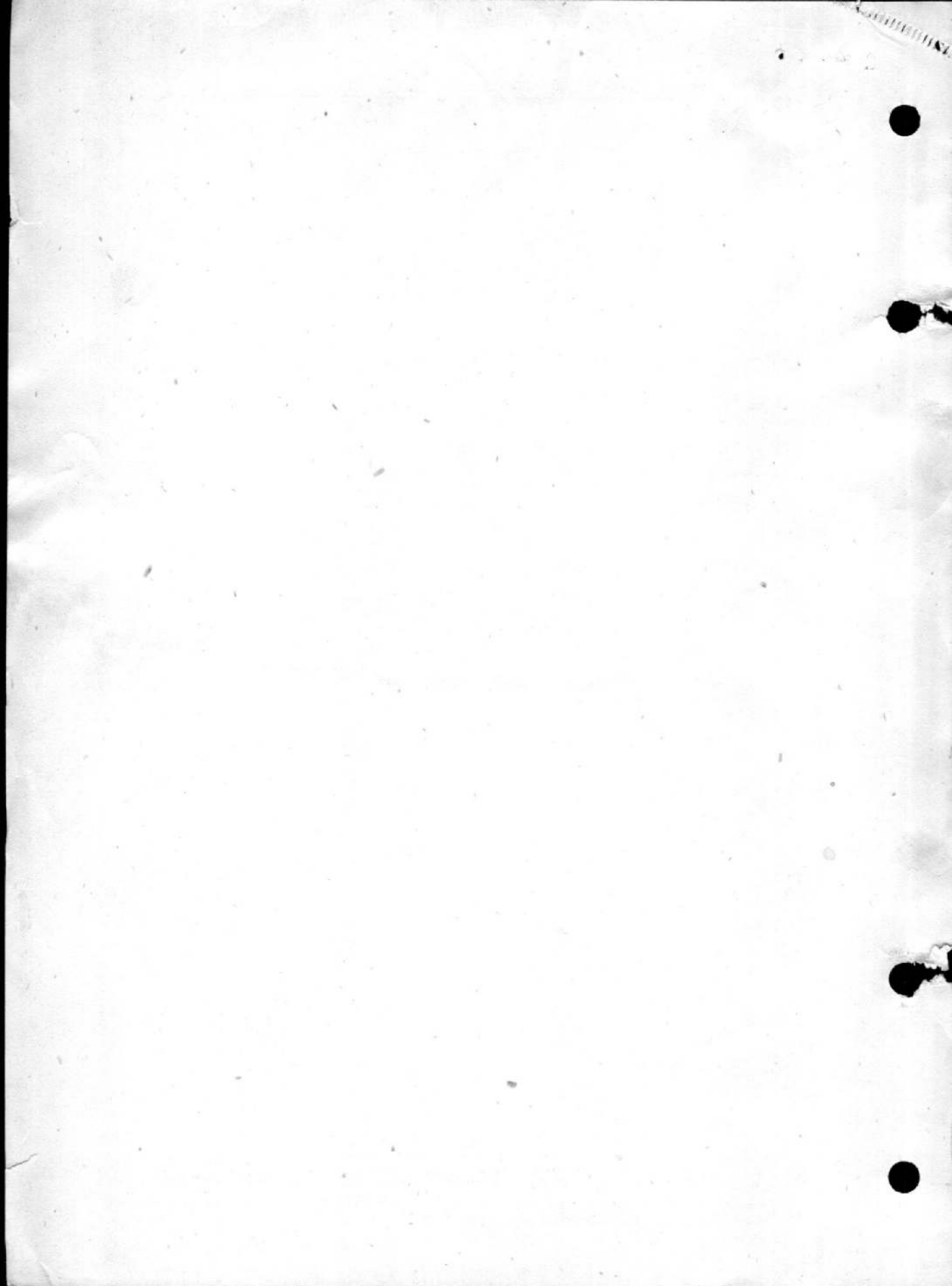
FIG 5

ASSEMBLY OF 20" GUN BAY DOORS & SPOUT FAIRING

FIG 5

6073 M13073 6/46 325 C.B. & S. LTD. G.P.S.







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