

RESTRICTED

CONTENTS

	<i>Page</i>
LIST OF ILLUSTRATIONS	2
INTRODUCTION	3
ASSOCIATED PUBLICATIONS	3
LIST OF MARKS OF VEHICLES	4
DON'TS	4
 CHAPTER 1 - INSTRUCTIONAL NOTES	
1 Method of Instruction	7
2 General description	8
3 Data	10
4 Hull and Turret details	15
5 Engine	21
6 Engine lubrication system	26
7 Engine cooling system	31
8 Fuel system	35
9 The carburetter	38
10 The air cleaner	43
11 Ignition	45
12 Lighting, starting, charging and ancillary electrical equipment	51
13 Fluid coupling	69
14 Gearbox	71
15 The transfer box	76
16 Propeller shafts, bevel boxes, tracta joints, hub reduction gears and road wheel hubs	79
17 Suspension and road wheels	82
18 Steering	87
19 Brakes	90
20 Fire fighting equipment	94
21 Hints and tips on driving (including starting up sequence)	96
22 Fluid coupling supplement	100
23 Gearbox supplement	101
 CHAPTER 2 - PARADE SERVICING	
1 First parade	105
2 At all halts	106
3 Servicing of armament during lull in firing	107
4 Servicing of armament immediately after firing	107
5 Last parade	108
6 Weekly servicing tasks	110
7 Monthly servicing tasks	112
8 Mileage tasks	113
9 Lubrication chart	116
10 Record sheets	118
11 Wireless drills and servicing tables	119
12 Crew drill - Mk 1 Liaison vehicle	146
13 Crew drill - Mk 2 Recce vehicle	149
 CHAPTER 3 - TOOLS, SPARES AND STOWAGE	
1 Vehicle tools and ancillaries	153
2 Armament, spares, tools and ancillaries	163
3 Wireless equipment and spares	169
Stowage diagrams	171

CHAPTER 4 - GUIDE TO VEHICLE INSPECTION (Vehicle wireless and armament)

	<i>Page</i>
1 Introduction	181
2 Driver's compartment	183
3 Engine compartment	185
4 Fighting compartment	188
5 Armament	190
6 Wireless and intercommunication	190
7 Exterior of vehicle	192
8 Running engine and performance tests	193

LIST OF ILLUSTRATIONS

<i>Fig</i>		<i>Page</i>	<i>Fig</i>		<i>Page</i>
1	Three-quarter front R.H. view of Mk 1 Liaison vehicle	5	23	Rear R.H. interior view of Mk 2 Recce vehicle with equipment removed	44
2	Three-quarter rear L.H. view of Mk 1 Liaison vehicle	5	24	No.1, Mk 2 distributor contact breaker	48
3	Three-quarter front R.H. view of Mk 2 Recce vehicle	6	25	No.1, Mk 2/1 distributor contact breaker	48
4	Three-quarter rear L.H. view of Mk 2 Recce vehicle	6	26	Rear R.H. interior view of Mk 1 Liaison vehicle	49
5	Vehicle dimensions	9	27	Headlight	54
6	Rear L.H. interior view of Mk 1 Liaison vehicle	14	28	Sidelight	55
7	Plan view of vehicle	16	29	Rooflight	57
8	Underside view of hull bottom plate	16	30	Generator panel No.2, Mk 1	60
9	Exterior view of two-door turret	19	31	Generator panel No.2, Mk 2/1	61
10	Interior view of two-door turret	20	32	No.2, Mk 2/1 generator panel fuse and switch compartment	62
10A	Interior view of three-door turret	20A	33	Horn	64
11	Engine compartment with cover plate removed	22	34	Wiring diagram	67
12	Exhaust side view of engine	23	35	Gearbox and transfer box	71
13	Induction side view of engine	23	36	Controls	72
14	Cylinder head tightening sequence	25	37	Transmission layout	79
15	Engine lubrication system	27	38	Front L.H. suspension viewed from rear	80
16	Exploded view of engine oil filter	29	39	Rear L.H. suspension viewed from rear	83
17	Cooling system	31	40	Road wheel changing sequence	86
18	Fuel system	34	41	Front R.H. suspension viewed from front	87
19	Rear L.H. interior view of Mk 2 Recce vehicle with equipment removed	35	42	Toe-in of front road wheels	89
20	Exploded view of fuel filter	37	43	Bleeding the brakes	93
21	Carburettor	39	44	Methyl-bromide fire extinguisher	94
22	Exploded view of air cleaner	43	44A	Wet water and chlorobromomethane fire extinguishers	95
			45	Fluid coupling	101
			46	Gearbox operation	103

STOWAGE DIAGRAMS

	<i>Page</i>
Front and L.H. side exterior stowage - Mk 1 Liaison vehicle	171
Front and L.H. side exterior stowage - Mk 2 Recce vehicle	172
Rear and R.H. side exterior stowage - Mk 1 Liaison vehicle	173
Rear and R.H. side exterior stowage - Mk 2 Recce vehicle	174
Front interior stowage of hull - Mk 1 Liaison vehicle	175
Front interior stowage of hull and turret - Mk 2 Recce vehicle	176
Rear and L.H. side interior stowage of hull - Mk 1 Liaison vehicle	177
Rear interior stowage of hull and turret - Mk 2 Recce vehicle	178
Rear and R.H. side interior stowage of hull - Mk 1 Liaison vehicle	179

INTRODUCTION

All chapters of this handbook except Chapter 1 deal with the vehicle complete with armament and wireless. Chapter 1 deals with the vehicle only.

The four main chapters are:-

Chapter 1 - Instructional Notes. This chapter is arranged in a form suitable for use as a training syllabus. The whole of the chapter is designed to teach the crew:-

- (a) How to operate the vehicle.
- (b) How to service the vehicle.
- (c) How to detect and remedy common faults.

Chapter 2 - Parade Servicing. This chapter describes the organization for regulating and recording the servicing of the vehicle. It details when servicing will be carried out, who will do it and how it should be recorded. Details of crew drill applying to this vehicle are also given in this chapter.

Chapter 3 - Tools, Spares and Stowage. This chapter contains a Table of Tools and Equipment and copies of the official Stowage Sketches for the vehicle.

Chapter 4 - Guide to Vehicle Inspection. This chapter gives a detailed guide to inspection of the vehicle, armament, and wireless and explains how it is to be used in conjunction with the standard report form. In addition to its function as a guide to inspection, this chapter has a high instructional value and is recommended for use in revision and general exploration of the vehicle.

ASSOCIATED PUBLICATIONS

The following publications are required to complete the crew's technical training on the vehicle:-

Working instructions, Wireless Set No.19, Marks 1, 2, 3, Part 1	W.O. Code No.1055
Working instructions, No.88 Set	W.O. Code No.6544
User Handbook for W.S. No.31 A.F.V.	W.O. Code No.11223
User Handbook for W.S. No.C42	W.O. Code No.11197
User Handbook for W.S. No.B47	W.O. Code No.11791
User Handbook for Wireless Control Harness Type B	W.O. Code No.11195
The Machine Carbine, S.A.T. Vol.1, Pamphlet 21	W.O. Code No.7238
The Light Machine Gun, Infantry Training Vol.1, Pamphlet 6	W.O. Code No.8398
Grenades, Infantry Training Vol.1, Pamphlet 7	W.O. Code No.8592
Eye Training for crews of AFV's	W.O. Code No.9040
Successful Instruction	W.O. Code No.8670
R.A.C. Training Vol.3, Army Pamphlet No.12 Saracen and Ferret	W.O. Code No.8526

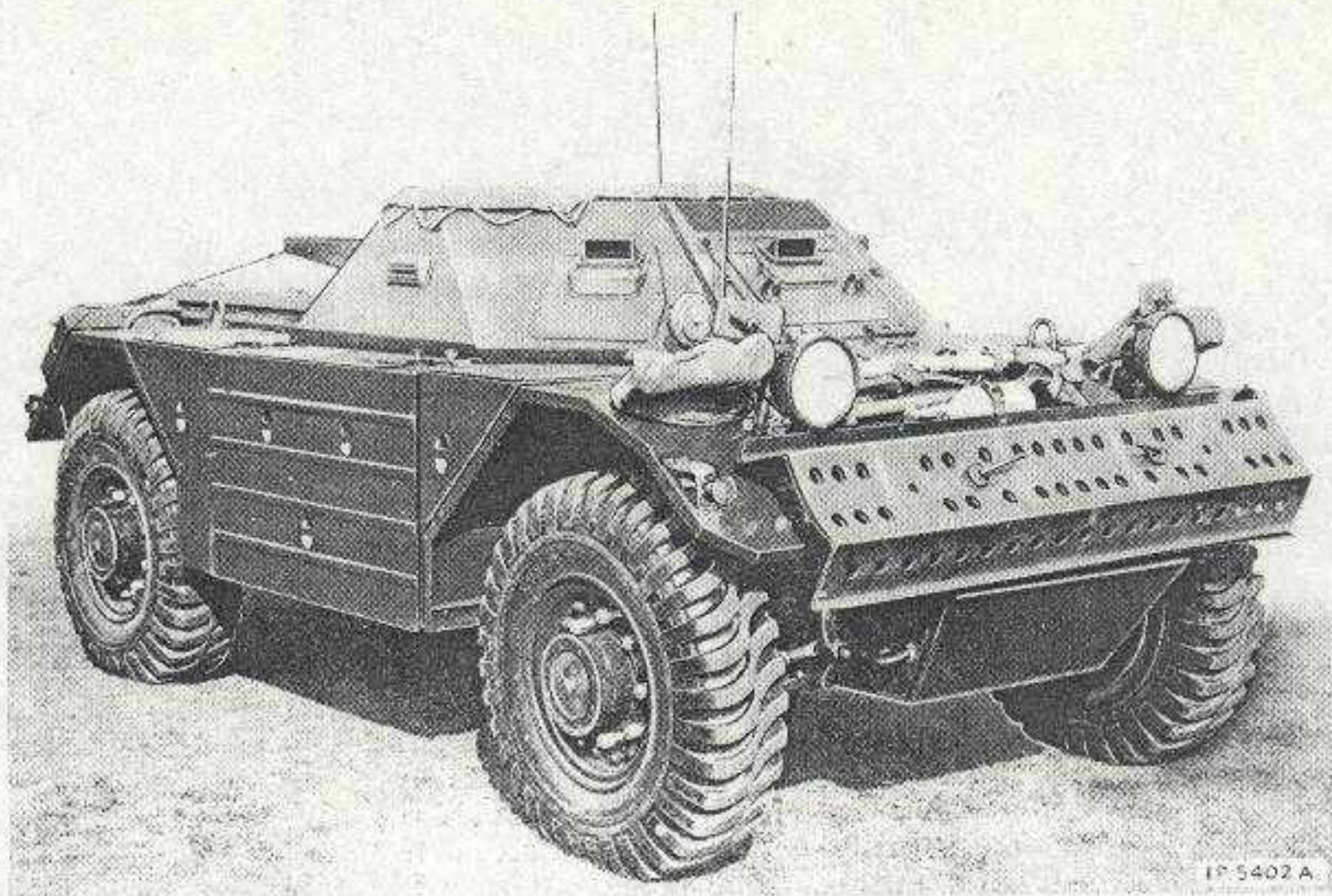
LIST OF MARKS OF VEHICLES

Since the production of the original Ferret vehicles certain modifications have been introduced which are indicated by a change of mark number as under:-

- Mk 1 - Original liaison vehicle with stowage for Bren MG
- Mk 1/1 - As Mk 1 but fitted with thicker side and rear hull plates during production
- Mk 2 - Original reconnaissance vehicle with two-door turret and Browning MG
- Mk 2/1 - Original Mk 1 fitted with two-door turret and Browning MG but Bren stowage
- Mk 2/2 - Original Mk 1 fitted with extension collar and three-door turret
- Mk 2/3 - As original Mk 2 but fitted with thicker side and rear hull and turret plates during production
- Mk 2/4 - Original Mk 2 fitted with welded-on applique plates on the side and rear of the hull and turret to thicken the armour
- Mk 2/5 - Mk 2/1 fitted with applique plates as the Mk 2/4 above

DON'TS

- (a) Don't start the engine before reading "Starting Up Sequence", para 295.
- (b) Don't use the gear-change pedal as a clutch pedal.
- (c) Don't move the forward and reverse lever while the vehicle is in motion.
- (d) Don't block the air intake louvres with equipment, blankets etc.
- (e) Don't top up the engine oil tank before running the engine to scavenge the sump.
- (f) Don't tow the vehicle before reading the instructions on towing, para 211.
- (g) Don't touch the accelerator while the engine is being started by means of the starter carburetter.
- (h) Don't pump the accelerator while the vehicle is standing in gear with the engine running and the brake on.



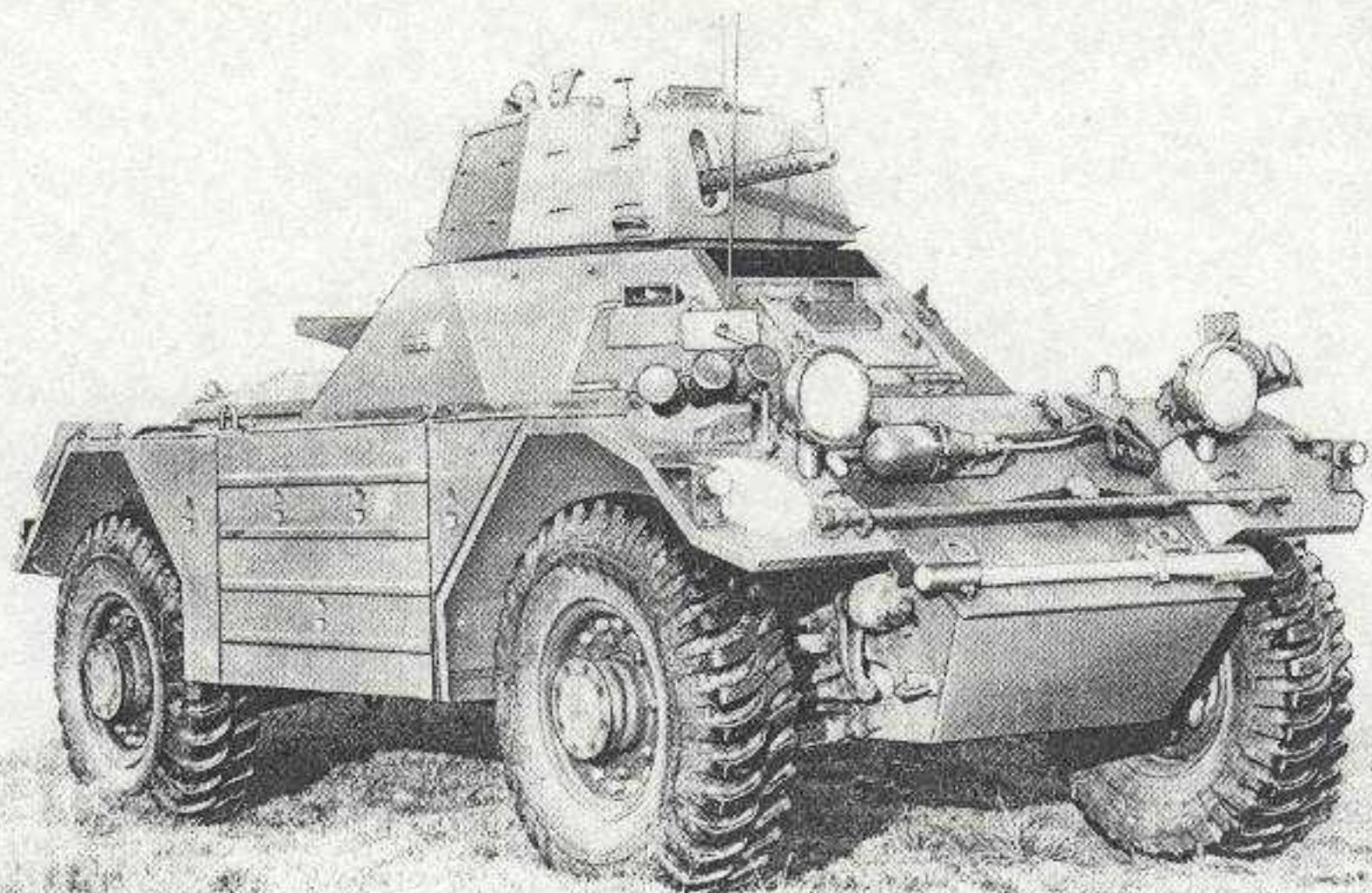
1P 5402 A

Fig 1 Three-quarter front R.H. view of Mk I Liaison vehicle



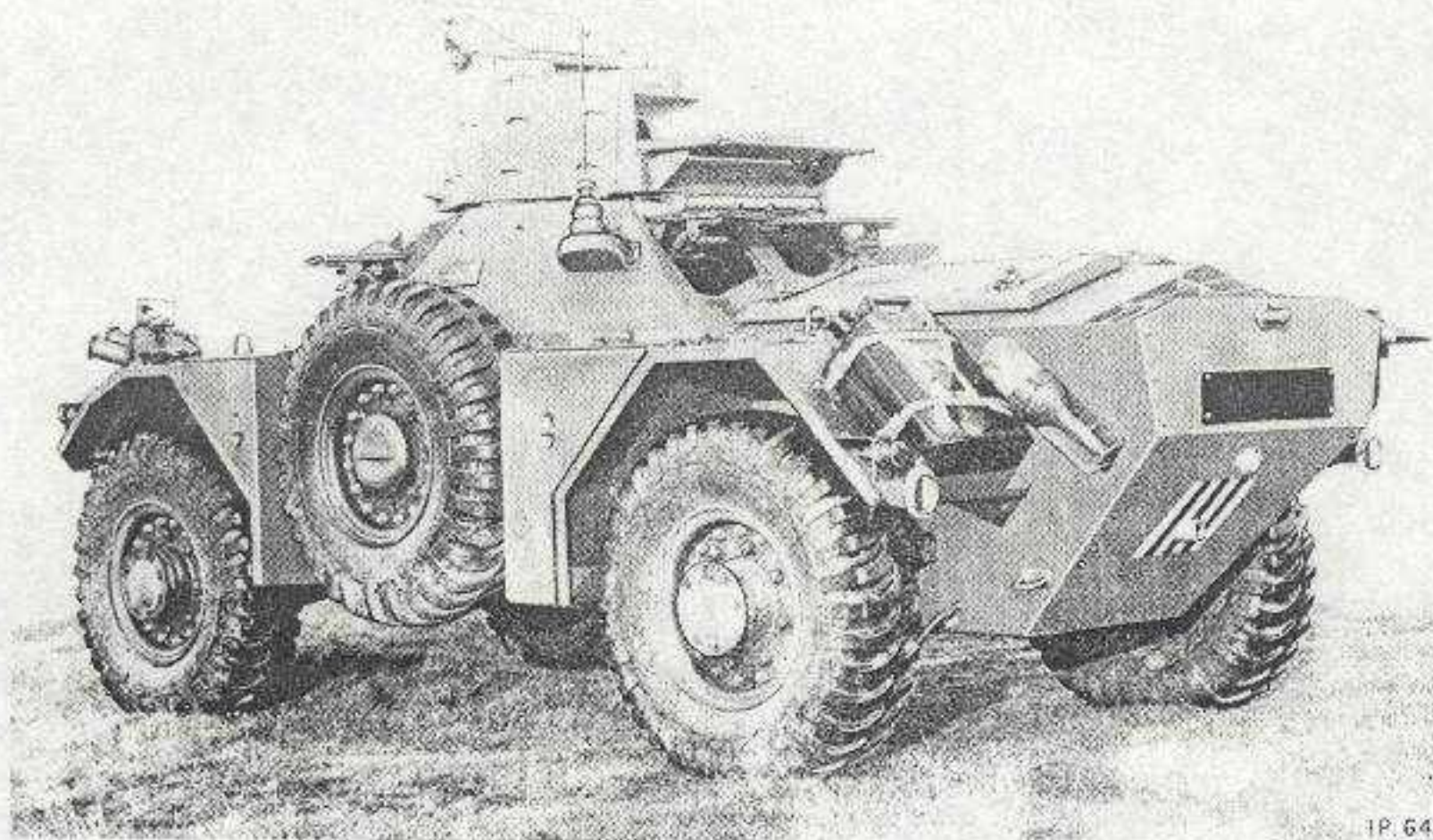
1P 5401A

Fig 2 Three-quarter rear L.H. view of Mk I Liaison vehicle



IP.6409.A

Fig 3 Three-quarter front R.H. view of Mk 2 Reconnaissance vehicle



IP.6410.A

Fig 4 Three-quarter rear L.H. view of Mk 2 Reconnaissance vehicle

CHAPTER I - INSTRUCTIONAL NOTES

I - METHOD OF INSTRUCTION

1. To obtain full value from this chapter it is necessary that the instructor should appreciate the principles of its composition.

2. The information contained in the chapter provides an answer to each of the three basic questions which should be in the mind of a driver. These questions are:-

- (a) How should I operate my vehicle?
- (b) How should I service it?
- (c) How can I detect and remedy faults?

The answer to these questions are the only essentials.

3. The instructor must constantly bear in mind that the only value of "how it works" is the extent to which it assists his explanation of "how it is operated, how serviced and how repaired".

4. The instructor should, therefore, base the preparation and conduct of the lessons upon the following six principles:-

- (a) Concentrate on *how* to operate, service and repair.
- (b) Introduce explanation *why* alongside *how*, when convenient.
- (c) Cut further theoretical explanations to a minimum. The best model is the vehicle itself.
- (d) Six is the maximum number of students which should be employed in one class on one vehicle. Instruction will be even more effective if the number is limited to three.
- (e) For most practical work (i.e., for most of the course), students should be divided into pairs and a register kept to ensure that each pair carries out each investigation or item of work.
- (f) The use of diagrams on blackboard, wall chart or in miniature is encouraged, provided that they are of the right type and are not produced too early in the lesson.

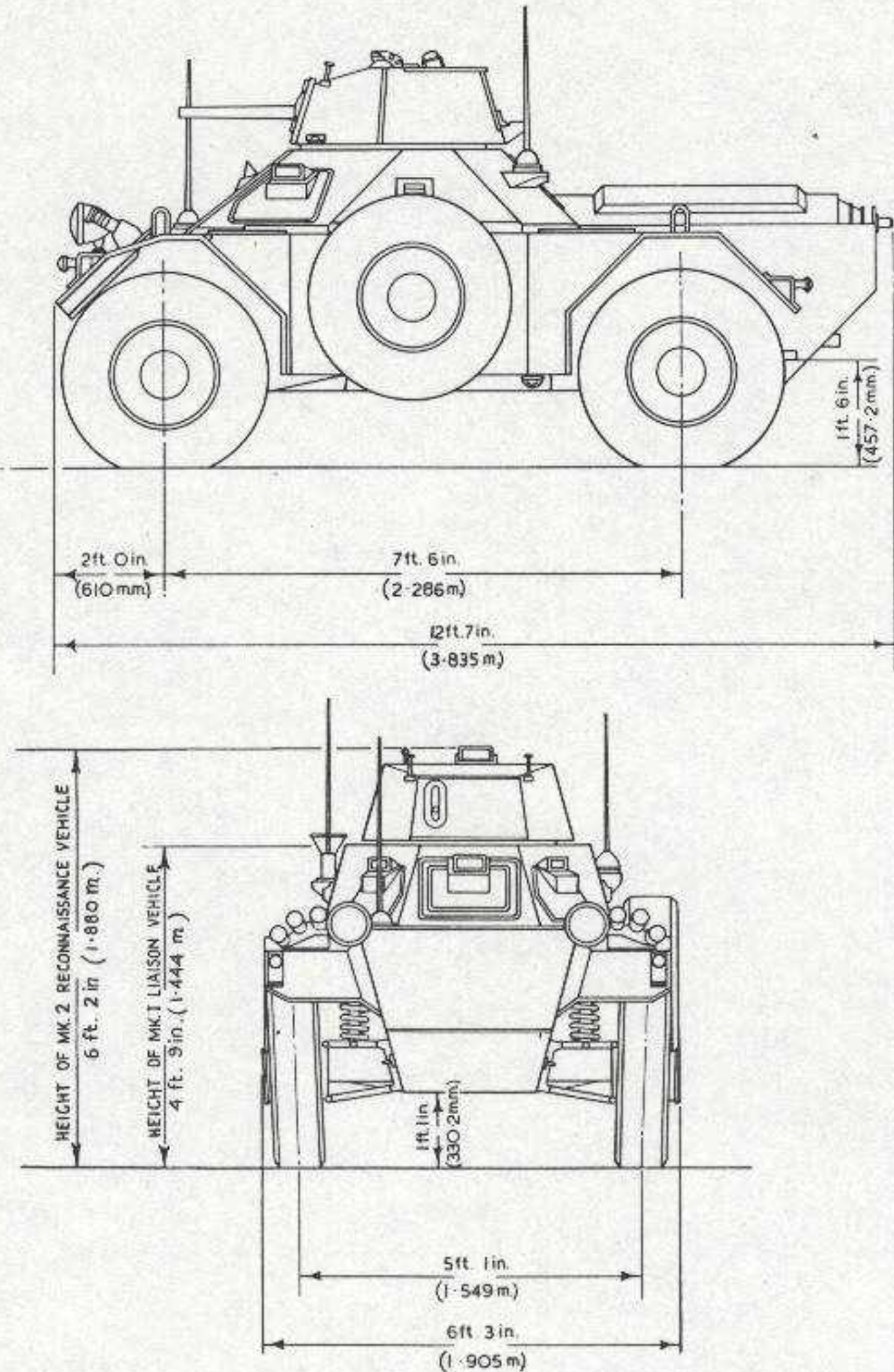
Note: Attention is drawn to "Successful Instruction", W.O. Code No.8670. This pamphlet lays down the principles and methods of instruction to be followed by all officer and N.C.O. instructors.

5. Throughout this book, the lubricants shown under Servicing are for normal conditions only. When the vehicle is operating under abnormal conditions, the lubricants used must be as given in current instructions. See note on page 117.

2 - GENERAL DESCRIPTION

Note: Throughout this handbook, any reference to left-hand (L.H.) or right-hand (R.H.) is as seen from the rear of the vehicle looking forward.

6. The Ferret is an armoured four-wheel drive road and cross-country vehicle. The Mk 1 liaison vehicle carries a crew of three - Commander, Gunner and Driver. The Mk 2 reconnaissance vehicle carries a crew of two - Commander/Gunner and Driver.
7. Generally the construction of the vehicles is the same with the exception that the Mk 1 liaison vehicle (Fig 1) has an open roof with provision for fitting a canvas cover, whilst the Mk 2 reconnaissance vehicle (Fig 3) is enclosed and fitted with a turret which mounts a .30 in. machine gun and rotates through 360 deg. See under LIST OF MARKS OF VEHICLES on page 4.
8. The hull and turret are of welded construction. The hull is water-proofed for fording and consists of two compartments - the fighting compartment and the engine compartment.
9. The front of the hull is provided with three observation flaps (Fig 7(1)) for use by the driver. A splinter-proof glass screen is fitted in the centre opening to give the driver maximum observation during an approach march. The screen must be removed before the centre flap can be closed. When the vehicle is closed down, observation is by means of a periscope in each of the flaps and from the hull by means of visors (Fig 19(8) and (Fig 23(3)) fitted with splash screens.
10. Power is supplied by a 6 cylinder water-cooled B60 type engine which is of unit construction with the fluid coupling and gearbox. The ignition system is waterproofed and is fully screened to prevent radio interference.
11. A gilled-tube radiator (Fig 17(11)) is provided together with a 12 bladed fan (1) for cooling purposes. The cooling system is pressurized to 10 lb/sq.in.
12. The power from the engine is transmitted through a fluid coupling to a pre-selective five speed gearbox. This gearbox drives a transfer box which is connected by propeller shafts and bevel boxes (Fig 37) to drive each wheel through reduction gears in each hub.
13. Independent springing is employed on each of the road wheels and consists of a helical spring and hydraulic shock absorber.
14. Hydraulic brakes of the two leading shoe type are fitted to all wheels. The handbrake operates mechanically on all wheels, whilst the footbrake operates through the hydraulic system.
15. Divided-disc road wheels with cross-country tyres are fitted. The tyres are normally of the run-flat type and enable a limited amount of running to be done after they have been punctured.
16. Steering is by means of steering wheel and recirculating ball system.
17. The negative earth return electrical system is 24 volt. The main earth connection is made at the distribution box. Two 12 volt batteries connected in series are housed in metal containers, one on each side of the gearbox.



1B.6411.A.

Fig 5 Vehicle dimensions

3 - DATA

DIMENSIONS - See Fig 5

WEIGHTS

Liaison vehicle - up armoured
heaviest version

Unladen - less all items shown
under laden weight

Total 3 tons 9 cwt 0 qr (7,728 lb; 3,505 kg)

Laden - including crew, armament,
ammunition, fuel, oil, water,
stowage and all equipment
normally carried

Front axle 1 ton 17 cwt 1 qr (4,172 lb; 1,892 kg)

Rear axle 2 tons 5 cwt 3 qr (5,124 lb; 2,324 kg)

Total 4 tons 3 cwt 0 qr (9,296 lb; 4,216 kg)

Reconnaissance vehicle - up
armoured heaviest version

Unladen - as Liaison vehicle

Total 3 tons 12 cwt 2 qr (8,120 lb; 3,683 kg)

Laden - as Liaison vehicle

Front axle 1 ton 19 cwt 2 qr (4,424 lb; 2,006 kg)

Rear axle 2 tons 7 cwt 0 qr (5,264 lb; 2,387 kg)

Total 4 tons 6 cwt 2 qr (9,688 lb; 4,394 kg)

BRIDGE CLASSIFICATION 4

FORDING DEPTH

Unprepared 3 ft 0 in. (0.914 m)

Prepared 5 ft 0 in. (1.524 m)

SHIPPING TONNAGE

Liaison vehicle, Mk 1 9 tons 13 $\frac{1}{2}$ cu ft

Reconnaissance vehicle, Mk 2 12 tons 2 cu ft

ENGINE

Type B60, Mk 3A or 6A

Number of cylinders 6 in line - No.1 nearest fan

Maximum b.h.p. (gross) 120 at 3,750 r.p.m.

Maximum b.h.p. at flywheel (nett) 96 at 3,300 r.p.m.

Efficiency at altitudes Altitude control fitted (para 100)

Maximum torque at flywheel (nett) 195 lb-ft at 2,000 r.p.m.

Bore 3.5 in. (88.9 mm)

Stroke 4.5 in. (114.29 mm)

Capacity 259.78 cu in. (4.25 litres)

Compression ratio 6.4 : 1

Valve tappet clearances - cold

Inlet 0.010 in. (0.254 mm)

Exhaust 0.015 in. (0.381 mm)

Distributor 6 cyl, No.1, Mk 2 - FV141535

Contact breaker gap 0.010-0.012 in. (0.254-0.305 mm)

Automatic advance Approximately 20 deg at maximum
engine speed on all distributors

Speed limiter 3,650-3,850 r.p.m. engine speed

OR

(Amdt. 2)

ENGINE - contd.				
Distributor	...	...	...	6 cyl, No. 1, Mk 2/1 - FV141540
Contact breaker gap	...	...	...	0.019-0.021 in. (0.483-0.533 mm)
Speed limiter	...	...	...	3,650-3,850 r.p.m. engine speed
Ignition timing	...	...	...	2 deg A.T.C.
Ignition coil	...	...	...	No. 1, Mk 2 - FV141532 or No. 1, Mk 2/1 - FV175891
Firing order	...	...	...	1 - 4 - 2 - 6 - 3 - 5
Sparking plugs	...	...	...	No. 1, Mk 1 - FV175878 ± LV6/MT4/3343
Gap	...	...	...	0.015-0.018 in. (0.381-0.457 mm)

ENGINE LUBRICATION SYSTEM

Type of system	...	...	...	Dry sump
Oil pump	...	...	...	Gear type
Oil pressure at which warning light operates	...	...	...	3-12 lb/sq.in.
Oil pressure - normal	...	...	...	35 lb/sq.in.
Oil filter	...	...	...	Full flow type
Oil cooler	...	...	...	Still tube

COOLING SYSTEM

Radiator	...	...	...	Gilled tube
Fan	...	...	...	12 blade
Circulation	...	...	...	Thermo-siphon - pump assisted
Cooling control	...	...	...	Bellows type thermostat

FUEL SYSTEM

Fuel pump	...	...	...	Mechanical diaphragm type
Carburettor	...	...	...	Solex type 40 NNIP
Choke	...	...	...	26 mm
Main jet	...	...	...	130
Fuel filter	...	...	...	Element type

GEARBOX

Type	Pre-selective - 5 gears
------	-----	-----	-----	-------------------------

GEARBOX RATIOS

					<i>Early Mk 1 Liaison veh</i>	<i>Later Mk 1 Liaison and Mk 2 Recce veh</i>
1st	...	...	...	...	5.666 : 1	6.046 : 1
2nd	...	...	...	...	4.170 : 1	4.381 : 1
3rd	...	...	...	...	2.375 : 1	2.437 : 1
4th	...	...	...	...	1.527 : 1	1.569 : 1
5th	...	...	...	...	1 : 1	1 : 1

TRANSFER BOX RATIO

1.347 : 1 Forward and reverse

BEVEL BOX RATIO

1.923 : 1

HUB REDUCTION GEAR RATIO

2.400 : 1

OVERALL RATIOS - engine to road wheels

					<i>Early Mk 1 Liaison veh</i>	<i>Later Mk 1 Liaison and Mk 2 Recce veh</i>
1st	...	...	...	...	35.225 : 1	37.580 : 1
2nd	...	...	...	...	25.924 : 1	27.240 : 1
3rd	...	...	...	...	14.765 : 1	15.150 : 1
4th	...	...	...	...	9.493 : 1	9.754 : 1
5th	...	...	...	...	6.217 : 1	6.217 : 1

MAXIMUM SPEEDS - based on early vehicle gear ratios						
1st	...	...	...	...	10.25 m.p.h.	{ 16.5 km.p.h. }
2nd	...	...	...	...	13.8 m.p.h.	{ 22.2 km.p.h. }
3rd	...	...	...	...	24.5 m.p.h.	{ 39.4 km.p.h. }
4th	...	...	...	...	38 m.p.h.	{ 61.2 km.p.h. }
5th	...	...	...	...	58 m.p.h.	{ 93.3 km.p.h. }
MAXIMUM SPEEDS - based on later vehicle gear ratios						
1st	...	...	...	...	9.6 m.p.h.	{ 15.4 km.p.h. }
2nd	...	...	...	...	13.23 m.p.h.	{ 21.3 km.p.h. }
3rd	...	...	...	...	23.8 m.p.h.	{ 38.3 km.p.h. }
4th	...	...	...	...	36.34 m.p.h.	{ 58.5 km.p.h. }
5th	...	...	...	...	58 m.p.h.	{ 93.3 km.p.h. }
PERFORMANCE						
Average safe speed (road)	...	...	...	...	45 m.p.h.	{ 72.4 km.p.h. }
Average safe speed (cross-country)	...	...	...	...	25 m.p.h.	{ 40.2 km.p.h. }
Maximum gradient climbable	...	...	...	...	24 deg	
Range of operation (road)	...	...	...	...	190 miles	{ 305.7 km }
Range of operation (cross-country)	...	...	...	...	100 miles	{ 161 km }
Fuel consumption (road)	...	...	...	...	9 m.p.g.	{ 3.2 km.p.litre }
Fuel consumption (cross-country)	...	...	...	...	5 m.p.g.	{ 1.7 km.p.litre }
Approach angle - front	...	...	...	...	60 deg	
Departure angle - rear	...	...	...	...	50 deg	
Ditch crossing - with channels	...	...	...	...	4 ft 0 in.	{ 1.22 m }
TURNING CIRCLE						
Left lock	...	...	...	...	38 ft 0 in.	{ 11.582 m }
Right lock	...	...	...	...	38 ft 0 in.	{ 11.582 m }
NETT POWER/GROSS WEIGHT RATIO						
Liaison vehicle - heaviest version	...	...	...	...	23.13 b.h.p./ton	
Reconnaissance vehicle - heaviest version	...	...	...	...	22.19 b.h.p./ton	
MAXIMUM TRACTIVE EFFORT - heaviest version of Reconnaissance vehicle at 100% efficiency nett						
5th gear	...	...	...	...	208 lb/ton	
1st gear	...	...	...	...	1,250 lb/ton	
TYRE PRESSURES						
					R.F. "L"	C.C. or Std.
Normal road use						
Front	...	...	...	...	30 lb/sq in.	40 lb/sq in.
Rear	...	...	...	...	39 lb/sq in.	52 lb/sq in.
Cross-country use						
Front	...	...	...	...	18 lb/sq in.	28 lb/sq in.
Rear	...	...	...	...	27 lb/sq in.	40 lb/sq in.
WHEELS						
Type	...	...	...	...	Divided disc	
Size	...	...	...	...	16.00 x 6.50	

BRAKES					Hydraulic - two leading shoe
Foot	...	...	...	...	Mechanical - two leading shoe
Hand	...	...	...	...	13 in. (330 mm)
Diameter of shoes	...	...	...	...	2½ in. (63.5 mm)
Width of shoes	...	...	...	...	230 sq in. (1484 sq cm)
Braking area	...	...	...	...

CAPACITIES				
Engine lubrication system (dry sump)	...	...	...	...
Engine cooling system	...	...	...	...
Fuel tank - total including reserve	3 gal	...	...	...
Fluid coupling	...	...	...	...
Gearbox	...	...	...	...
Transfer box	...	...	...	...
Inner tracta joint housings, including bevel boxes	...	...	...	...
Outer tracta joint housings, including road wheel hubs	...	...	...	...
Brake fluid supply tank	...	...	...	...
Air cleaner	...	...	...	...
Steering cross-shaft bevel box (lower)	...	...	...	...
Steering bevel box (upper)	...	...	...	...

Imperial	U.S.A.	Metric (litres)
3 gal	3½ gal	13.64
4½ gal	5½ gal	20.46
21 gal	25¼ gal	95.5
9¾ pints	11¾ pints	5.54
1½ gal	1½ gal	5.7
6 pints	7¼ pints	3.41
3 pints	3½ pints	1.7
1½ pints	1¾ pints	0.85
1½ pints	1½ pints	0.71
2 pints	2½ pints	1.14
1½ pints	1¾ pints	0.85
1½ pints	1¾ pints	0.85

STEERING					Recirculating ball
Type	...	...	...	...
Number of turns of steering wheel - lock to lock	...	...	...	...	3.3/4 approximately
Front wheel toe-in	...	...	...	...	1/8 in. 3.175 mm

SUSPENSION					Fully independent
Type	...	...	...	...	Single coil spiral
Springs	...	...	...	...	Double acting hydraulic (telescopic)
Shock absorbers	...	...	...	...

BATTERIES					
Number off	...	...	...	...	2
Voltage	...	...	...	...	12
Capacity	...	...	...	...	60 Ah

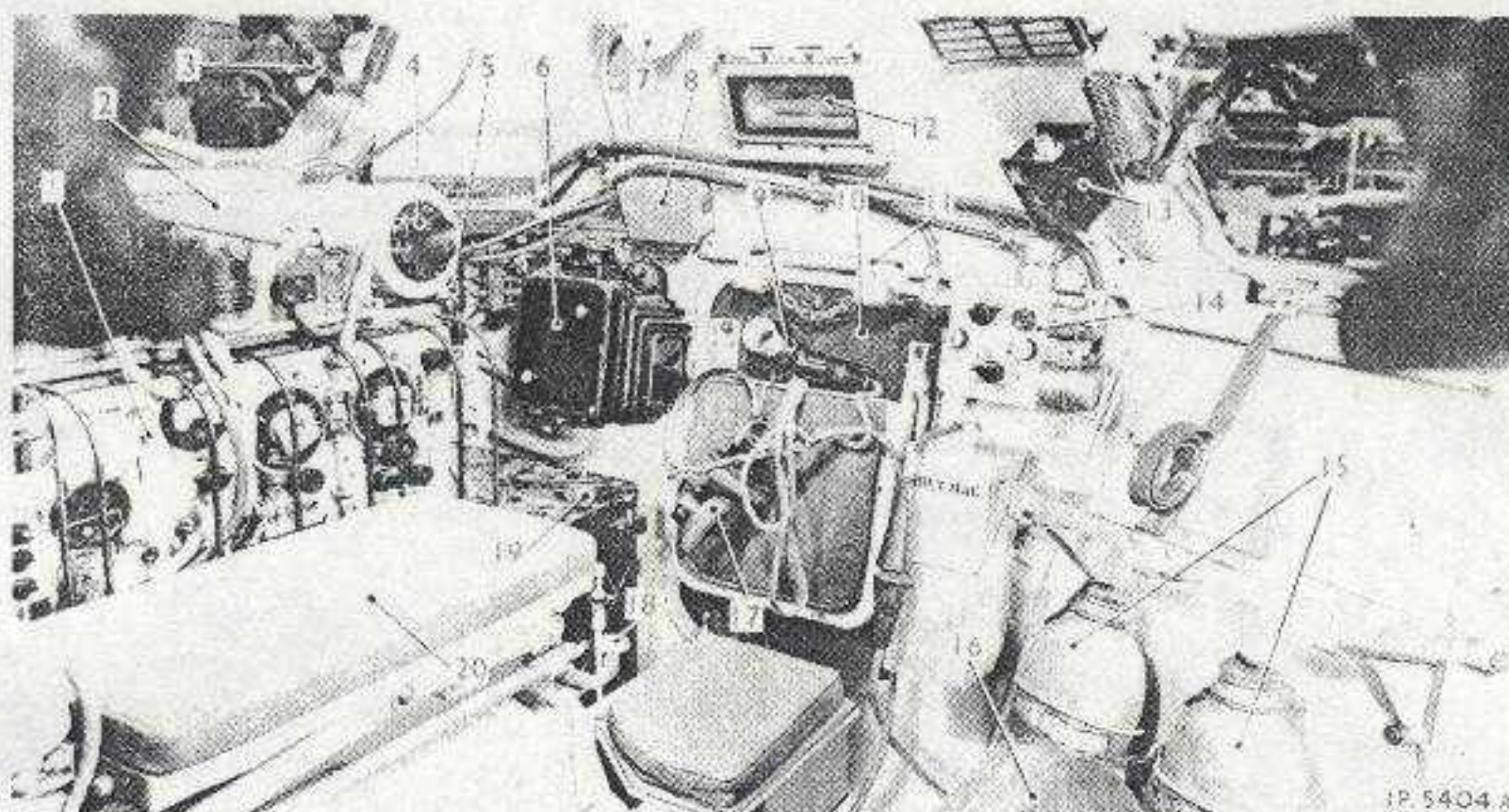
Light	Volts	Watts	Type
Head	26	50/50	British pre-focus D.C.
Side	26	6	S.C.C.
Tail	26	6	S.C.C.
Number	26	6	S.C.C.
Convoy	26	6	S.C.C.
Roof	26	6	S.C.C.
Instrument panel	26	6	S.C.C.
Ignition warning	26	6	S.C.C.
Oil pressure warning	26	6	S.C.C.

FUSES

Location	Controlling	Rating	Material and S.W.G.
Generator Panel, No.2, Mk 1	Generator Main circuit	25A	No.23 S.W.G. tinned copper wire
	Ignition warning light	5A	No.35 S.W.G. tinned copper wire
Generator Panel, No.2, Mk 2/1	Generator Main circuit	50A fusing	Special strip type
	Ignition warning light	5A	No.30 S.W.G. tinned copper wire

CIRCUIT BREAKERS (Thermal magnetic type)

Location	Controlling	Rating
Distribution Box, No.1, Mk 1	Inspection light sockets, smoke dischargers, lights, horn, windscreen wiper and wireless feed.	30A
	Engine instruments i.e., fuel gauge, thermometer, oil pressure warning light, ignition warning light, instrument panel light and starter switch	10A



- | | | |
|-------------------------------------------|-------------------------------------|---------------------------|
| 1 Wireless set | 8 W/T junction box | 14 Control unit |
| 2 Power supply unit | 9 Microphone | 15 Water bottles |
| 3 Rear observation flap
locking device | 10 Escape hatch | 16 Driver's seat |
| 4 W/T variometer | 11 Escape hatch
operating handle | 17 Headset |
| 5 Distribution box | 12 Side observation visor | 18 Gunner's seat
catch |
| 6 Generator panel | 13 Smoke discharger
button box | 19 Battery box |
| 7 Roof light | | 20 Gunner's seat |

Fig 6 Rear L.H. interior view of Mk I Liaison vehicle

4 - HULL AND TURRET DETAILS

18. The hull is of welded construction and is waterproofed. Entry to the Mk 1 liaison vehicle is made via the top of the vehicle whilst entry to the Mk 2 reconnaissance vehicle is through the turret door.

DRIVER'S FLAPS

19. The driver's front flap is hinged at the top and incorporates a spring loaded catch which holds the flap open or closed. A locking catch on the hull can be engaged with the flap to prevent it being opened from outside. The driver's side flaps are of similar design to the front flap. All flaps are fitted with a periscope for indirect vision when closed.

To open and close a flap

20. Push the flap fully outwards by means of the operating handle. Reverse the action to close the flap.

To remove and replace the periscope

21. Support the periscope and pull each supporting arm to the rear to disengage it from the periscope trunnion, then lower the periscope from the mounting. Replace by reversing the sequence of removal.

DRIVER'S SEAT

22. The driver's seat is adjustable for height and in a forward or rearward direction.

To adjust the seat fore and aft

Press down the catch on the left front of the seat and slide the seat in the required direction. Release the catch and ensure that the seat is locked.

To adjust the seat for height

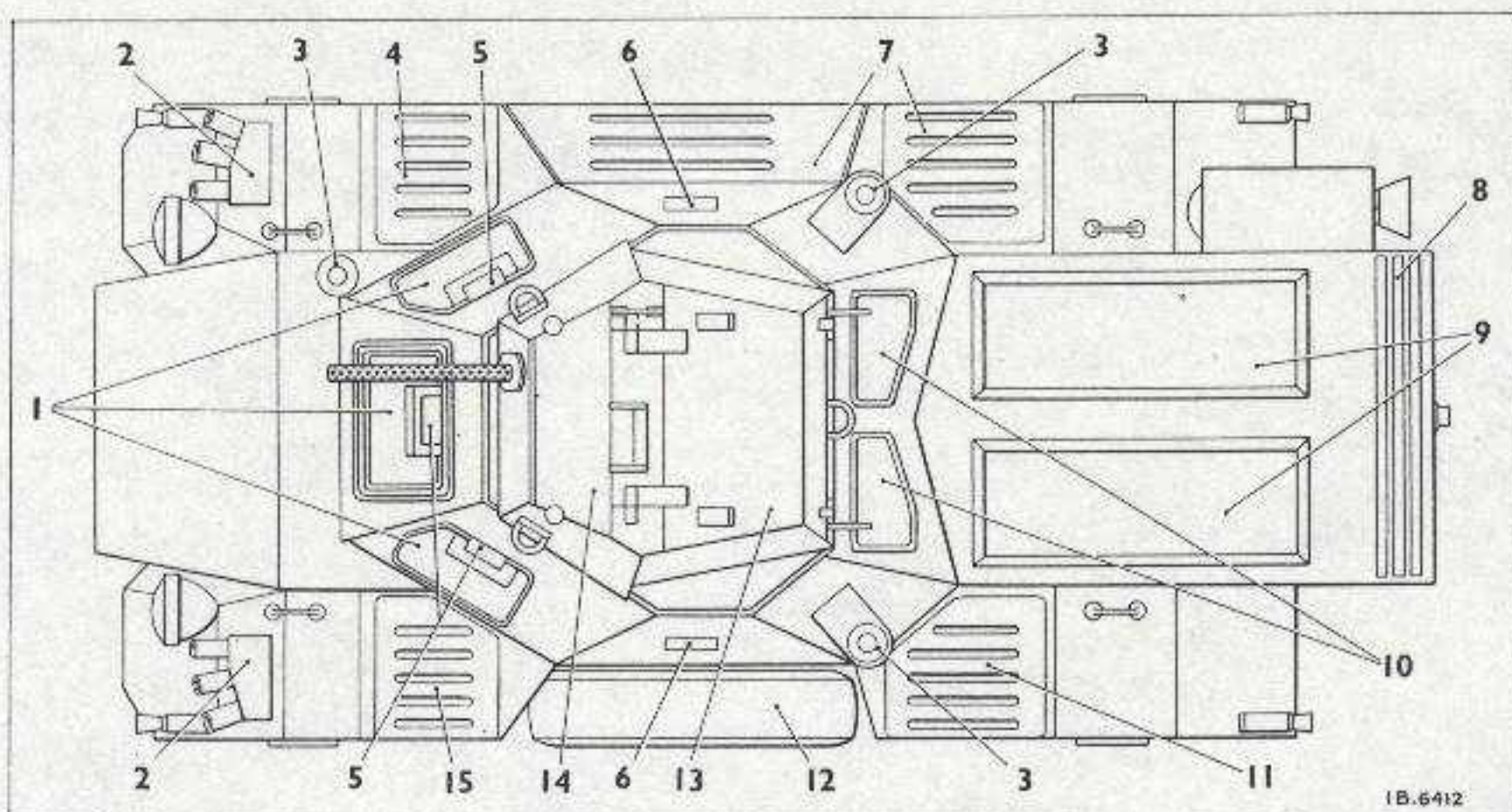
Turn the handwheel at the back of the seat until the required position is obtained.

GUNNER'S SEAT

23. The gunner's seat (Fig 23(8)) is mounted upon runners secured to the transfer box cover. It can be adjusted in a forward or rearward direction, and raised or lowered to one of two positions. An adjusting handwheel is provided on the R.H. side to adjust the vertical height to personal requirements.

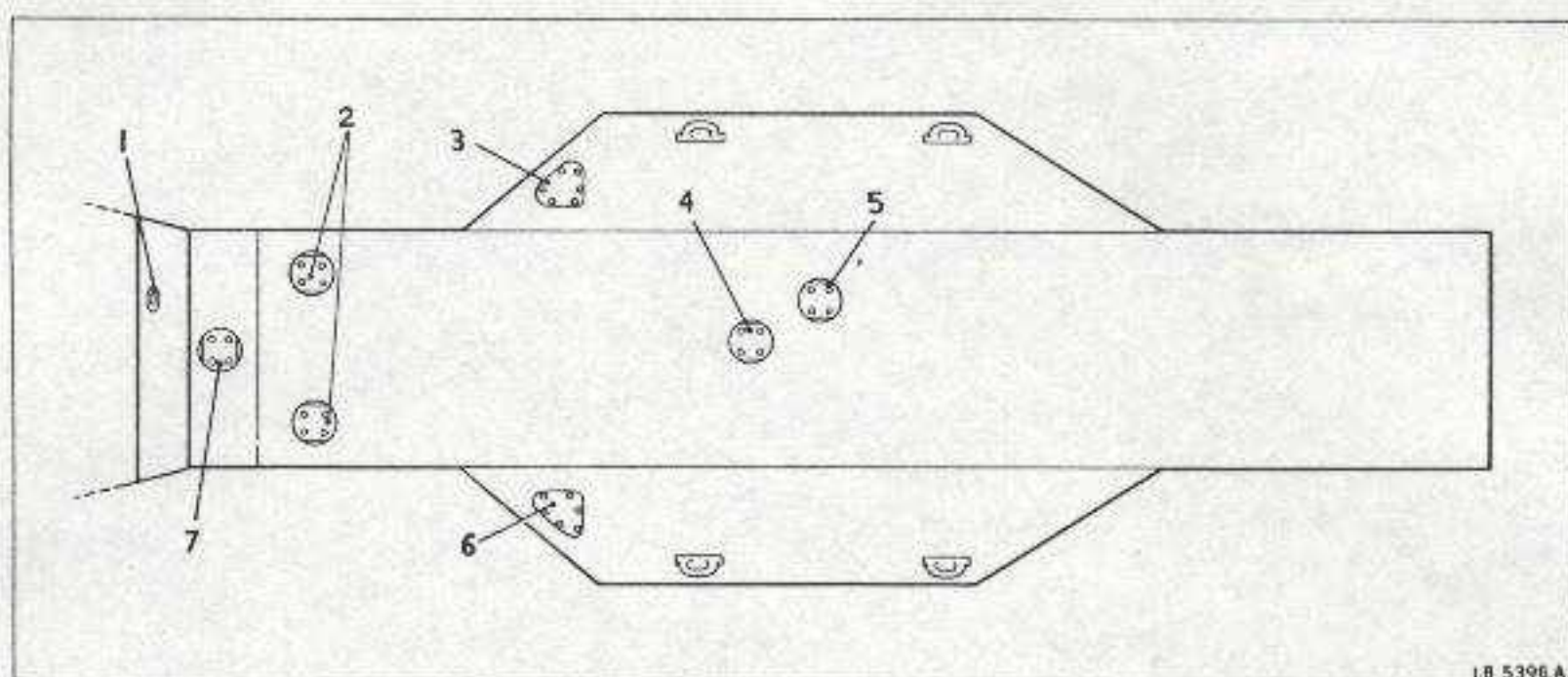
To adjust the seat fore and aft

Press down the catch (Fig 23(9)) and slide the seat in the required direction. Release the catch, ensuring that the seat is locked.



- | | | |
|-----------------------------|----------------------|----------------------------------------|
| 1 Driver's flaps | 6 Side visors | 11 Stowage container |
| 2 Smoke grenade dischargers | 7 Stowage containers | 12 Spare wheel |
| 3 Aerial bases | 8 Air louvre | 13 Turret door - Mk 2 Recce. veh. only |
| 4 Stowage container | 9 Engine covers | 14 Turret - Mk 2 Recce. veh. only |
| 5 Periscopes | 10 Rear flaps | 15 Stowage container |

Fig 7 Plan view of vehicle



- | | |
|------------------------------------------|-------------------------------------------|
| 1 Coolant drain plug | 5 Transfer box drain plug access plate |
| 2 Engine compartment access plates | 6 Fuel tank L.H. drain plug access plate |
| 3 Fuel tank R.H. drain plug access plate | 7 Engine oil tank drain plug access plate |
| 4 Gearbox drain plug access plate | |

Fig 8 Underside view of hull bottom plate

To raise the seat

Press down the catch (13) and the seat will rise, by the action of springs, to the raised position. Ensure that the seat is locked by lifting the seat until the locking catch engages.

To lower the seat

Press down the catch (13) and at the same time press down the seat until the locking catch engages.

EMERGENCY ESCAPE HATCHES

24. There are three escape hatches: one, hinged, in front of the driver in which the driver's flap is fitted, and one in each side of the hull.

To open the forward (driver's) escape hatch

- (a) Close the driver's flap and lock the centre catch.
- (b) Disengage the catch (Fig 36(11)) at each side of the hatch.
- (c) Push the hatch forward on its hinges until fully open.

To release a side escape hatch

- (a) The two side escape hatches are each secured to the hull by lugs at the bottom and by a claw catch at the top. The catch is fitted with a locking pin which should be engaged during approach marches and removed when action is imminent.
- (b) With the locking pin removed, pull back the release handle (Fig 19(12)) or (Fig 23(14)) and push the hatch outwards. Both side hatches are jettisoned with the attached bins.

REAR OBSERVATION FLAPS

25. There are two observation flaps in the rear of the fighting compartment. A spring-loaded locking catch secures the flap open or closed.

To open the flaps

Push the locking handle (Fig 19(2)) with flap outwards as far as possible. Reverse the action to close.

SIDE OBSERVATION VISORS

26. The side observation visors (Fig 19(8) and (Fig 23(3))) in each side of the hull are provided with splinter-proof glass screens to protect the observer from bullet splash.

To remove and replace the splash screen

Press up the thumb catch at the top of the screen holder and withdraw the screen. Reverse the action to replace.

ENGINE COVERS

27. The engine access covers (Fig 7(8)) are hinged to the compartment cover which is located on flanged ledges in the hull and secured by setscrews. The covers are fitted with locks operated by a special key. The construction of the covers allows air to be drawn into the engine compartment by the cooling fan. The warm air leaves the engine compartment through the louvres at the rear of the hull.

STOWAGE CONTAINERS

28. External stowage containers (Fig 7) are fitted behind each front wheel, in front of each rear wheel, and on the right-hand side escape hatch.

SMOKE GRENADE DISCHARGERS

29. A three-barrelled grenade discharger (Fig 7(2)) is fitted on each front wheel mudguard. The dischargers are fired electrically by means of push-buttons (Fig 19(10)) situated on the left-hand wall of the fighting compartment.

ACCESS PLATES

30. Access plates (Fig 8) for the following components are secured by bolts (9/16 in. A/F) to the hull bottom plate and are removed when required to drain the components:-

- (a) Transfer box.
- (b) Engine oil tank.
- (c) Gearbox.
- (d) Fuel tank (2).
- (e) Engine compartment drain and cleaning access plates (2).

A screwed plug in the rear skid plate must be removed when the starting handle is to be used. The end of the starting handle is used to remove the plug.

DRAIN PLUGS

31. The hull drain plug on early vehicles is situated at the extreme rear of the bottom plate of the hull and is removed by means of a square key when necessary to drain the hull. The coolant drain plug (Fig 8(1)) is situated in the rear plate of the hull bottom right and is removed by means of a hexagon key.

Note: *On later vehicles the hull drain plug is not fitted but the bottom plate is provided with two apertures with cover plates, as shown in Fig 8, for draining and cleaning purposes.*

SAND CHANNELS

32. Two sand channels for obstacle crossing are secured by clamp screws to the front glacis plate.

LIFTING AND LASHING EYES

33. Four lifting eyes are fitted, one above each wheel station; lashing eyes are fitted to the sides of the hull for use when the vehicle is transported by air.

COMMUNICATION

34. The vehicle is fitted with wireless (see Section 11).

- 1 Door supports
- 2 Catch handles
- 3 Roof door
- 4 Retaining bolt
- 5 Retaining bolt sockets
- 6 Rear door
- 7 Depression stop rail

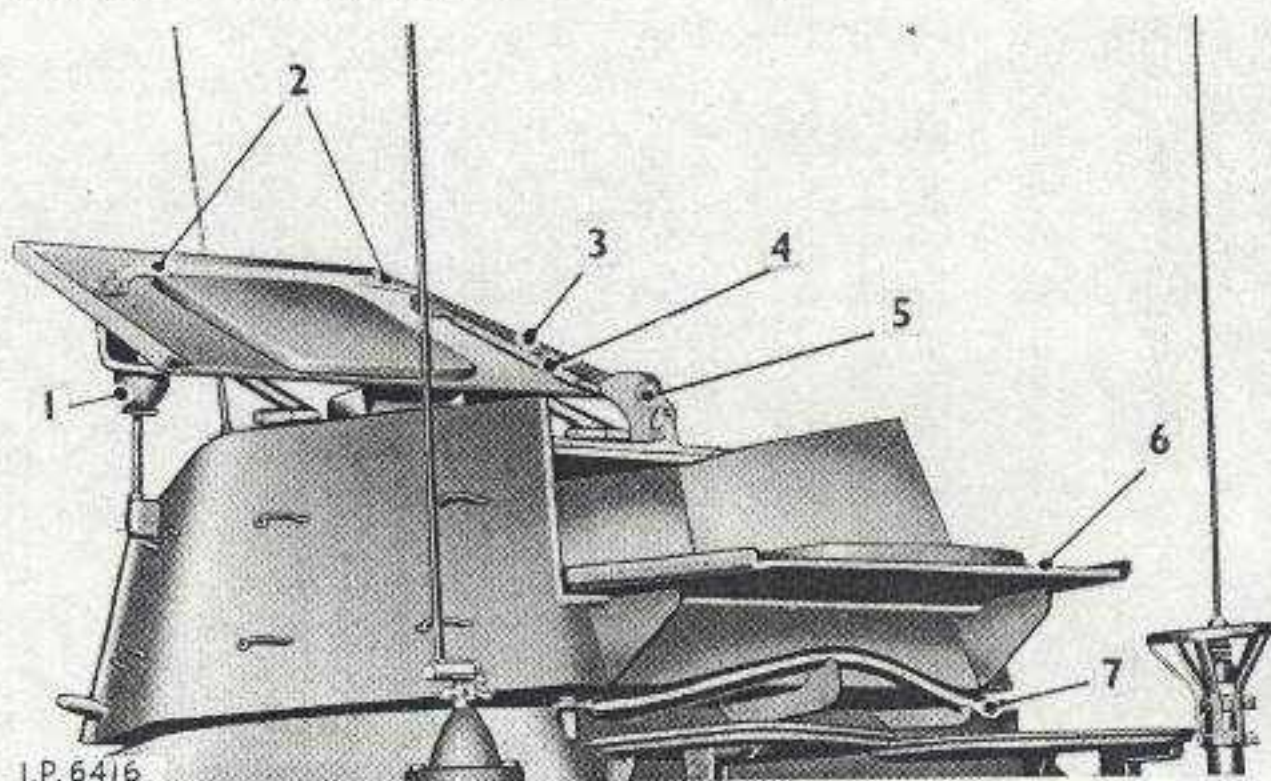


Fig 9 Exterior view of two-door turret

TURRET - Two-door type

35. This turret (Fig 9) is fitted to all reconnaissance vehicles with the exception of the Mk 2/2. It is of welded construction and is mounted on three equally spaced rollers to give 360 deg traverse. The front plate is slotted to accommodate the machine gun barrel which can be elevated 45 deg or depressed 15 deg from the horizontal. A hinged roof door is fitted with provision for retaining it in any of three open positions. Fitted on the rear of the turret is a hinged door which forms a seat when in the open position.

36. A depression stop rail (7) is fitted on the hull to limit the amount of depression when the machine gun is over the rear of the vehicle so preventing damage to the vehicle by MG fire. For details of the turret fitted to the Mk 2/2 vehicle see para 41A.

To open the turret roof door

37. Turn the two catch handles (2) and raise the door to the required position. Ensure that the spring-loaded retaining bolt (4) fully engages its socket.

To open the turret rear door

38. (a) First open the roof door as this when closed secures the rear door.
- (b) Turn the rear door catch handle and lower the door on to the supporting brackets. Turn the catch handle to lock the door in position.

TURRET TRAVERSE - Two-door turret

39. The turret is manually traversed by means of a spring-loaded handle (Fig 10(1)). The handle mechanism also operates a friction block which bears against the hull roof plate and prevents the turret from rotating when the handle is in the horizontal position. A turret lock (2) is also provided for use when travelling.

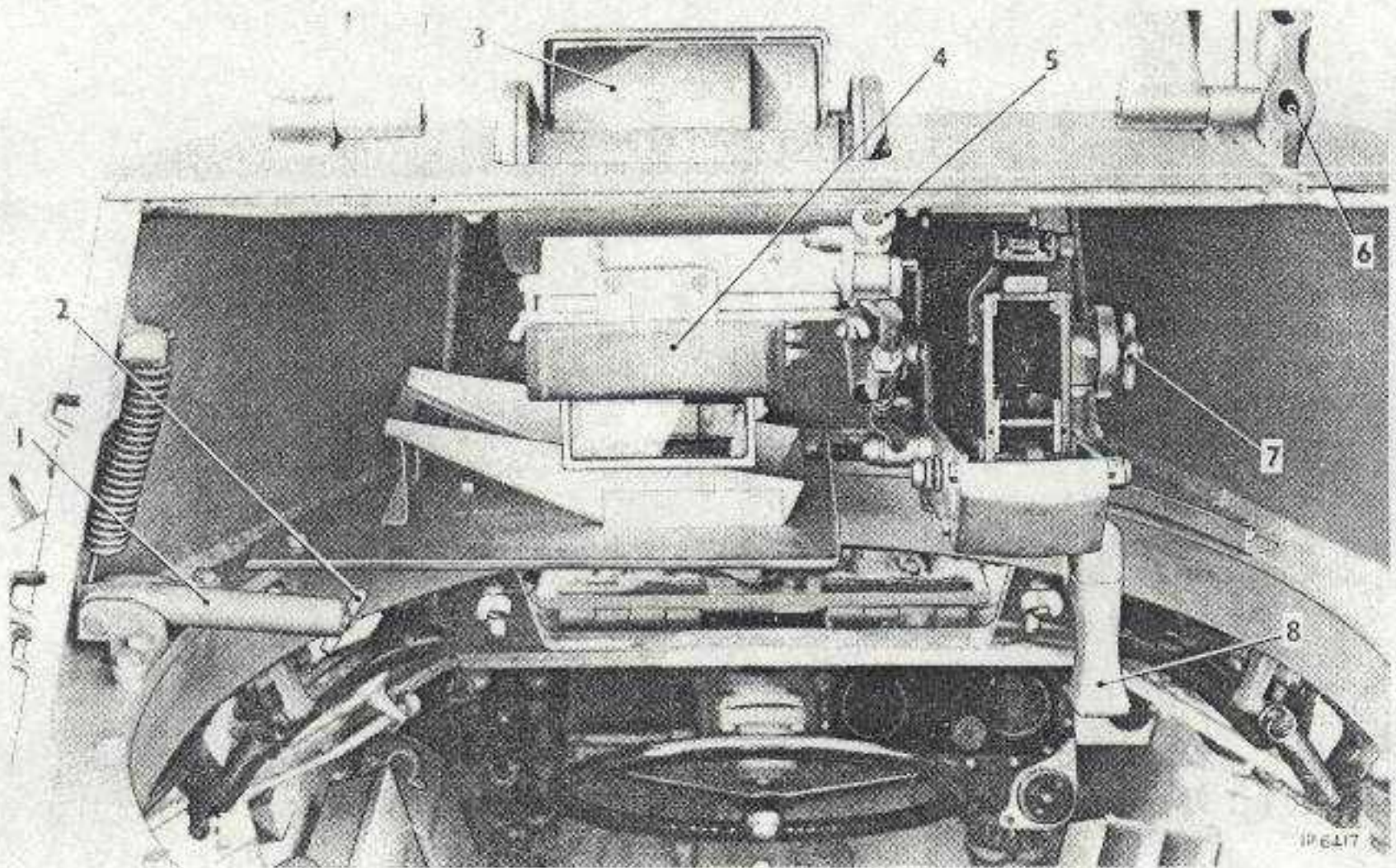
To traverse the turret

40. Lift the traversing handle (Fig 10(1)) against the spring reaction and rotate the turret to the required position. Release the handle as necessary to prevent further movement of the turret.

To lock the turret

41. Rotate the turret to the front position, then turn the lock handle (Fig 10(2)) to release the plunger. If necessary, slightly rotate the turret either way until the plunger engages the recess in the hull roof plate.

To release the lock, pull the handle outwards and turn it 90 deg.

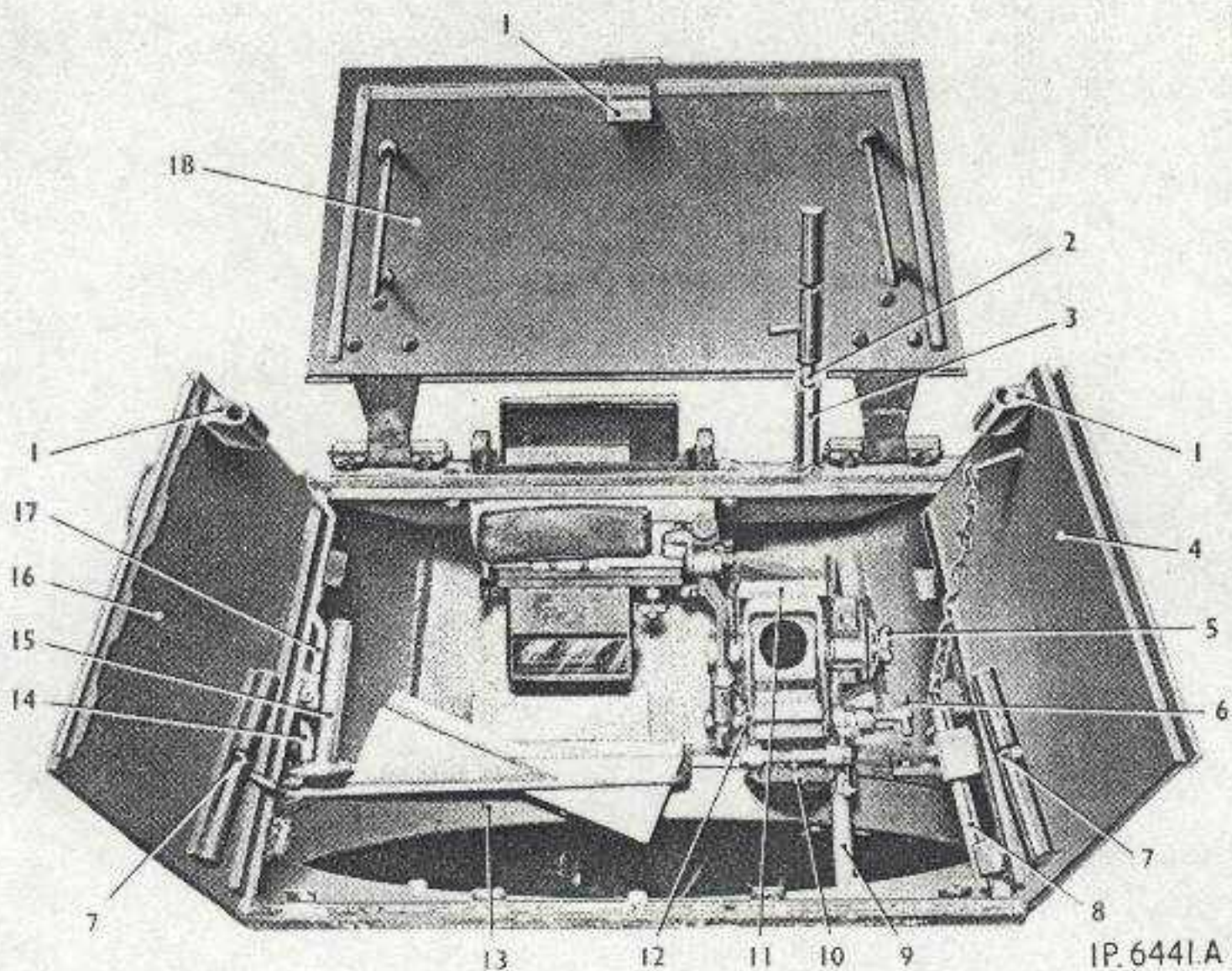


- | | |
|----------------------------|-------------------------|
| 1 Turret traversing handle | 5 Adjusting screw |
| 2 Turret lock | 6 Retaining bolt socket |
| 3 Sight | 7 MG mounting lock |
| 4 Browpad | 8 Trigger handle |

Fig 10 Interior view of two-door turret

TURRET - Three-door type

41A. This turret (Fig 10A) is used on the Mk 2/2 vehicle only. It is of welded construction and is mounted on three equally spaced ball bearings to give 360 deg traverse. The front plate is slotted to accommodate the machine gun barrel which can be elevated 45 deg and depressed 15 deg from the horizontal. A hinged roof door is fitted with provision for retaining it in any of two open positions, and two hinged rear doors are fitted which form the complete rear plate. Provision is made for retaining the rear doors in any of two open positions. The side plates have two holes positioned at normal ocular distance apart for use as observation ports when closed down. The ports can be closed by a rotating plate operated by a handle inside the turret.



- | | |
|--------------------------------------|-----------------------------------------|
| 1 Socket - roof door locking pin | 10 Firing lever |
| 2 Retaining bolt - roof door | 11 Mantlet |
| 3 Socket - retaining bolt | 12 Cradle |
| 4 Rear door - R.H. | 13 Turret mounting ring |
| 5 Elevating clamp | 14 Release lever - turret traverse lock |
| 6 Locking pin - gun mounting | 15 Handle - turret traverse |
| 7 Bolt - rear door | 16 Rear door - L.H. |
| 8 Door locking pin - stowed position | 17 Catch handle - retaining rear door |
| 9 Elevating handle | 18 Roof door |

Fig 10A Rear view of three-door turret - typical

To open the turret doors

41B. Withdraw the locking pin (Fig 10A(8)) from the sockets (1), open the doors and retain them in the required positions by the bolts (2) and (7), or the catches on the roof and side plates.

TURRET TRAVERSE - Three-door turret

41C. The turret is manually traversed by means of a handle (Fig 10A(15)). A turret lock is provided to lock the turret when the gun is in the forward (12 o'clock) position. The lock is released by a lever (14).

To traverse the turret

41D. Grip the lock release lever (Fig 10A(14)) and traverse handle (15) together, then rotate the turret manually to the required position.

5 - ENGINE

42. Before details of the engine and auxiliary systems are studied, reference should be made to Fig 11 to locate and identify the components visible in the engine compartment.

43. The starting up sequence will be found on page 96 and is inserted near the end of the instructional notes rather than in the engine section as it refers to several different systems.

DESCRIPTION

44. The engine (Fig 12 and 13) is a B60 Mk 3A or 6A, 6 cylinder liquid-cooled engine and is mounted in the rear of the hull with the fan and radiator to the rear. The cylinders are numbered from the rear of the vehicle, i.e., No.1 nearest the fan.

OPERATION OF CONTROLS

Starting handle

45. The starting handle, which is normally carried in the external left-hand rear locker, can be fitted to the engine through a hole in the skid plate after removal of the detachable screwed plug. The end of the starting handle is used to remove the plug. The starting handle should be used for turning the engine during servicing and for starting the engine in cold weather, or in the event of a faulty starter motor or weak battery.

Speedometer

46. The speedometer is mounted on the instrument panel (Fig 36(9)) to the right of the driver and is driven by a flexible drive from the transfer box. The trip re-set control (10) is mounted in the left side of the horn switch bracket.

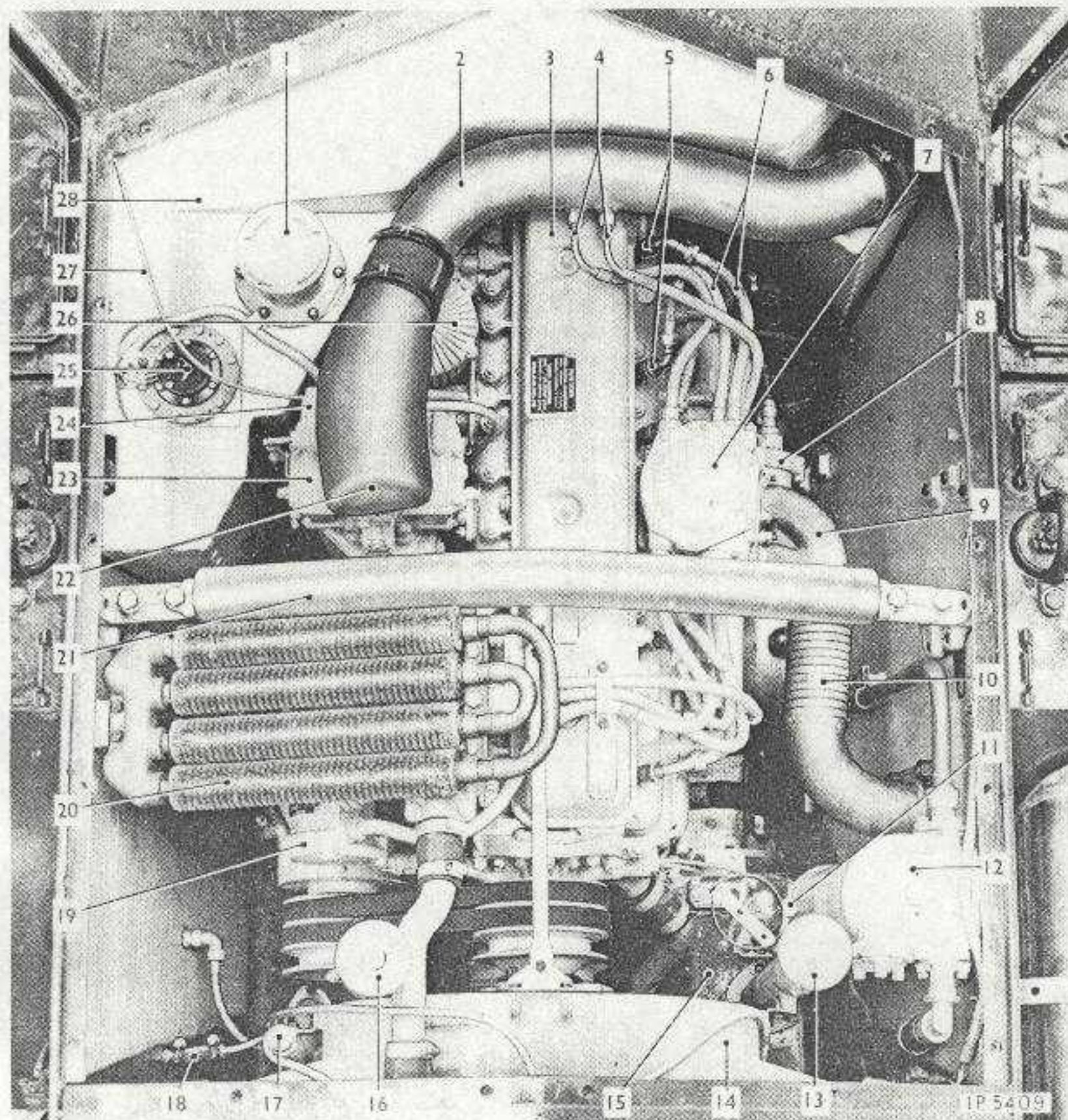
Tachometer

47. The tachometer, mounted alongside the speedometer, indicates engine crankshaft speed and provides a check on the efficiency of the engine speed limiter which should operate between 3,650 and 3,850 r.p.m. It should also be used as an aid to correct gear-changing (para 217). The tachometer scale is graduated from 0 to 40 and the reading must be multiplied by 100 to give the engine speed.

All other controls of the engine are dealt with under the systems which they operate.

SERVICING

48. D.M.E. instructions state that kerosine, fuel or oil must not be used for engine cleaning. Owing to the extensive use of rubber in the manufacture of all engines, it is important that this instruction is strictly adhered to.



- | | |
|---------------------------------------|----------------------------------------------|
| 1 Fuel filler cap | 15 Engine oil tank |
| 2 Air inlet pipe | 16 Radiator filler cap |
| 3 Valve rocker cover | 17 Engine oil tank breather pipe |
| 4 Ignition distributor breather pipes | 18 Radiator pressure outlet pipe |
| 5 Sparking plugs | 19 Ignition coil |
| 6 Sparking plug cable conduits | 20 Engine oil cooler |
| 7 Ignition distributor | 21 Cross-member |
| 8 Starter | 22 Air horn |
| 9 Exhaust manifold | 23 Carburetter |
| 10 Exhaust pipe | 24 Fuel feed pipe banjo and filter |
| 11 Engine oil tank dipstick | 25 Fuel gauge tank unit |
| 12 Engine oil filter | 26 Ignition junction box |
| 13 Engine oil filler cap | 27 Carburetter starting device control cable |
| 14 Fan cowl | 28 Fuel tank |

Fig 11 Engine compartment with cover plate removed

- 1 Ignition distributor
- 2 Sparking plug
- 3 Distributor heat shield
- 4 Exhaust manifolds
- 5 Engine breather pipe
- 6 Exhaust valve tappet covers
- 7 Crankcase
- 8 Mounting plate
- 9 Wheelcase
- 10 Crankshaft damper
- 11 Crankshaft seal lubricating nipple
- 12 Coolant pump lubricating nipple
- 13 Thermometer bulb unit
- 14 Air horn

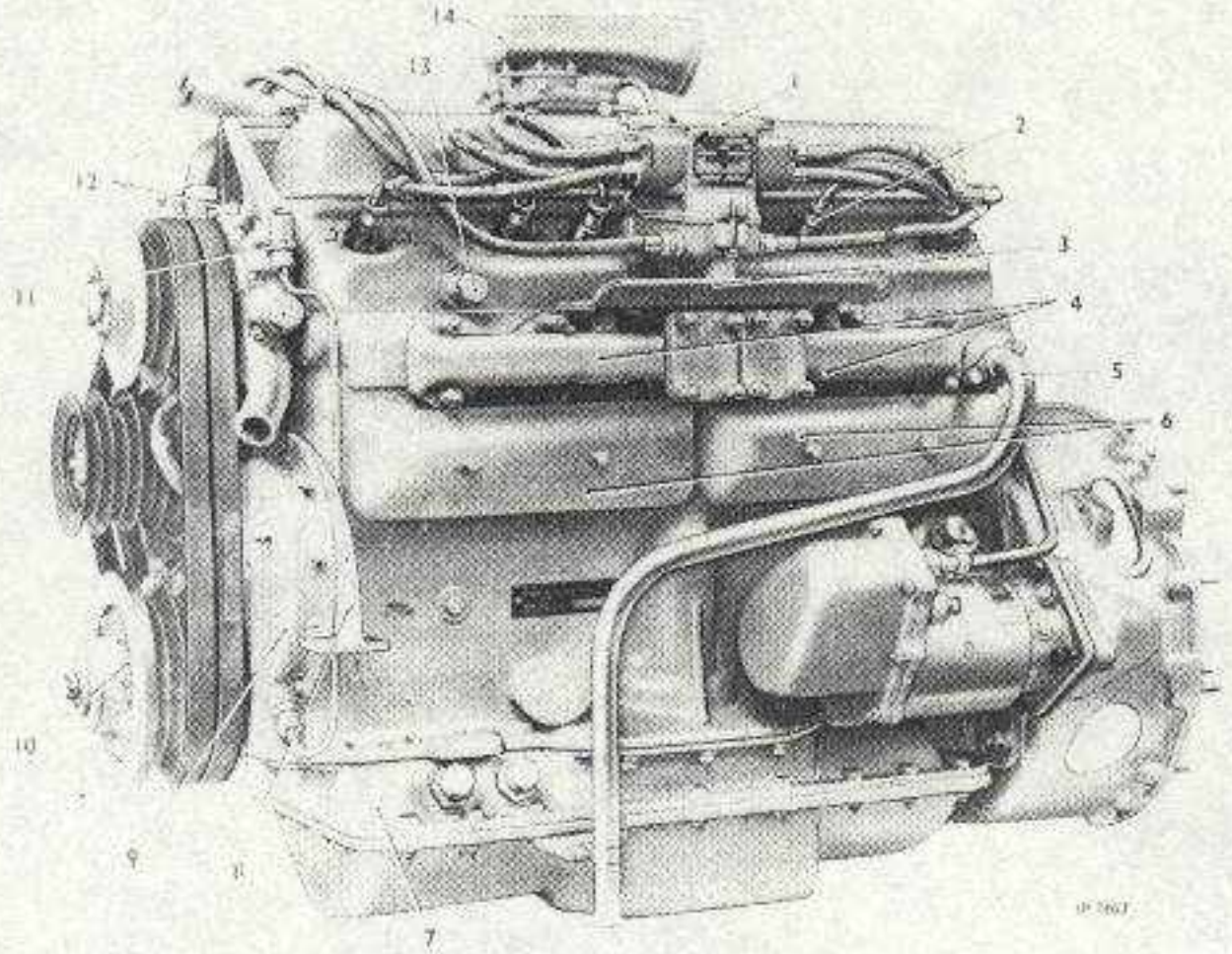


Fig 12 Exhaust side view of engine

- 1 Air horn
- 2 Carburetter
- 3 Ignition filter unit
- 4 Ignition coil
- 5 Certificate container
- 6 Thermostat
- 7 Terminal cover plate
- 8 Driving belts adjuster
- 9 Manifold jacket coolant pipe
- 10 Generator gearbox filler plug
- 11 Generator
- 12 Oil pressure relief valve
- 13 Fuel pump
- 14 Priming lever
- 15 Coolant drain plug
- 16 Oil pressure switch
- 17 Manifold jacket drain tap
- 18 Priming atomizer
- 19 Ignition junction box
- 20 Fuel feed pipe filter

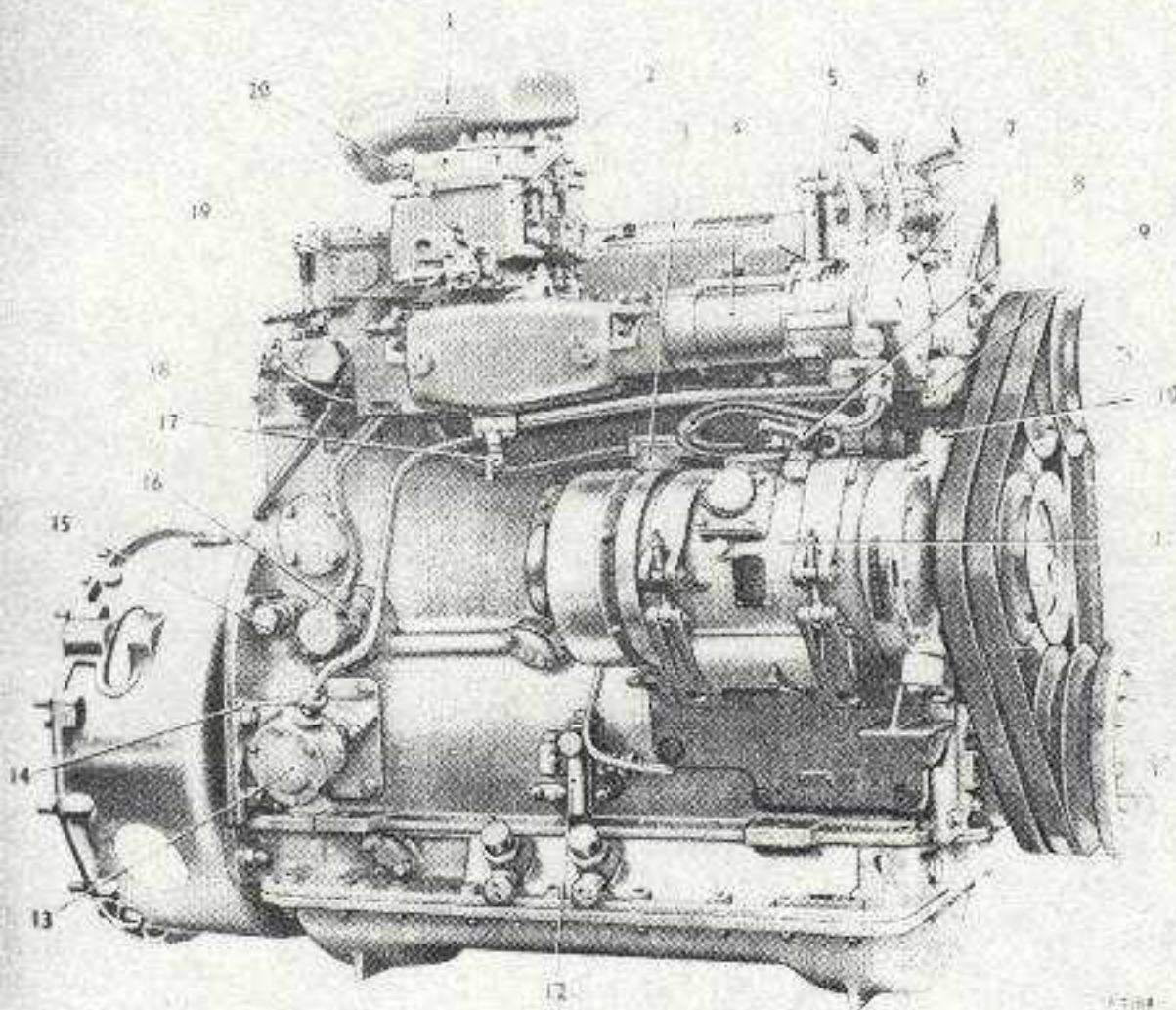


Fig 13 Induction side view of engine

Cylinder head nuts

49. Cylinder head nuts should be checked for tightness by a vehicle mechanic after the first 500 miles running by a new vehicle. The cylinder head gasket should be checked for signs of leakage at the same time.

To check the cylinder head nuts

50. (a) Equipment required:-

Spanner, box, B.S.W., 5/16 in.	Spanner, 3/4 in. A/F
Tommy bar	Spanner, B.S.W., 1/8 in.
Screwdriver	Spanner, B.S.W., 1/4 in.
Spanner, 7/16 in. A/F	Spanner, B.S.W., 5/16 in.
Spanner, 9/16 in. A/F	

(b) Method:-

(i) Remove the engine compartment covers (9/16 in. A/F).

Note: Access to the cylinder head nuts can be obtained without removing the complete engine cover plate, but as it means working in a confined space with the cover plate in position, it is advisable to remove it.

- (ii) Remove the engine compartment cross-member (Fig 11(21)) (3/4 in. A/F). Remove the nuts (1/8 in. B.S.W.) securing the ignition cable conduits clip to the bracket on the top of the valve rocker cover (3) and remove the clip.
- (iii) Slacken the hose connection clips on the carburettor air horn (22), unscrew the union nuts connecting the distributor breather (5/16 in. B.S.W.) pipes (4) to the air inlet pipe (2). Finally remove the air horn (8 nuts 7/16 in. A/F) and inlet pipe.
- (iv) Remove the banjo bolt securing the engine breather pipe to the rocker cover and move the pipe aside. The banjo bolt together with the two washers should be temporarily replaced in the rocker cover. (This instruction applies only to engines with breather pipe fitted to valve rocker cover).
- (v) Remove the three acorn nuts and washers securing the rocker cover (3) to the cylinder head. The centre nut on certain engines carries the clip for the modification certificate container. Remove the rocker cover.
- (vi) With a standard type 5/16 in. box spanner and a steel tommy bar check the tightness of the cylinder head holding down nuts, working to the sequence depicted in Fig 14.
- (vii) Check and if necessary adjust the inlet valve clearances (0.010 in. cold).

- (viii) Ensure that the mating faces of the cylinder head and the rocker cover are clean and the gasket in good condition.
- (ix) Refit the cover, tightening the retaining nuts securely but not excessively.
- (x) Replace the ignition cable conduits and clip on the valve rocker cover.
- (xi) Refit the carburettor air horn and inlet pipe, and connect the distributor breather pipes. If previously disconnected, refit the engine breather pipe ensuring that the banjo union is fitted with a joint washer on each side. Ensure that all hose connection clips are tight.
- (xii) See that the modification certificate container (if provided) is secured to the centre rocker cover retaining nut.

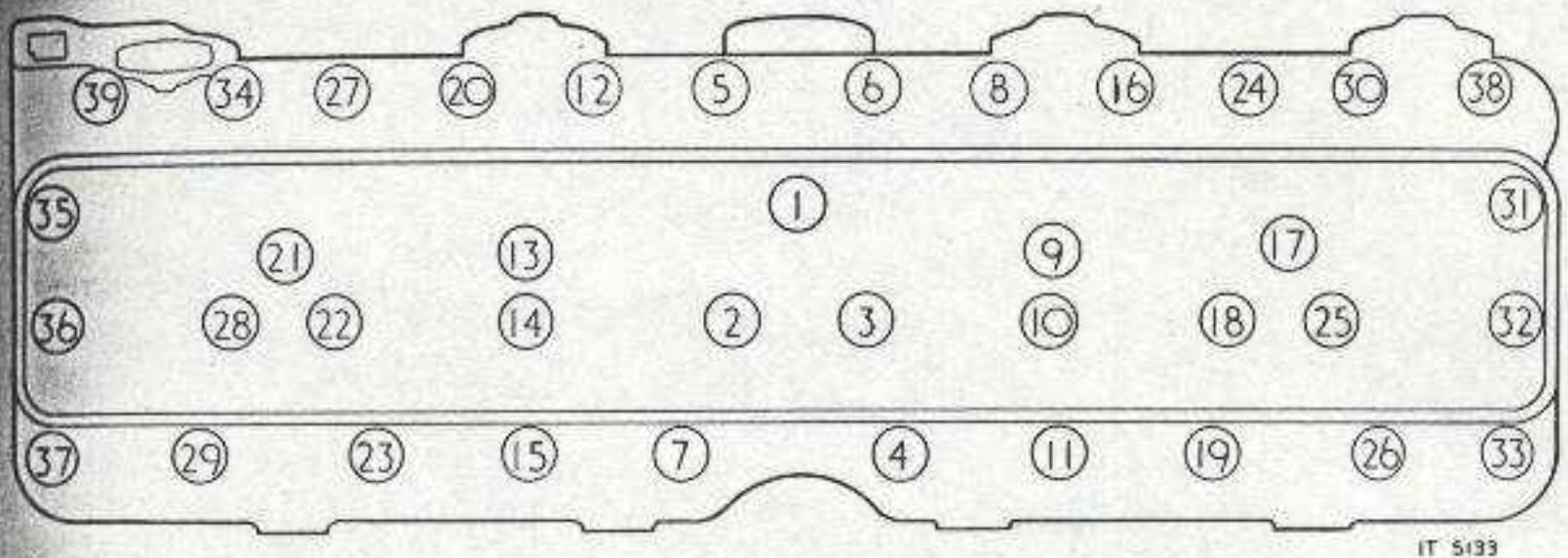


Fig 14 Cylinder head tightening sequence

Exhaust manifold and flanges

To check and tighten nuts (monthly task)

51. (a) Equipment required:-

Spanner, 1/2 in. A/F

Spanner, B.S.W., 1/4 in.

(b) Method:-

- (i) Start the engine and examine the system for signs of leakage.
- (ii) Switch off, and check the tightness of all exhaust manifold nuts (1/4 in. B.S.W.) and pipe flange nuts (1/2 in. A/F).
- (iii) If, after tightening the nuts, either a manifold or pipe flange gasket still shows signs of leakage, report to a vehicle mechanic.

6 - ENGINE LUBRICATING SYSTEM

DESCRIPTION

52. Fig 15 shows the layout of the system and will familiarize the crew with the position and function of all external pipes and unions and assist them in tracing leaks and in the diagnosis of faults. The following brief description of the path of the lubricant will act as a background to the practical instruction which follows.

53. The system is of the dry sump type with a capacity of 3 gallons. There are two circuits: pressure and scavenge.

54. The gear type pressure pump draws oil from the engine oil tank below the radiator and delivers it direct to the full flow oil filter on the right-hand side of the engine compartment. The filtered oil then passes to the relief valves from which the main oil supply is delivered to the crankshaft, camshaft, big-end and gudgeon pin bearings. The low-pressure supply from the relief valves is conveyed by a pipe and drilling to the inlet valve rocker shaft, rockers and exhaust valve tappets. A branch pipe from the low-pressure system conveys oil to a jet to lubricate the timing gears.

55. The gear type scavenge pump, draws oil from the engine sump and feeds it through the oil cooler, mounted above the engine, from whence it is returned to the engine oil tank.

56. The oil tank is provided with a push-in dipstick (Fig 11(11)), a filler pipe with captive clip-on cap (13), a breather pipe, and a drain plug which is accessible after removing an access plate (Fig 8(6)) on the rear of the hull bottom plate.

OPERATION OF CONTROLS

Oil pressure warning light

57. An amber warning light on the left of the driver's switchboard (Fig 36(4)), indicates any dangerous drop in oil pressure. The light is controlled by a switch incorporated in the main oil supply circuit and arranged to switch off the light when the pressure in the circuit exceeds approximately 7 lb/sq.in. The light will come on when the ignition is switched on and should go out as soon as the engine starts. Should it come on while the engine is running at normal speed, the engine must be stopped and the cause investigated.

SERVICING

To check engine oil level and top up (daily task)

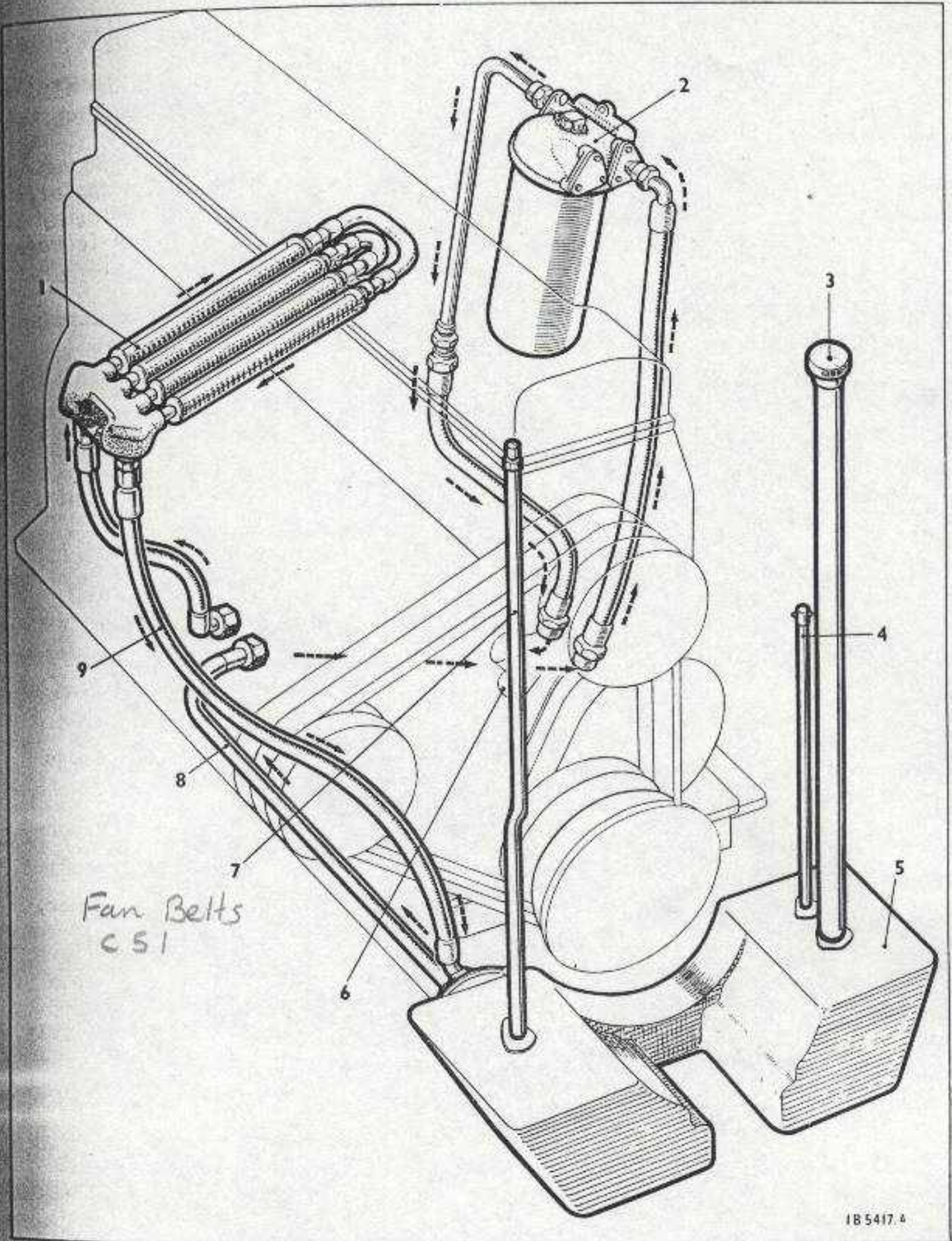
58. (a) Equipment required:-

Engine cover key

Supply of OMD-110 - see para 5

(b) Method:-

(i) Open the right-hand side engine cover.



- | | | |
|-----------------------|-----------------------------|--------------------------|
| 1 Oil cooler | 4 Oil tank dipstick | 7 Oil tank breather pipe |
| 2 Oil filter | 5 Oil tank | 8 Oil tank delivery pipe |
| 3 Oil tank filler cap | 6 Oil pressure relief valve | 9 Oil tank return pipe |

Fig 15 Engine lubrication system

- (ii) Check that some oil shows on the dipstick (Fig 11(11)).
- (iii) Start the engine and run it for a short time so that any oil which may be in the sump is returned to the tank, then stop the engine.

Warning: Failure to clear the sump before topping up the oil tank will cause overfilling. The consequent overloading of the scavenge system may damage the oil cooler. Extensive leakage from the oil tank may also be caused.

- (iv) Check that the oil level is up to the FULL mark on the dipstick. If necessary, top up.
- (v) Replace the filler cap and close the engine cover.

To change the engine oil (3,000 miles task)

Note: The oil should also be changed after the first 500 miles running.

59. (a) Equipment required:-

Hexagon key, 1/2 in. x 9 in.	Engine cover key
3 gallons OMD-110 (see para 5)	Container - 4 gallons
Spanner, 9/16 in. A/F	Cotton waste

(b) Method:-

- (i) With the engine warm and the vehicle on level ground, remove the engine oil drain access plate (Fig 8(7)).
- (ii) Clean any dirt from around the drain plug, and place the container under the access hold.
- (iii) With the hexagon key, remove the drain plug and joint washer, and allow the oil to drain.
- (iv) When all the oil has drained, clean the threads of the drain plug and drain hole, ensure that the joint washer is in good condition and replace the plug with washer. Tighten securely.
- (v) Fill the engine oil tank with OMD-110 or approved lubricant to the mark indicated on the dipstick (Fig 11(11)).
- (vi) Start the engine, check that the oil pressure warning light operates. Run the engine for five minutes and switch off.
- (vii) Check the level of oil and top up if necessary. Examine for leaks at the filter and drain plug. Replace the access plate. Close the engine cover.

Engine oil filter

60. The filter (Fig 11(12)) is of the felt element full flow type and situated in the rear right-hand side in the engine compartment.

To change the element (6,000 miles task)

61. (a) Equipment required:-

- Spanner, 1/2 in. A/F
- Spanner, B.S.W., 11/16 in.
- OMD-110 (see para 5)

- Engine cover key
- New element

(b) Method:-

(i) Open the right-hand side engine cover.

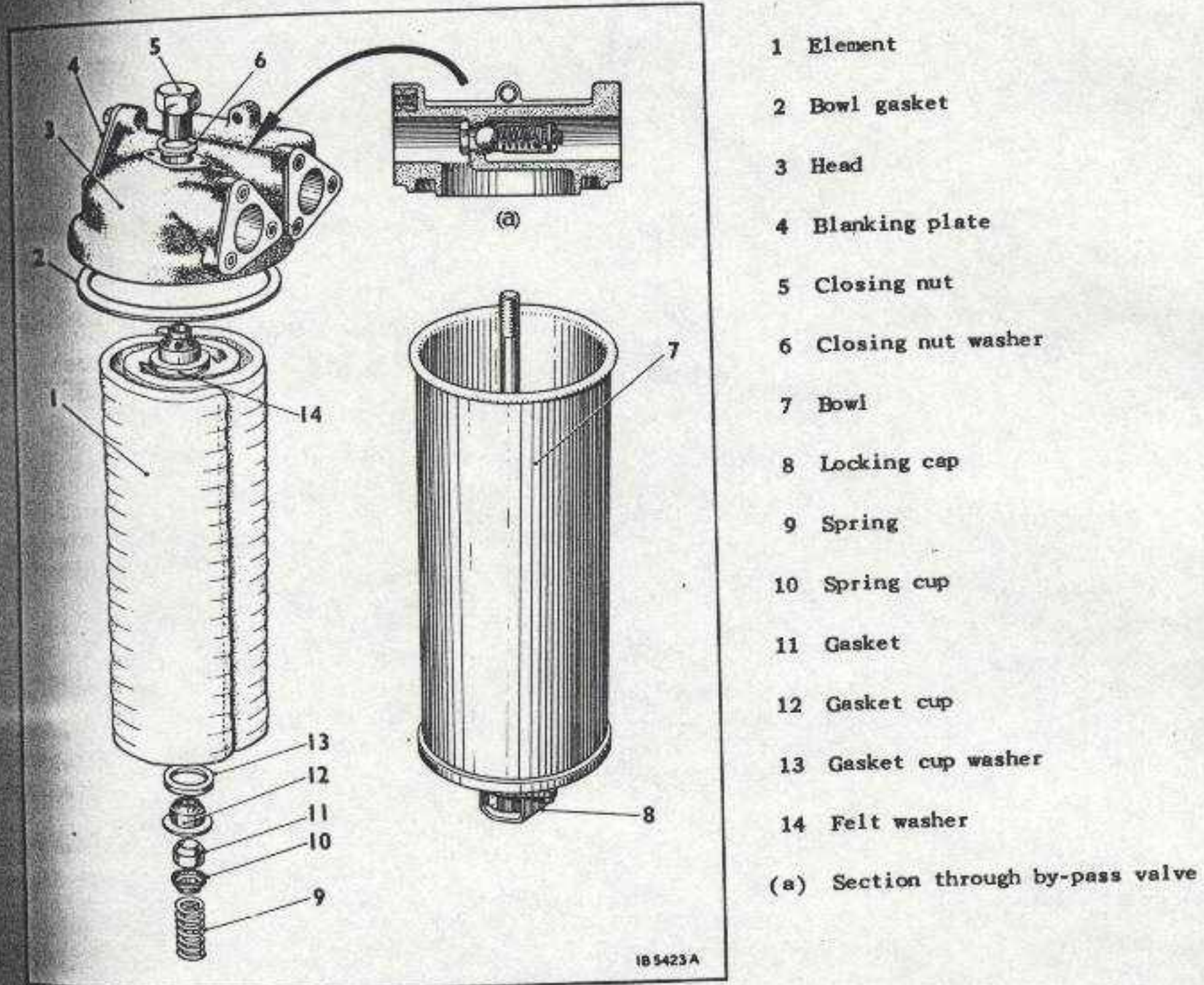


Fig 16 Exploded view of engine oil filter

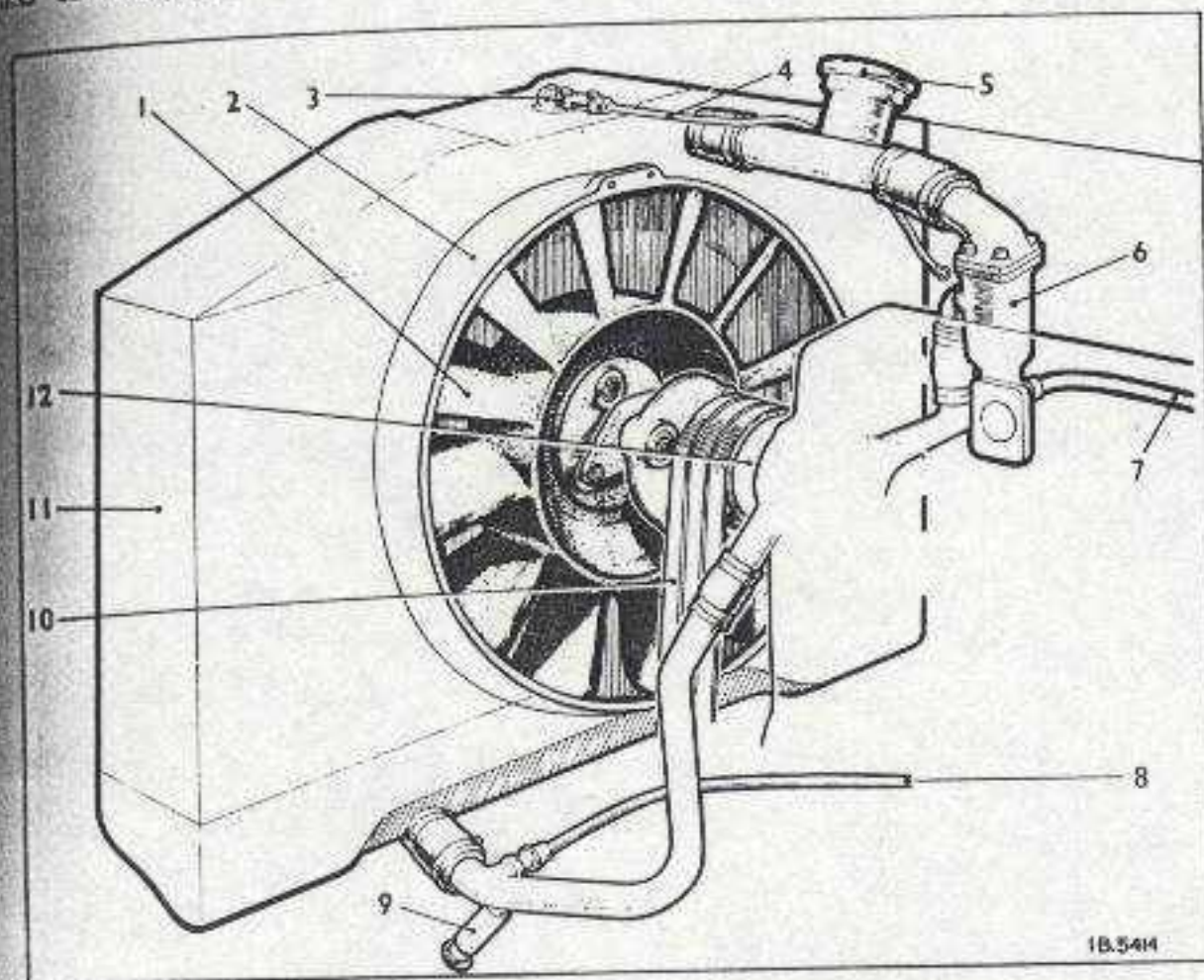
- (ii) Disconnect the pipes and remove the filter (Fig 11(12)).
- (iii) Remove the closing nut (Fig 16(5)) and washer (6).
- (iv) Draw the bowl (7) away from the head (3) bearing in mind that it will be filled with oil.
- (v) Remove the element (1), drain the bowl and remove the spring (9) which is fitted over the centre bolt in the base of the bowl. Before discarding the old element, ensure that the gasket (11) and spring cup (10), are removed from the recess in the base as they will be required for fitting in the new element.
- (vi) Clean the bowl thoroughly.
- (vii) Examine the gaskets and felt washer (14) and renew where necessary.
- (viii) Place the spring over the centre bolt in the bowl.
- (ix) See that the felt washer is positioned over the cap on the top of the new element and ensure that the gasket cup washer (13), gasket cup (12), gasket (11) and spring cup (10) are positioned in the recess in the bottom of the element.
- (x) Place the element in the bowl, then fill the bowl with clean OMD-110 or approved lubricant.
- (xi) See that the bowl gasket (2) is positioned in the head recess then engage the centre bolt in the head, raise the bowl and at the same time ensure that the element cap engages the recess in the head.
- (xii) Press the bowl firmly against the gasket on the head, then replace the closing nut with gasket and tighten up. Do not overtighten.
- (xiii) Replace the filter and connect up the pipes, ensuring that the gaskets are undamaged.
- (xiv) Start the engine and check for leaks. Re-check the tightness of the closing nut and pipe flanges when the engine has reached normal operating temperature.

7 - ENGINE COOLING SYSTEM

DESCRIPTION

62. The following brief description of the path of the coolant will act as a background to the practical instruction following (see Fig 17).

63. The system is sealed and has a capacity of 4.1/2 gallons. The coolant used is an anti-freeze mixture of one third ethylene glycol and two thirds water.



- 1 Fan
- 2 Fan cowl
- 3 Pressure relief valve
- 4 Relief valve outlet pipe
- 5 Radiator filler cap
- 6 Thermostat housing
- 7 Induction manifold jacket connecting pipe
- 8 Cylinder block drain pipe
- 9 Coolant drain
- 10 Fan driving belts
- 11 Radiator
- 12 Coolant impeller

Fig 17 Cooling system

64. A belt-driven impeller type pump on the rear of the engine assists circulation of the coolant from the bottom of the radiator through the cylinder block water jacket, through the thermostat housing and into the top of the radiator.

65. When the engine is cold and the thermostat closed, the coolant is prevented from passing to the top of the radiator and is passed back to the engine where it is re-circulated until warmed sufficiently to open the thermostat valve.

66. A pressure and vacuum relief valve operating at +10 lb/sq.in. and -3 lb/sq.in. is fitted to the top of the radiator header tank to protect the system against excessive pressures.

67. The filler cap for the system is situated in the coolant pipe from the cylinder head to the radiator header tank. The relief valve outlet pipe is situated between the relief valve and the left-side of the engine compartment.

68. The cooling fan, which is driven by a pulley on the crankshaft through a flexible coupling, draws air through the louvres of the engine covers and directs it through the radiator to maintain the coolant at the correct working temperature, the heated air escaping through the air-outlet louvres at the extreme rear of the hull.

69. A thermometer graduated in degrees Fahrenheit is mounted in the centre of the instrument panel (Fig 36(9)) and registers the temperature of the coolant. The thermometer bulb unit (Fig 12(13)) is fitted in the upper part of the engine cylinder block. The operating temperature should be between 170 and 190 deg F, but will vary according to climatic conditions.

SERVICING

Coolant level

To check and top up the cooling system (daily task)

70. The system is filled and topped up through a filler hole normally closed by means of a clip-on type cap (Fig 11(16)). Since the system is sealed the filler cap should not be removed when the engine is hot. When the system is filled correctly the level of the coolant will be just below the edge of the filler hole.

(a) Equipment required:-

Engine cover key

Coolant

(b) Method:-

- (i) Open the left-hand side engine cover.
- (ii) Turn the radiator filler cap (Fig 11(16)) anti-clockwise and remove.
- (iii) Check the level.
- (iv) If necessary, top up to just below the edge of the filler hole with clean coolant.
- (v) Replace the filler cap, turning it clockwise as far as possible to make a pressure-tight joint. Close and secure the engine cover.

To drain the cooling system

71. As the system contains anti-freeze mixture, the mixture should be drained into a clean container and preserved for re-use.

(a) Equipment required:-

Engine cover key
Container 4.1/2 gal

Hexagon key, 1/2 in. x 9 in.

(b) Method:-

- (i) Slacken the radiator filler cap (Fig 11(16)).
- (ii) Remove the coolant drain plug (Fig 8(1)) from right side of the rear hull plate and allow the system to drain.

- (iii) Open the induction manifold jacket drain tap (Fig 13(17)).
- (iv) After draining, replace and tighten the drain plug with joint washer and close the manifold tap.
- (v) Tighten the filler cap and close the engine cover.

If the vehicle is left, a notice NO WATER should be placed on the front of the vehicle.

To fill the cooling system

72. (a) Equipment required:-

Engine cover key	4.1/2 gal of coolant
------------------	----------------------

(b) Method:-

- (i) Open the left-hand side engine cover.
- (ii) Remove the radiator filler cap (Fig 14(16)) by turning it anti-clockwise.
- (iii) Ensure that the induction manifold jacket drain tap (Fig 13(17)) is closed and the coolant drain plug (Fig 8(1)) tight.
- (iv) Pour in coolant slowly until the level is just below the edge of the filler hole.
- (v) Replace the filler and turn it clockwise as far as possible.
- (vi) Start the engine and run it for two minutes, then switch off.
- (vii) Check level of coolant and top up if necessary.

Fan belt adjustment (vehicle mechanic)

73. When adjusted correctly, the vertical run of the fan and generator driving belts should have 1/2 in. deflection either way.

(a) Equipment required:-

Engine cover key	Spanner, 9/16 in. A/F
------------------	-----------------------

(b) Method:-

- (i) Open the left-hand side engine cover.
- (ii) Slacken the outer nut on the driving belt adjuster (Fig 13(8)).
- (iii) Turn the inner nut in the required direction to give half an inch deflection in either direction at the centre of the vertical run of the belts.
- (iv) Tighten the outer nut and close the engine cover.

Radiator and fan

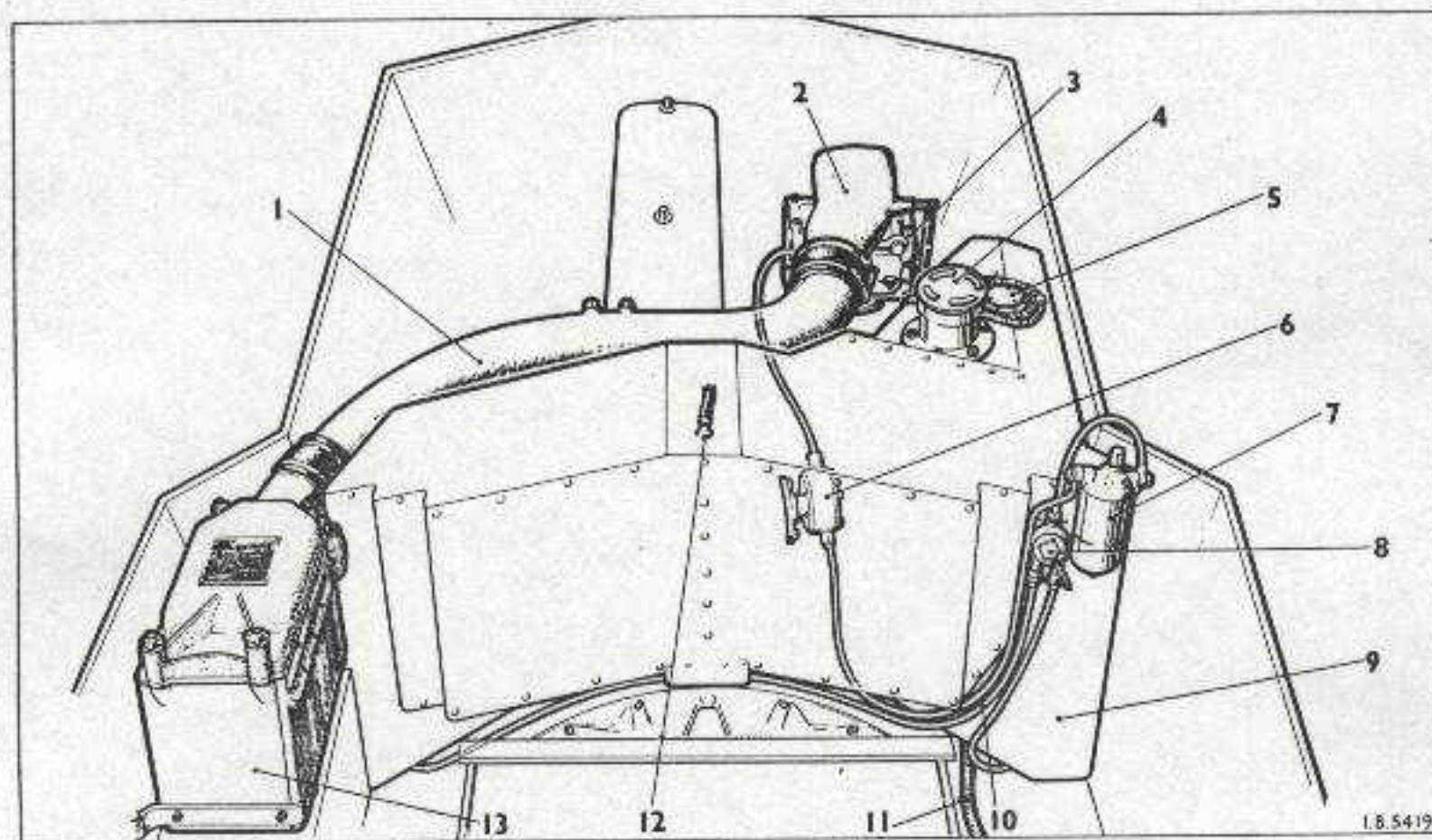
74. Check that the cowl mounting bolts (1/2 in. A/F) are secure, the radiator matrix clean and undamaged, and the spring-loaded mounting bolts securely pinned. Check the fan for security and damage, with particular attention to the coupling bolts.

Hoses and clips

75. Check all hose connections for leaks. Report to a vehicle mechanic if leaks are found.

Coolant pump

76. One lubricating nipple (Fig 12(12)) is provided in the coolant pump for the bearing which should be lubricated every 6,000 miles.



- | | | |
|-------------------|-------------------|-----------------------------|
| 1 Air inlet pipe | 5 Fuel gauge unit | 9 Fuel tank |
| 2 Air horn | 6 Fuel pump | 10 Fuel suction pipes |
| 3 Carburettor | 7 Fuel filter | 11 Fuel gauge cable conduit |
| 4 Fuel filler cap | 8 Fuel tap | 12 Fuel tank breather pipe |
| | | 13 Air cleaner |

Fig 18 Fuel system

8 - FUEL SYSTEM

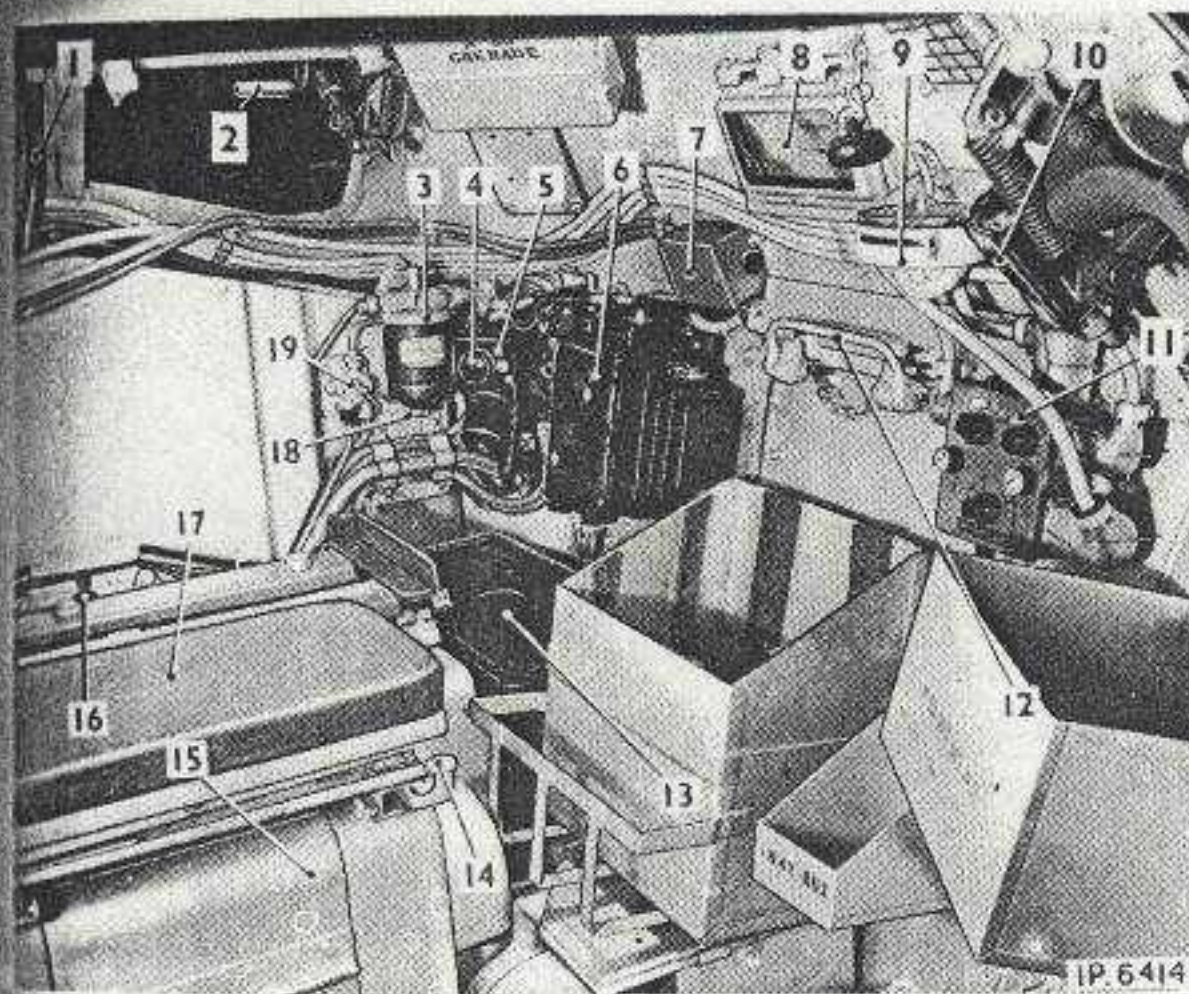
DESCRIPTION

77. Fig 18 shows the layout of the fuel system and will serve to familiarize the crew with the position of the external pipes and unions. It will also assist in tracing leaks and in the diagnosis of faults.

78. The fuel tank is mounted between the engine and fighting compartments. It has a main capacity of 18 gallons and a reserve capacity of 3 gallons. A drain plug is situated in the bottom of each side of the fuel tank above the access plates (Fig 8(3) and (6)) in the hull.

79. The fuel is drawn from the tank, through a 2-way tap and filter by a mechanically operated pump on the induction side of the engine. The fuel is then fed to the carburetter.

80. The fuel tank filler cap is located in the front left-hand side of the engine compartment. The filler is provided with a gauze filter. A breather pipe from the tank terminates on the outside of the hull above the engine compartment.



- 1 Fuel tank breather pipe
- 2 Rear observation flap locking handle
- 3 Fuel filter
- 4 Inspection lamp socket cap
- 5 Distribution box
- 6 Generator panel
- 7 W/T junction box
- 8 Side observation visor
- 9 Roof lamp
- 10 Smoke discharger button box
- 11 W/T control unit
- 12 Escape hatch release handle
- 13 Battery box
- 14 Gunner's seat catch - horizontal adjustment
- 15 Gearbox access cover
- 16 Fluid coupling access hole
- 17 Gunner's seat
- 18 Fuel filter drain plug
- 19 Fuel tap

Fig 19 Rear L.H. interior view of Mk 2 Reconnaissance vehicle with equipment removed

OPERATION OF CONTROLS

81. The fuel tap (Fig 19(19)) is located on the rear left side of the fighting compartment and is marked M for main and R for reserve. The central position is "off".

Note: The reserve fuel should be used only in an emergency and as soon as the tank has been refilled, the tap must be turned to main (M).

Fuel pump priming lever

82. A priming lever (Fig 13(14)) is located on the side of the fuel pump. This should normally be used initially to fill the carburetter.

SERVICING

Fuel tank

Warning: When filling rubber tyred vehicles with large quantities of fuel there is considerable danger of fire from the discharge of static electricity.

In order to release these charges before filling up, the hull should be earthed by leaning a crowbar between the hull and ground, or by dropping one end of the towrope on the ground while the other end remains on the vehicle. This precaution is most essential when filling from pumps.

To fill the fuel tank

83. (a) Equipment required:-

Fuel funnel

Engine cover key

(b) Method:-

- (i) Open the left-hand side engine cover.
- (ii) Unscrew and remove the fuel filler cap (Fig 11(1)). Ensure that the joint washer is not misplaced. Do not remove the filler filter.
- (iii) Turn the ignition switch to ON.
- (iv) Fill the tank until the fuel gauge on the instrument panel (Fig 36(9)) registers full. Turn the ignition switch to OFF.
- (v) Replace and tighten the filler cap with joint washer. Close the engine cover.

To drain the fuel tank

84. (a) Equipment required:-

Spanner, 9/16 A/F
Clean containers

Hexagon key

(b) Method:-

- (i) With the vehicle standing on level ground, remove the fuel drain plug access plates (Fig 8(3) and (6)).
- (ii) Remove each of the two drain plugs and joint washers in turn and allow the fuel to drain into the containers.

- (iii) Check that the joint washers are in position, then replace the drain plugs and tighten up.
- (iv) Replace the drain plug access plates.

55. Fuel filler filter:-

A gauze filter is fitted under the filler cap (Fig 11(1)). This filter should be removed periodically and washed in clean gasoline.

Fuel pump

84. The fuel pump (Fig 13(13)) is located on the induction side of the engine. It is of the normal diaphragm type and is fitted with a hand priming lever - para 82. The pump should not require servicing between major overhauls.

Fuel filter

87. The fuel filter (Fig 19(3)) is located at the rear left-side of the fighting compartment. The filter should be cleaned every 3,000 miles (vehicle mechanic).

To clean the filter

88. (a) Equipment required:-

- Spanner, B.S.W., 3/16 in.
- Spanner, 11/16 in. A/F

(b) Method:-

- (i) Turn off the fuel, i.e., fuel tap lever (Fig 19 (19)) in the central position.
- (ii) Remove the filter drain plug (18) locking wire, place a suitable receptacle underneath, then remove the drain plug and allow the filter to drain. Ensure that the drain plug gasket is not misplaced.
- (iii) Support the bowl (Fig 20 (5)), then unscrew and remove the centre bolt wingnut (2) and gasket, and remove the bowl with element (9).

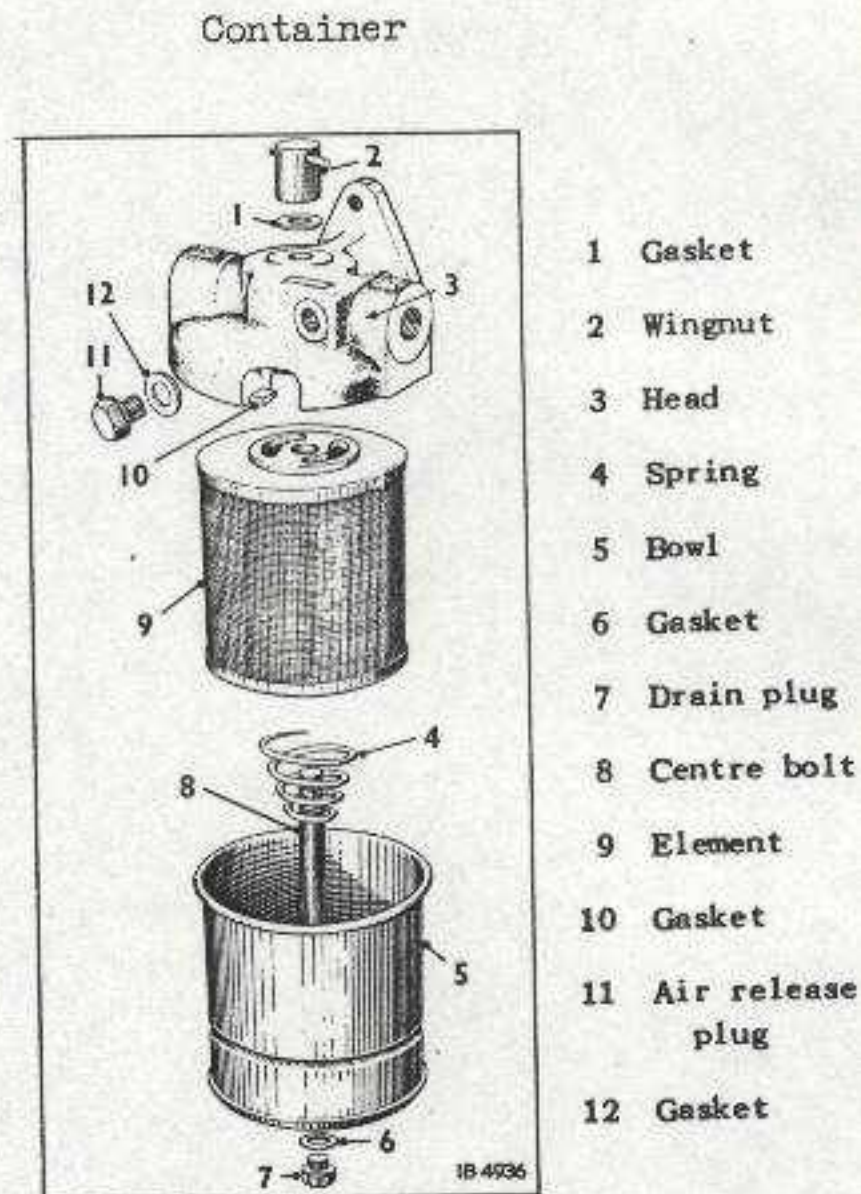


Fig 20 Exploded view of fuel filter

- (iv) Remove the element, ensuring that the spring (4) in the base of the bowl is not misplaced.
- (v) Rinse the element in clean gasoline, carefully removing any sediment on the outside.
- (vi) Thoroughly clean out the bowl.
- (vii) Examine all gaskets and renew where necessary.
- (viii) Place the spring - large diameter uppermost - in the bowl and insert the element so that the ports are on the top.
- (ix) Guide the bowl centre bolt through the head, at the same time ensuring that the element seats centrally against the underside of the head.
- (x) Push the bowl up against the gasket in the head recess, then replace the centre bolt wingnut and gasket and tighten up. Tighten the nut securely but not excessively.
- (xi) Fit the drain plug with gasket, tighten up and lock with suitable wire.
- (xii) Remove the filter air release plug (11) and gasket, then fill the filter with clean gasoline through the plug hole.
- (xiii) Refit the air release plug with gasket and tighten up.
- (xiv) Turn on the fuel.
- (xv) Start the engine and examine the filter for leaks. All pipes and connections should be checked weekly for damage and security. The fuel tank breather pipe (Fig 18(12)) should be checked weekly to ensure that it is clear.

9 - THE CARBURETTER

89. The carburetter (Fig 11(23)) is fitted to the induction manifold. Air is drawn from the engine air cleaner through the carburetter and into the induction manifold. Fuel is supplied to the carburetter by the fuel pump (Fig 13(13)).

OPERATION OF CONTROLS

Accelerator

90. The accelerator pedal (Fig 36(18)) is in the right-hand side in the driver's compartment. It is connected to the carburetter by an adjustable rod and lever linkage.

Note: Do not touch the accelerator while the engine is being started by means of the starter carburetter. Do not pump the accelerator when the vehicle is standing in gear with the brake on as this will cause excessive slip in the fluid coupling, resulting in overheating of the oil.

HAND THROTTLE CONTROL

91. The hand throttle control (Fig 36(24)) is mounted immediately below the driver's switchboard and is connected to the accelerator control stop lever by a cable. To increase the idling speed, press the accelerator pedal until the engine reaches the required speed and screw out the knob to hold the pedal. Return the knob to the "off" position before moving off.

92. The control may be used after starting the engine from cold to maintain a fast idling speed (800 to 1,000 r.p.m.) to warm up the engine. When the control is fully off, the engine should run satisfactorily at a normal idling speed. This speed is controlled by the adjustment of the carburetter (para 98).

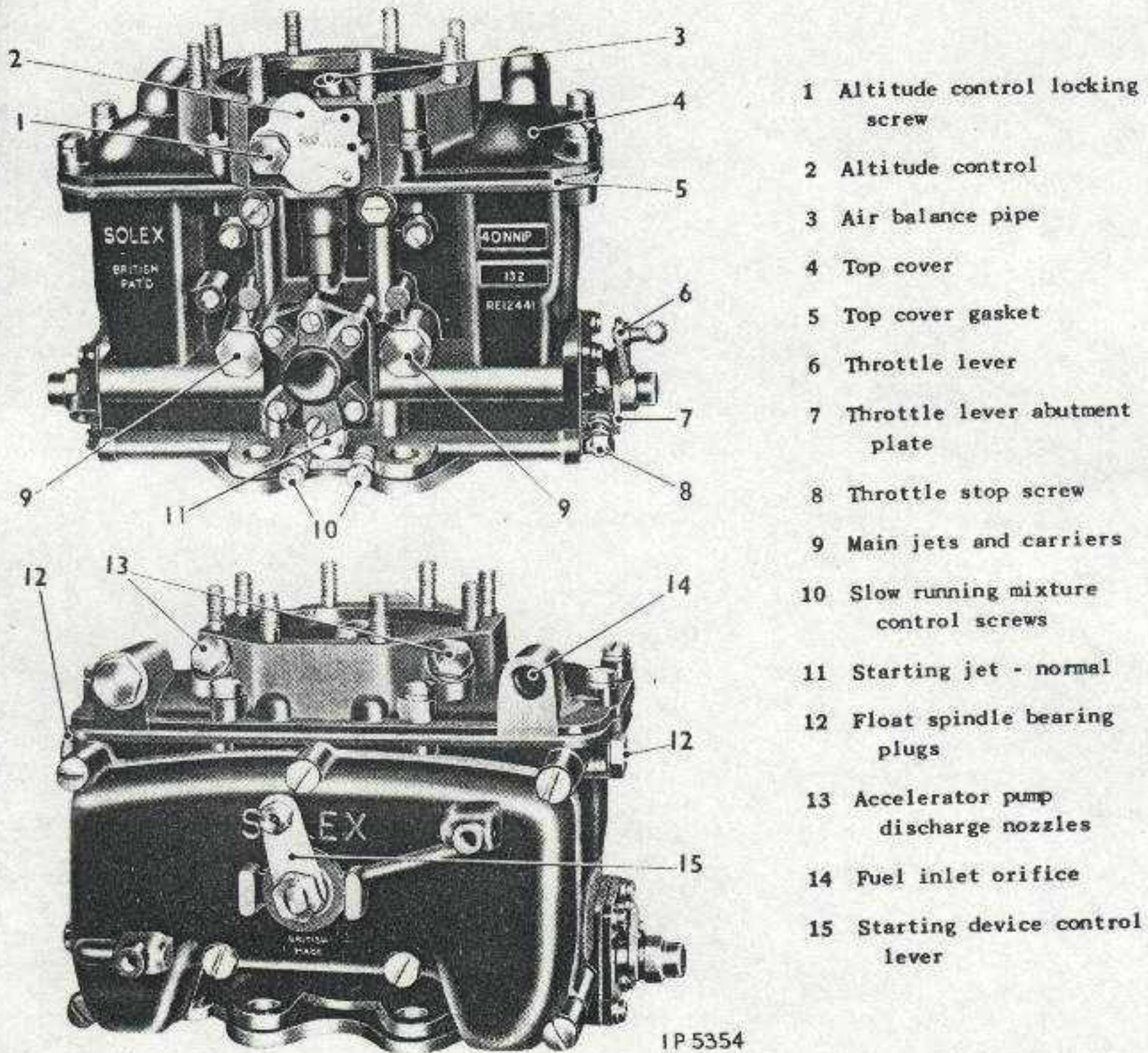


Fig 21 Carburetter

Starter carburetter

93. The carburetter is fitted with a starting device operated by a control (Fig 36(1)) situated on the left-hand wall of the driver's compartment. This control should be used only when starting from cold and should be returned to the fully "in" position as soon as the engine will run without it. When the control is in operation the accelerator pedal should not be moved.

94. The carburetter starting device control knob has three positions in addition to the fully "in" position. They are as follows:-

(a) For starting from cold (normal operation):-

Pull the control knob out, without turning, to the first stop. Return the control to the fully "in" position as soon as the engine will run with the control in that position.

(b) For starting in cold weather:-

Pull the control knob out as in (a), then turn it anti-clockwise as far as possible and pull it out further to the next stop. Return the control to (a) and then fully "in" as soon as the engine will run with the control in that position.

(c) For starting in sub-zero conditions:-

Pull the control knob out as in (a) and (b), then turn it clockwise as far as possible and pull it out further to the next stop. Return the control to position (b) as soon as the engine starts, and then to the fully "in" position as soon as the engine will run with the control in that position.

Note: Do not use the carburetter starting device when the engine is warm.

Do not use the carburetter starting device for longer than necessary.

Do not use the control in intermediate positions.

95. The sub-zero position must only be used in extreme cold conditions since it provides an extremely rich mixture and if used indiscriminately will flood the engine with fuel and make starting difficult.

96. An altitude compensating control is also fitted to the carburetter. This is a pre-set mixture control and its setting must not be changed without specific instructions.

SERVICING

Fuel feed pipe banjo union filter

97. The banjo union of the fuel feed pipe (Fig 11(24)) to the carburetter is fitted with a gauze filter which should be cleaned every 1,000 miles.

To clean the filter

(a) Equipment required:-

Engine cover key
Spanner, B.S.W., 3/8 in.

Clean gasoline

(b) Method:-

- (i) Open the left-hand side engine cover.
- (ii) Remove the banjo bolt ensuring that the two joint washers do not fall.
- (iii) Remove the gauze filter and wash in clean gasoline.
- (iv) Replace the gauze. Ensure that the joint washers are in good condition and positioned one on each side of the banjo union, then replace and tighten the banjo bolt.

Carburetter adjustment

98. It is most important that the slow-running mixture control screws (Fig 21(10)) are correctly adjusted. Adjustment will be necessary if any of the following symptoms are observed:-

- (a) "Flat spots" (hesitation) when accelerating.
- (b) "Hunting" (uneven running when idling).
- (c) Black smoke from the exhaust.
- (d) Engine not idling when the idling speed control is slackened right off.

The adjustment must be made with the engine at the usual working temperature and the idling speed control knob screwed in fully.

To adjust the slow running (vehicle mechanic)

99. (a) Equipment required:-

Engine cover key
Small screwdriver

(b) Method:-

The slow-running is effected by adjusting the two slow-running mixture control screws (Fig 21(10)) and the throttle stop screw (8).

- (i) Run the engine up to the normal working temperature.
- (ii) Ensure that the accelerator and linkage are working freely. Lubricate pivots if necessary.

- (iii) Screw in each slow-running adjustment screw fully, without force, and screw back approximately $1.1/4$ turns.
- (iv) Adjust the screws further by the same amount, if necessary, to obtain even running of the engine. The normal position of the screws is from $1.1/4$ to $1.1/2$ turns open.
- (v) Check the slow-running speed by reference to the tachometer. The speed should be between 300 and 400 r.p.m. Adjust, if necessary, by turning the throttle stop screw in the required direction.
- (vi) Ensure that the engine speeds up without hesitation by means of the accelerator.

Altitude compensating control

Note: Adjustment must not be made unless orders are given to do so.

To adjust the altitude compensating control

100. Three positions of the altitude control are provided and these are marked zero, 3,000 and 6,000. These figures indicate the lowest altitude at which the vehicle is likely to operate. Thus, if the control is set to 3,000, the vehicle should not be operating *below* 3,000 ft. If it does, the mixture will be too weak for efficient running.

- (a) Slightly slacken the altitude control locking screw (Fig 21(1)).
- (b) Set the control so that the hole adjacent to the altitude figure required registers on the spring-loaded ball in the carburetter casing.
- (c) Tighten the locking screw.

Checking and tightening retaining nuts

101. The induction manifold and carburetter securing nuts ($3/16$ in. and $5/16$ in. B.S.W.) should be checked for tightness weekly, bearing in mind that a comparatively thick heat insulating gasket is positioned between the carburetter mounting flange and the manifold; therefore these nuts should not be tightened excessively. After tightening the manifold nuts it may be found necessary to readjust the engine slow running (para 99).

Control rods, joints and springs

102. Apply a few drops of oil to the accelerator control rod joints and bearings, the starter carburetter control cable, and the bearings on the carburetter. Check the security of return springs. If the engine is run frequently in very dusty conditions, any excess oil on the control joints and bearings will collect dust which may affect the smooth working of the controls. Affected parts should be washed with kerosine and then lubricated sparingly.

10 - THE AIR CLEANER

103. The engine air cleaner (Fig 23(4)) is of the oil bath type and situated in the rear right side of the fighting compartment. It is connected to the carburetter by an air inlet pipe (Fig 11(2)).

104. The air cleaner should be dismantled and cleaned weekly if operating under normal conditions. If operating in very dusty conditions, it should be cleaned daily.

105. The box type body has a detachable cover secured by four captive screws. The body houses an oil container which in turn houses an oil wetted element. In the base of the container is a removable perforated damper to prevent oil surge.

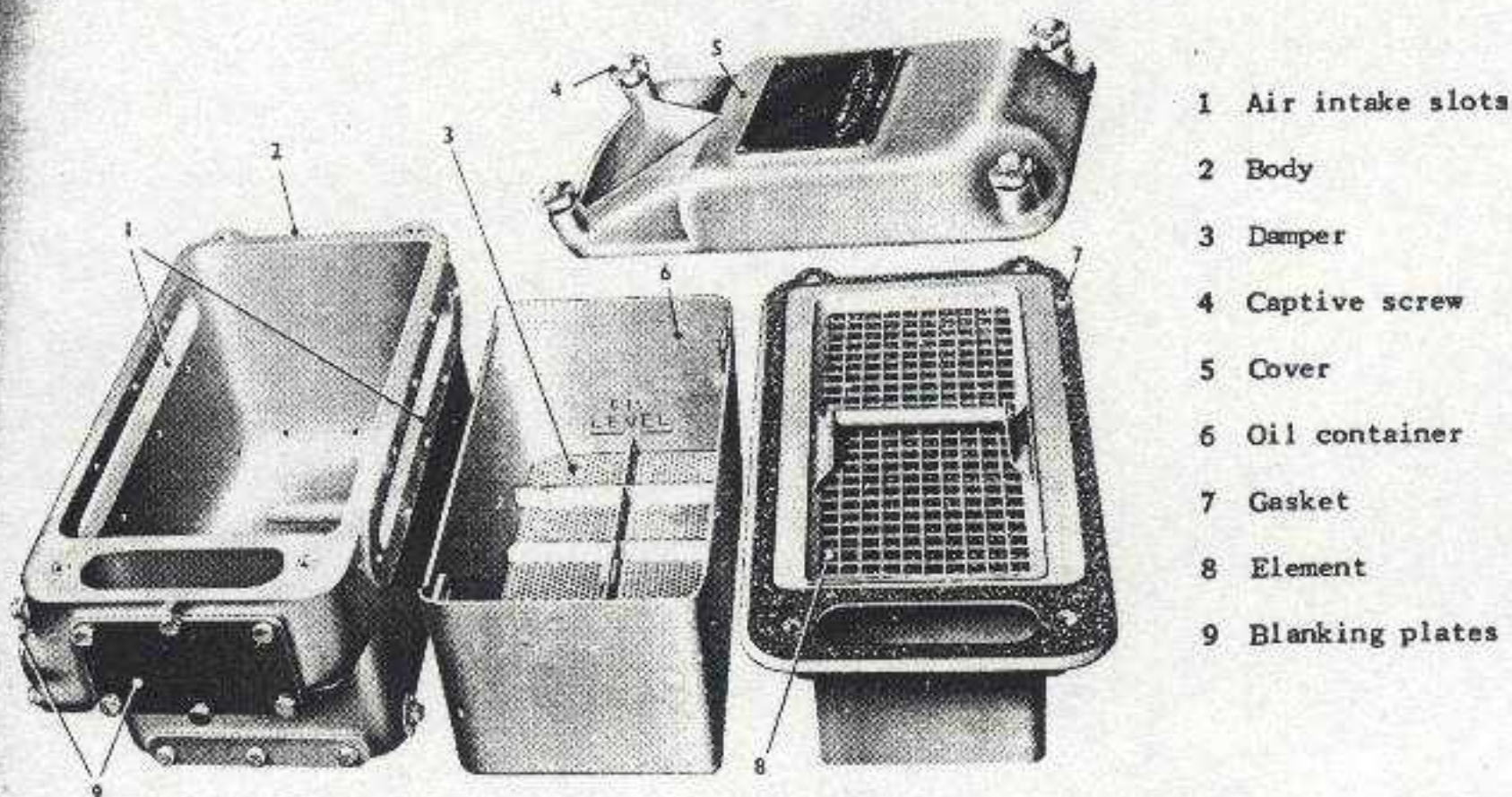


Fig 22 Exploded view of air cleaner

Servicing

To clean the air cleaner

106. (a) Equipment required:-

Spanner, 5/8 in. A/F
(for loosening screws only)

Clean gasoline
OMD-110 (see para 5)

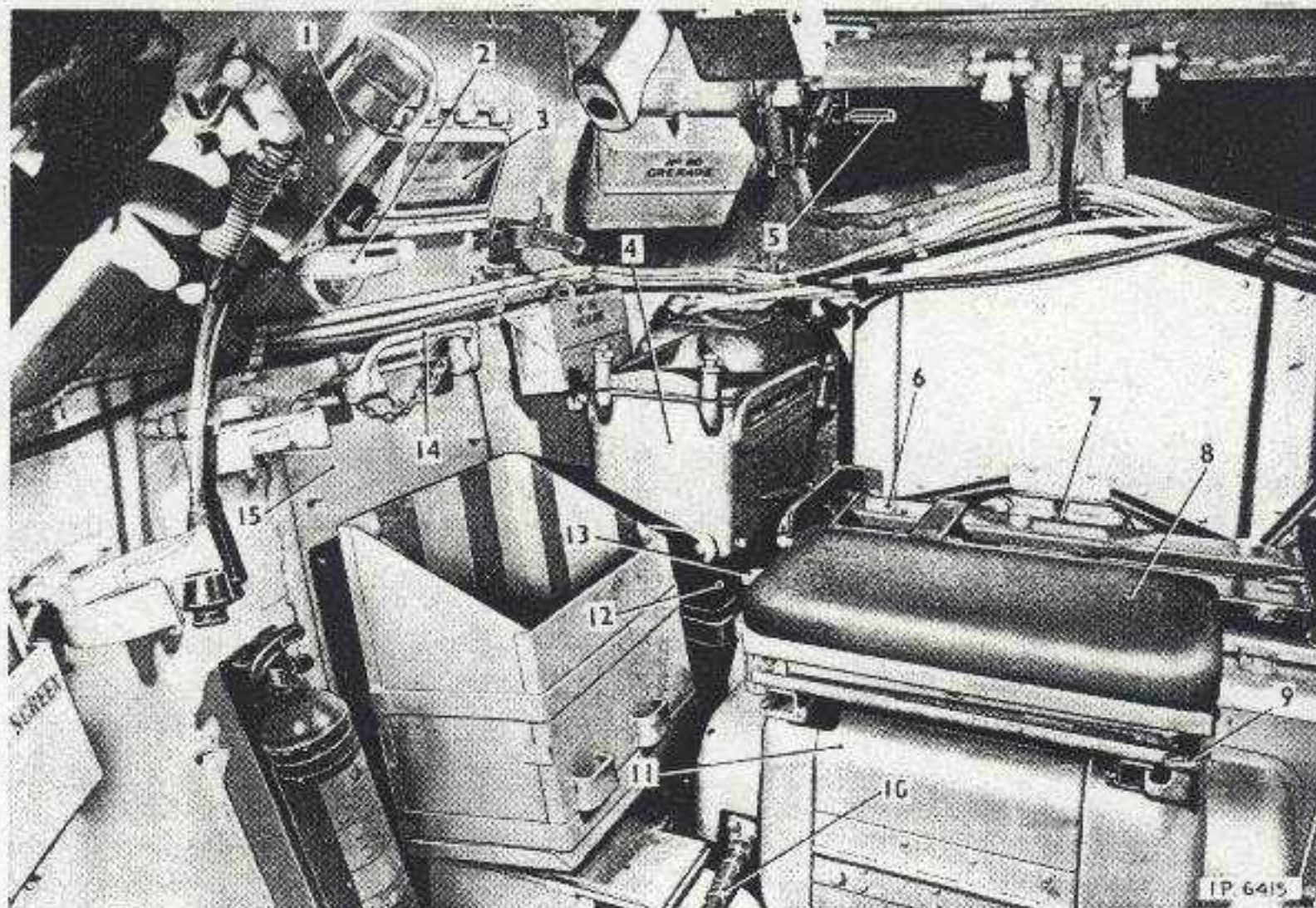
(b) Method:-

- (i) Unscrew the four captive screws and remove the top cover (Fig 22(5)).
- (ii) Lift out the element (8).
- (iii) Lift out the oil container (6) and remove the damper (3).
- (iv) Drain the oil from the container, clean out with gasoline or kerosine, and allow to dry.

- (v) Clean out the body, damper and top cover in the same way.
- (vi) Flush through the element with gasoline or kerosine in the reverse direction to the air flow and then allow it to drain completely.
- (vii) Replace the damper in the oil container, fill with the correct grade of oil to the level mark indicated, and replace the container in the body.

Note: It is important that the level of oil in the container should be within 1/16 in. of the indicated level mark. To ensure satisfactory operation of the cleaner this tolerance must not be exceeded and, to fulfil these conditions, the container should be placed in a level position when being filled.

- (viii) Replace the element, ensuring that the gaskets are undamaged.
- (ix) Replace the top cover and progressively tighten the screws hand tight.



- | | | |
|----------------------------------------|-----------------------------------------------|----------------------------------------------|
| 1 W/T control unit | 7 Fluid coupling filler aperture | 12 Battery box |
| 2 Roof lamp | 8 Gunner's seat | 13 Gunner's seat catch - vertical adjustment |
| 3 Side observation visor | 9 Gunner's seat catch - horizontal adjustment | 14 Escape hatch release handle |
| 4 Air cleaner | 10 Speedometer cable | 15 Escape hatch |
| 5 Rear observation flap locking handle | 11 Gearbox access cover | |
| 6 W/T set mounting | | |

Fig 23 Rear R.H. interior view of Mk 2 Reconnaissance vehicle with equipment removed

11 - IGNITION

107. The coil ignition system is waterproofed and fully tropicalized. The equipment comprises a distributor, an ignition coil, a filter unit, junction box and six sparking plugs, connected by cables contained in screened flexible metallic conduits. Alternative marks of distributor or coil may be fitted (see DATA). The alternative items are interchangeable as complete units. The ignition equipment is screened and filtered to reduce electrical interference to radio services. The introduction of V.H.F. wireless sets call for a high standard of vehicle suppression if full advantage of these sets is to be obtained; good maintenance of the electrical system is therefore essential. Possible sources of interference by the ignition system are included under SERVICING. It should be remembered that even if a wireless set is not fitted, the vehicle electrical system can cause interference to nearby wireless sets.

108. The distributor (Fig 11(7)) is situated centrally on the exhaust side of the engine and is driven in a clockwise direction (looking down on engine) by an extension of the oil pump driving shaft. Incorporated in the distributor, and actuated by a three lobed cam, is a contact breaker having two sets of contact points. One set of points is mounted on a movable plate to enable the contacts to be synchronized and it is essential that this plate is not disturbed during user servicing. To identify the movable plate securing screws they are sealed with red paint.

109. The contact breaker is secured to a baseplate below which is an automatic advance mechanism (see DATA). A centrifugal type speed limiter, which cuts out the ignition at an engine speed of 3,650 and 3,850 r.p.m., is embodied in the rotor. For details of ignition timing see under DATA on page 7.

110. As the distributor is waterproofed, special provision is made for ventilation, air being circulated through the distributor via two breather pipes (4) connected to the carburettor air inlet pipe (2).

Distributors, No.1, Mk 2, were originally fitted with waxoline impregnated cam felts but to prevent unsatisfactory waxoline being included in the distributors, the cam felts are now omitted. This change is indicated by erasure of No.11 from the modification record plate.

111. The coil (19) is a 12 volt unit mounted horizontally on the induction manifold. The coil is made suitable for the 24 volt supply by means of a ballast resistance connected in series with the coil. This resistance, which is housed in the junction box, is short-circuited at starting.

112. The filter unit (Fig 13(16)) is bolted to a bracket on the induction side of the engine. It comprises two choke coils connected in series with the L.T. of the coil and two capacitors connected one across each coil and earth.

113. The 14 mm sparking plugs are of the three-piece screened type with a built-in resistor to prevent erosion of the plug points.

OPERATION OF CONTROLS

Ignition switch

114. The ignition switch, on the switchboard (Fig 36(4)) to the left front of the driver, is a three-position unit, LOCK, ON and OFF, incorporating a barrel type lock. With the ignition key inserted in the lock, the switch can be turned to any of the three positions. If the key is removed when the switch is in the LOCK position, the switch cannot be moved. If the key is removed when the switch is in the OFF or ON position the switch can be turned to the OFF and ON positions only.

115. When the ignition switch is turned to the ON position, battery current is fed through the distributor box, generator panel, ignition switch, ballast resistance and filter unit to the coil. From the ignition switch, battery current is also fed through a 10A circuit breaker to the ignition warning light, oil pressure switch and light, starter switch, thermometer, fuel gauge and the instrument panel light.

Starter switch

116. When the starter switch situated on the switchboard (Fig 36(4)) is operated, the starter motor solenoid and hence the starter are energized. At the same time the ballast resistance is short-circuited and the maximum available battery voltage (24V nominal) is applied to the coil. When the starter switch is released, the ballast resistance is inserted in the ignition circuit and the voltage applied to the coil is reduced to approximately 12 volts.

Ignition warning lamp

117. Located on the switchboard (Fig 36(4)) is a red warning light which should glow when the ignition is switched on and remain alight until the generator begins to charge the batteries, when it should go out. When the engine stops, the light glows again and remains alight until the ignition is switched off. A faulty lamp in the ignition warning light will not affect the operation of the ignition system. The warning light will remain alight if the generator fording caps are removed from the generator panel (see para 187).

SERVICING

Sparking plugs

118. The sparking plugs should be cleaned and checked by an electrician after the first 500 miles of running and thereafter every 3,000 miles. Removal and replacement should be carried out by the crew. The correct gap is 0.015 to 0.018 in.

To check and adjust sparking plugs (3,000 miles task)

119. (a) Equipment required:-

Spanner, box, B.S.W., 7/16 in.

Spanner, B.S.W., 7/16 in.

(b) Method:-

- (i) Open the right-hand side engine cover and release the cable elbows from the sparking plugs (Fig 11(5)).
- (ii) Remove and clean the plugs.
- (iii) Adjust the gap by carefully bending the *side* electrode.
- (iv) Ensure that the mating surfaces of the plug, plug washer and cylinder head are clean.
- (v) Replace the plugs and washers ensuring that they are tightly fitted. Replace the cable elbows.

Distributor

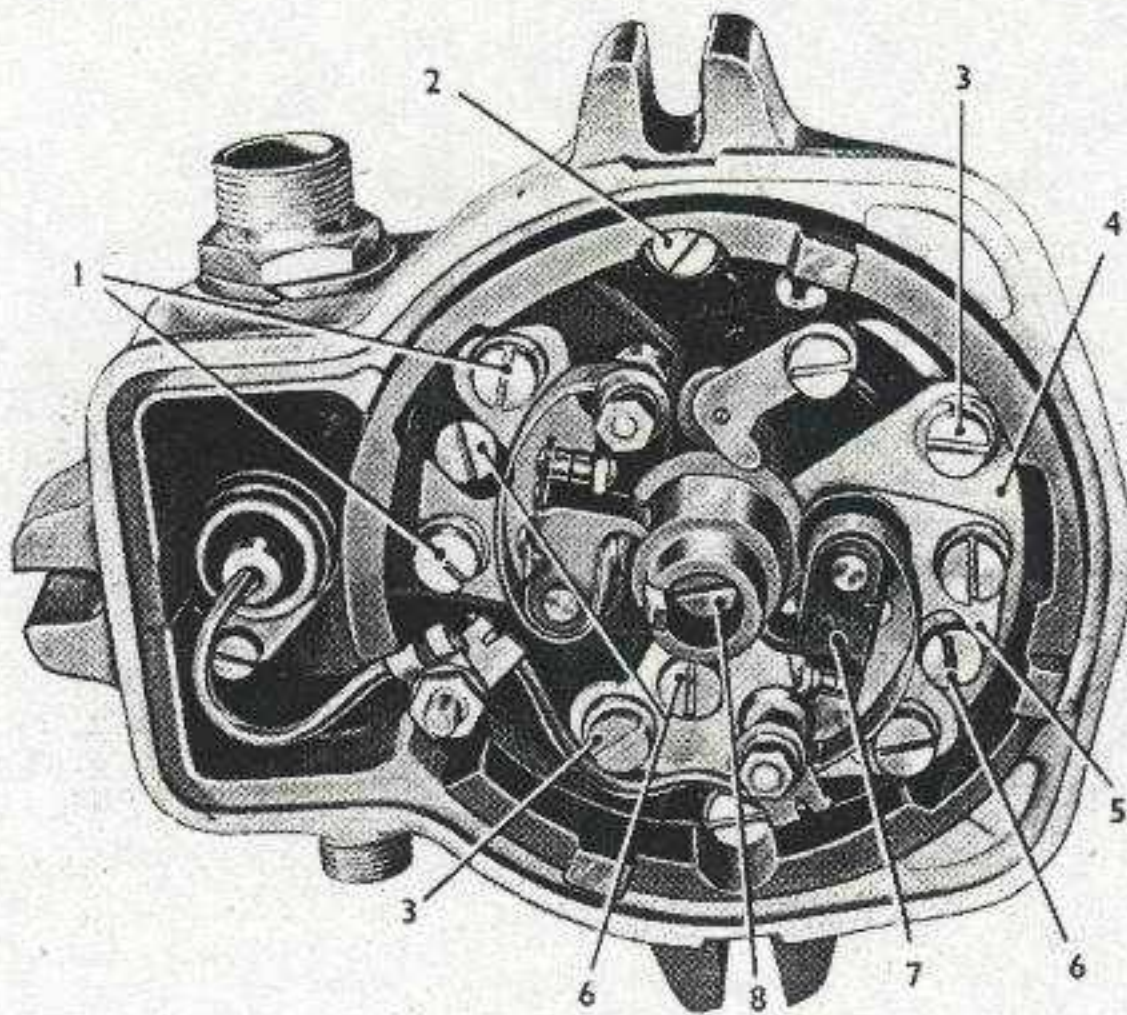
120. The distributor should be checked for adjustment by an electrician after the first 500 miles and thereafter every 3,000 miles.

To check, lubricate and adjust the distributor (3,000 miles task)

121. (a) Slacken the swivel bolts and release the distributor moulding and screen from the body. The moulding and screen assembly of the Mk 2/1 distributor is secured by six captive type bolts.
- (b) Carefully withdraw the rotor.
- (c) Check the contact breakers for cleanliness and burning, and for correct gap setting.
- (d) If necessary, clean the contacts using a fine carborundum stone. The stoning must be done carefully so that the two contact faces are parallel. Emery cloth or sand paper must not be used.
- (e) Check that each contact breaker has a maximum opening of 0.010-0.012 in. (0.019-0.021 in. for the Mk 2/1 distributor). If necessary, adjust to this setting by releasing the contact plate securing screw and then carefully turning the slotted eccentric pin (Fig 14(6)) or (Fig 15(7)). Do not disturb the movable plate as the two contact breakers are accurately synchronized.

Note: *The movable plate securing screws are sealed with red paint. If the seal is broken it indicates that synchronism may have been disturbed.*

- (f) Lightly smear the cam with the approved lubricant if a Mk 2 distributor is fitted, or renew the cam lubricating pad if a Mk 2/1 distributor is fitted.
- (g) Add one drop of clean oil to each pivot pin.
- (h) Add a few drops of clean engine oil to the top of the cam spindle. Do not remove the cam securing screw fitted to the Mk 2 distributor as there is a designed clearance through which the oil passes to the bearing.

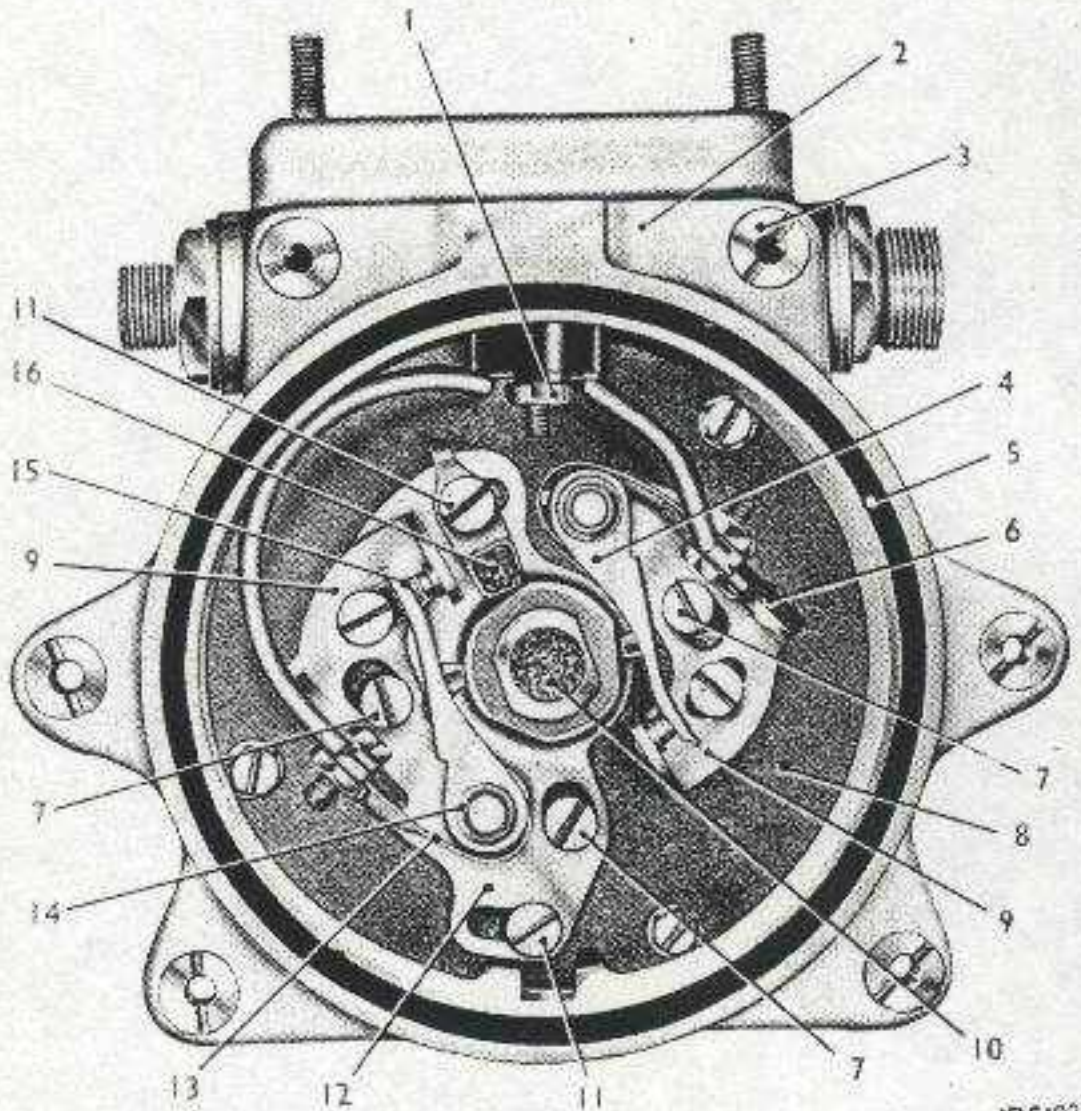


- 1 Contact plate securing screws
- 2 Base securing screws
- 3 Movable plate securing screws (Do not disturb)
- 4 Movable plate
- 5 Contact plate
- 6 Eccentric pin
- 7 Contact breaker lever
- 8 Cam securing screw

1.P 5320 B

Fig 24 No.1, Mk 2 distributor contact breaker

- 1 L.T. terminal
- 2 Body
- 3 Screwed insert
- 4 Contact breaker lever
- 5 Rubber sealing ring
- 6 Insulating strip - L.T.
- 7 Eccentric pin
- 8 Base plate
- 9 Contact plate
- 10 Spindle lubricating pad
- 11 Movable plate securing screws (Do not disturb)
- 12 Movable plate
- 13 Control spring
- 14 Fibre bush
- 15 Contact
- 16 Cam lubricating pad



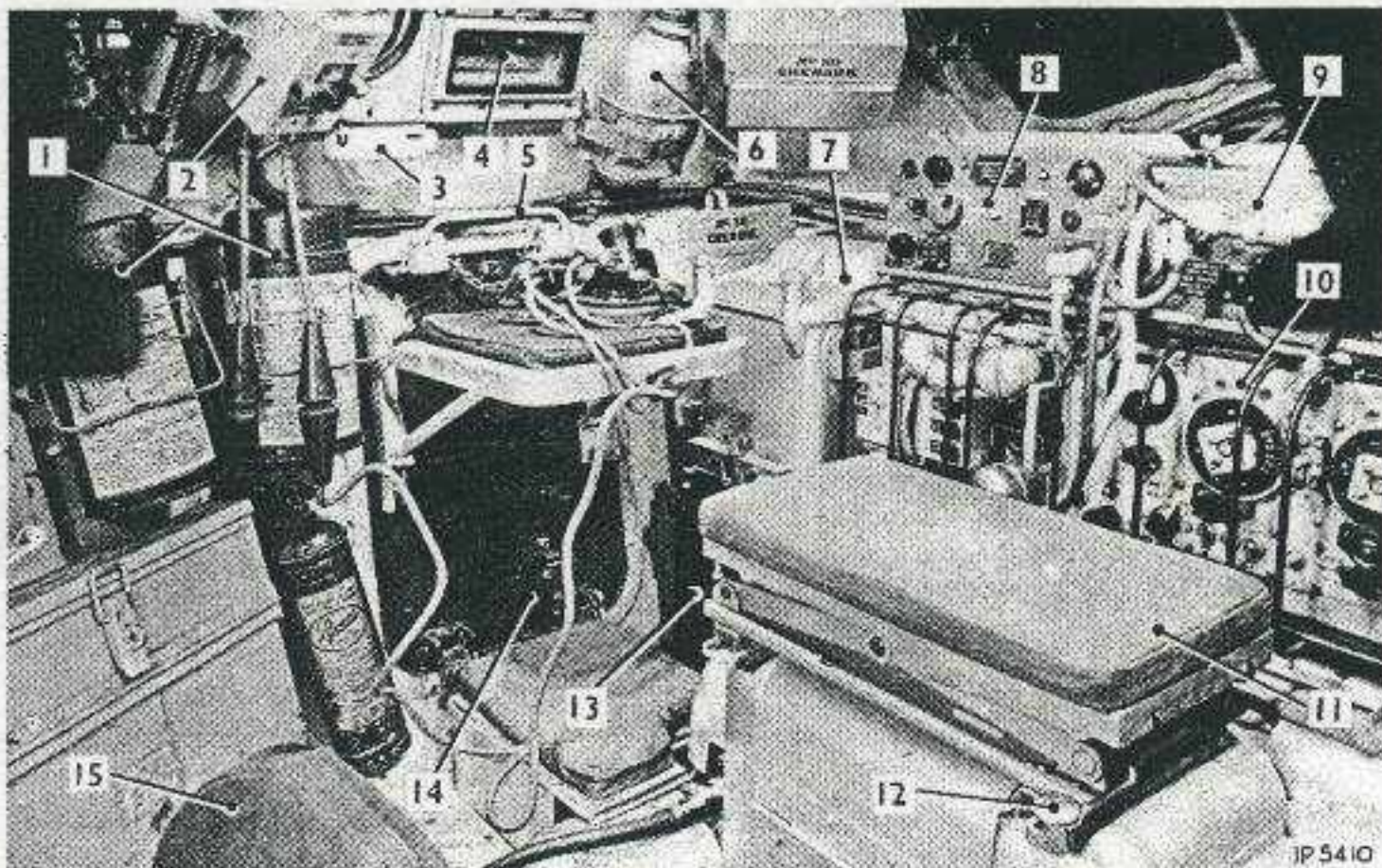
1P6192A

Fig 25 No.1, Mk 2/1 distributor contact breaker

- (j) Wipe away all surplus oil. The performance of the distributor will be seriously affected if oil reaches the contacts.
- (k) Replace the rotor ensuring that its moulded key is correctly engaged with the keyway in the cam. Push on fully. To ensure correct engagement in the Mk 2/1 distributor, unequally sized flats are embodied in the bore of the rotor and on the camshaft.
- (l) Clean the distributor with a dry cloth and ensure that the carbon brush moves freely.
- (m) Ensure that all joint faces are cleaned and lightly smeared with sealing compound (LV6/MT4/1311).
- (n) Carefully replace the distributor moulding and screen, taking care not to damage the carbon brush. Tighten the securing nuts (or bolts) evenly.

122. All ignition components, screening and waterproofing should be examined weekly. All connections must be tight, mating surfaces clean and free from paint, corrosion and lubricant. The screening of leads should not be frayed or corroded and must be continuous with the body of the component, metal-to-metal contact must be continuous throughout the system. Junctions of screens, covers, components and mounting brackets must be tight and clean i.e., free from paint, corrosive material and lubricant.

Report immediately any defects which may affect the standard of suppression of the vehicle.



- | | | |
|---------------------------------|----------------------------|------------------------|
| 1 Vacuum jars | 6 Water bottle | 11 Gunner's seat |
| 2 Control unit | 7 Air cleaner | 12 Gunner's seat catch |
| 3 Roof lamp | 8 Wireless set - No.31 AFV | 13 Battery box |
| 4 Side observation visor | 9 Power supply unit | 14 Escape hatch handle |
| 5 Escape hatch operating handle | 10 Wireless set - No.19 | 15 Driver's seat |

Fig 26 Rear R.H. interior view of Mk I Liaison vehicle

Switchboard

123. The switchboard (Fig 36(4)) is waterproofed and no attempt should be made to dismantle it.

To change a warning lamp

124. Unscrew the plastic window and with a straight pull withdraw the lamp. Before replacing, ensure that the spring-loaded centre contact is satisfactory, that the felt disc is in position inside the window, and that the window is complete with sealing ring.

Fault finding

125. The following table is included for use in the event of failure of the ignition system.

IGNITION FAULT FINDING TABLE

<i>Indication</i>	<i>Possible cause</i>
<p>(a) Engine will not start</p> <p>(i) Warning lights on</p> <p>(ii) Warning lights do not glow</p>	<p>Loose or broken connections at switchboard, ignition junction box, filter unit, coil or distributor. Faulty ignition coil. Faulty distributor e.g., contact breaker, rotor or moulding. Faulty condenser. Dirty plugs.</p> <p>Faulty ignition switch. Faulty connections at generator panel or switchboard.</p>
<p>(b) Engine starts but runs irregularly</p>	<p>Faulty H.T. lead(s). Dirty plugs. Incorrect plug gaps. Contact breaker points dirty or out of adjustment. Faulty ignition coil. Faulty condenser. Weak contact breaker spring. Faulty distributor. Loose connections at switchboard, junction box, filter unit, coil or distributor.</p>
<p>(c) Engine stops when starter switch is released</p>	<p>Open circuit in ballast resistance.</p>

12 - LIGHTING, STARTING, CHARGING AND ANCILLARY ELECTRICAL EQUIPMENT

126. The vehicle is wired on the 24 volt (nominal) negative earth system with the starter motor and generator wired with an insulated return to the main earth point located at the distribution box. In addition, the generator negative connection is earthed at the generator panel.

127. The majority of the equipment is waterproofed, tropicalized and, where necessary, suppressed to prevent interference with wireless equipment. (See paragraphs 107 and 204).

128. There are two battery containers (Fig 19(13*)) and (Fig 23(12)) situated in the rear right and left sides of the fighting compartment. The batteries are connected in series and are charged by a generator mounted on the engine. The output of the generator is controlled by a generator panel operating under the current voltage control system. Fuses fitted in the generator panel protect the charging and indicator light circuits.

129. The starter motor is of the axial type with a built-in solenoid switch operated by a switch located on the driver's switchboard (Fig 36(4)).

130. To assist in starting the engine in the event of discharged batteries an inter-vehicle starting socket is fitted in the distribution box (Fig 19(5)).

131. Two circuit breakers in the distribution box protect the auxiliary circuits should a fault occur. The ignition circuit does not include a circuit breaker, starting conditions excepted (para 111).

132. An inspection light socket is provided in the distribution box.

133. Connections to most units are made by means of plugs and sockets or by snap-type connectors, thus facilitating the easy removal of components. Leads enter most units through tightly fitting rubber bushes secured by gland nuts.

134. To facilitate the removal and replacement of the engine, a junction box (Fig 11(26)) is provided and mounted on a bracket at the front end of the induction manifold. The L.T. ignition lead, oil pressure switch lead, and the starter motor auxiliary lead are connected to this box. The vehicle connections are made to the box through a multi-pin plug and socket.

BATTERY No. 2, MK I

135. The two 12 volt 60 ampere-hour batteries are of the standard lead acid type housed in partially waterproof metal containers and are connected in series to give a 24 volt supply.

The containers have covers which are secured by a U-section lipped rubber seal which fits tightly on the turned-over rim of the container. Rubber breathers are supplied for fitting to these covers when complete waterproofing is a requirement. In some cases breathers have been fitted during normal operations and instances have occurred of the breather failing to release gases generated during charging with the result that the cover has been blown violently from the container. To prevent any such occurrence, pending the development of a modified battery container, the breather (Part No. FV175894) will be stored inside on the top of the battery adjacent to the positive terminal.

/Note:

Note: The gases liberated from a battery under (or recently under) charge are highly inflammable, therefore it is important that electrical connections are maintained clean and tight as an insurance against ignition of the gases. Similar danger would exist from the proximity of any naked light.

It is equally important to ensure that the vents in the battery filler plugs are kept clear, as pressure within the battery cell is produced if the gases resulting from charging cannot escape. A blocked cell vent may result in a burst battery.

Servicing (weekly task)

To top up the electrolyte

136. (a) Remove the cover from each battery box (Fig 19(13) and (Fig 23(12)) in turn.
- (b) Unscrew the vent plugs and check the level of the electrolyte. If necessary top up with distilled water to 1/4 in. above the plates.
- (c) Check that the air vents in the filler plugs are clear, and replace the plugs hand tight.
- (d) Dry clean the tops of the cells, remove any corrosion and ensure that the terminals are clean and tight.
- (e) Smear the terminals with PX7. If this preservative is not available, leave the terminals dry and clean. (Do not use grease).
- (f) Replace the cover ensuring that it is firmly seated on the box.

For further Army User information, reference should be made to EMER Power J 318, Lead-Acid Battery Maintenance, First Echelon Work and EMER Power J 468, Vehicle Lead-Acid Battery Maintenance, Initial filling and Charging in Tropical and Sub-tropical Zones.

DISTRIBUTION BOX No. 1, MK I

137. The distribution box (Fig 19(5)) is fitted close to the generator panel in the fighting compartment. The positive and negative battery leads are taken to the box from where the battery current is distributed to the various electrical components. The negative leads of the battery and starter motor are connected to an earthing stud fitted to the box.

138. The positive battery lead terminates in a shrouded socket which fits a heavy duty plug in the box. A similar arrangement, but with the heavy duty socket fitted to the box, is used to connect the starter motor positive lead to the box.

139. Inside the box are two thermal-magnetic circuit breakers which operate should a circuit become overloaded. The breakers close automatically to re-make the circuit when the fault has been cleared. In heavily loaded circuits, it may be found necessary to switch off all connected circuits to allow the breaker contact to close.

140. Also incorporated in the box are a pair of inspection light sockets and an inter-vehicle starting socket. To protect the sockets when not in use, screwed caps are fitted.

141. The box is waterproofed and no attempt should be made to remove the cover.

Servicing

142. Check the tightness of the box securing nuts and the security of the electrical connections.

LIGHTING

143. The vehicle is provided with two headlights, two sidelights, two taillights, a convoy light and a number light. The lights are controlled by a switch on the switchboard (Fig 36(4)) in the driver's compartment. The switch is of the semi-rotatable type with positions OFF, T, S and H and controls all the external lights.

144. Turning the switch to the T position energizes the convoy light. Advancing the switch to the S position energizes the sidelights, taillights and number light. The final position H of the switch brings the headlight into circuit and all external lights are energized.

HEADLIGHT No.2, MK I

145. The two headlights (Fig 27) are of the stem-mounted, pre-focus type working on the double dipping system of headlight control, i.e., operation of the dipswitch (Fig 36(12)) changes the light beams of both lamps from normal to the dip position and from dip to normal.

146. Each light consists of a light unit and body together with a lamp. The lamp is of the double filament type to provide dipping and can be fitted in one position only in the light unit. This position has been determined in the design of the light to give correct focusing for both filaments.

147. The light unit comprises a reflector and front lens assembly so constructed that the lens is permanently sealed to the reflector to prevent the entry of dust and moisture.

148. The lens is of the block type which is designed to give a powerful beam with a flattish top and, when the dipping filament is in use, directs the beam downwards.

149. The lamp holder adaptor has two spring-loaded contacts which engage the lamp contacts and press the lamp against its seating in the light unit. Vehicle cables enter the light through a rubber sealing washer and, together with the cables from the lamp holder adaptor, connect to a terminal block fitted inside the body.

150. Four clips with securing screws secure the light unit and rim to the body and are also used to secure the blackout mask when required.

151. A rubber sealing washer is interposed between the light unit and the rim and another between the light unit and the body to render the light waterproof.

Servicing

To adjust the beam setting

152. The vehicle should be normally loaded standing on level ground with the front of the car parallel to and at least 25 ft from, a suitable screen or wall. The headlights should be set so that the two main beams are parallel to each other and to the ground.

153. Slacken the single fixing nut at the base of the light and move the light on its adjustable mounting to the required position. Finally tighten the nut.

To change a lamp

154. Slacken the screws securing the spring clips, swing the clips aside, and withdraw the light unit and rim assembly. Press the adaptor and lead assembly in towards the light unit; turn it anti-clockwise and pull it off; withdraw the lamp. Fit a new lamp taking care to engage the slot of the lamp plate with the key of the lamp holder. Ensure that the spring-loaded contacts of the adaptor are satisfactory and engage the projections on the inside of the adaptor with the slots of the holder. Press on and secure by twisting clockwise.

155. Locate the light unit and rim assembly in position in the body; the rim and light unit are marked TOP: secure by the spring clips.

- 1 Light unit
- 2 Body
- 3 Adaptor
- 4 Terminal block
- 5 Sealing washer

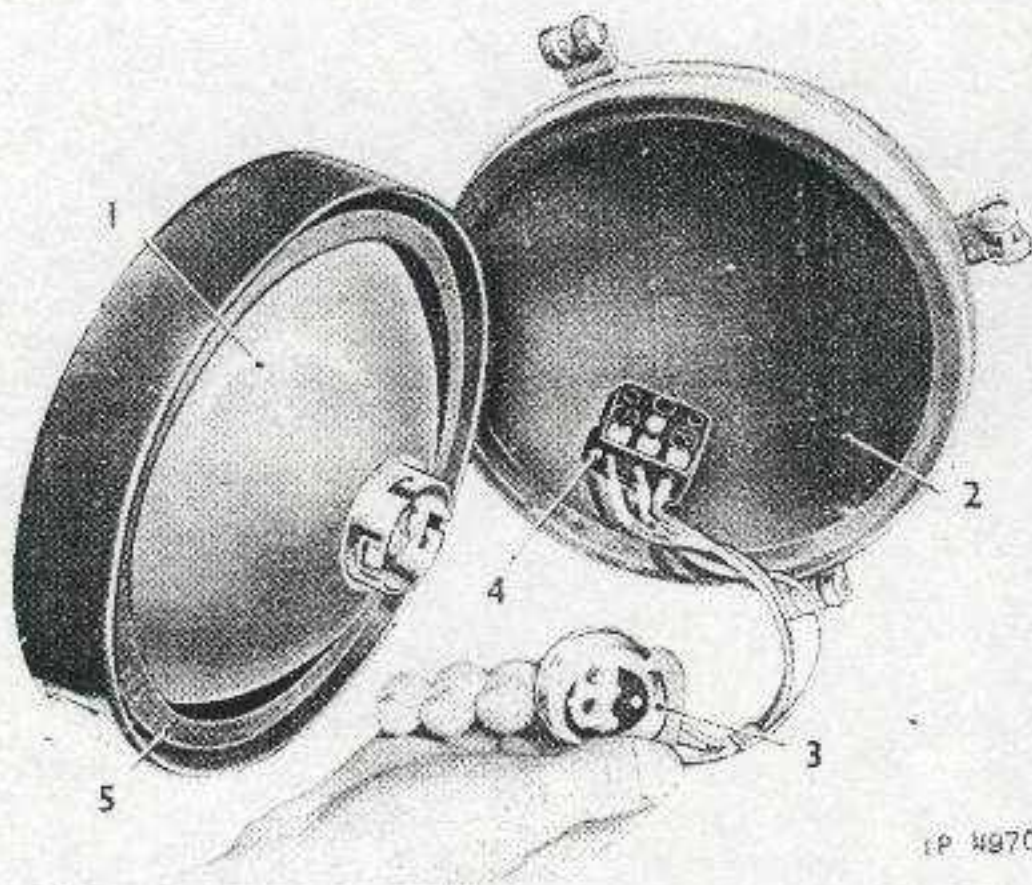
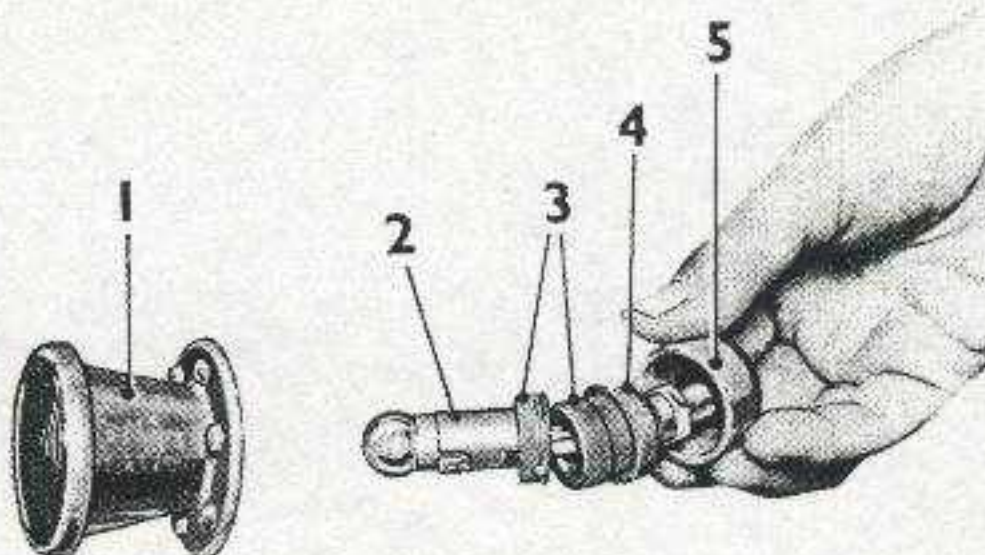


Fig 27 Headlight

- 1 Front cover
- 2 Bulb holder
- 3 Rubber mounting
- 4 Outer case
- 5 Locking ring



L.P. 5187

Fig 28 Sidelight

SIDELIGHT No.2, MK I

156. The waterproof sidelights (Fig 28) each comprise a three-piece assembly consisting of a front cover, backplate and bush, and rubber mounted lamp holder assembly.

157. The earth connection is effected by means of an earthing ring located against the flange of the lamp holder sleeve; projections on the ring bend over the front rubber mounting to contact the bore of the backplate bush. Six tapped holes are provided in the backplate, three for securing the front cover and three for securing the light to its mounting bracket.

Servicing

To change a lamp

158. Unscrew the knurled locking ring at the back of the light and withdraw the lamp holder complete. Fit a new lamp and replace the lamp holder ensuring that the front rubber mounting is located in the earthing ring. Secure by means of the locking ring.

TAILLIGHT No.2, MK I

159. Two taillights are fitted, one on the rear of each wheelguard. The lights are similar to the sidelights but are fitted with ruby windows.

Servicing

To change a lamp

160. Proceed as for the sidelight (para 158).

NUMBER LIGHT No.1, MK 1

161. The number light is fitted to the hull rear plate. The cable to the light is long enough to permit removal of the rear plate for engine servicing with the light connected.

162. This light is very similar to the sidelight but differs in the front cover assembly.

The front cover is cylindrical with a 180 deg light aperture. Fitted on the cover is a light shield with two light apertures, one similar to that of the cover and diametrically opposite this a 3/8 in. diameter hole. The shield is slotted to engage a locating peg fitted to the cover and the shield may be rotated on the cover, within the limits set by the peg, to give full or restricted illumination. The light shield is spring-loaded by reason of a spring fitted between the end of the cover and the shield.

Servicing

To change a lamp

163. Unscrew the three screws securing the cover and carefully withdraw the cover and its gasket. Fit a new lamp and replace the cover and gasket. Ensure that the shakeproof washers are fitted and tighten the screws.

CONVOY LIGHT No.2, MK 2

164. The convoy light is situated below the number light and is secured to the hull by a stem and nut. An extra long cable is provided to permit removal of the hull rear plate with the light connected.

165. The light is a two-piece assembly consisting of a body with a lamp holder and is fitted with a screwed cap in which is a plain glass window and ruby lens. The lamp holder is of similar construction to that of the sidelight.

Servicing

To change a lamp

166. Unscrew the cap and remove the lamp. Fit the new lamp and replace the cap with the waterproofing seal in position.

PANEL LIGHT

167. This light is provided on the instrument panel mounted on the right front side of the driver and is controlled by the top centre switch on the switch-board (Fig 36(4)). The switch is used as a dimmer to control the degree of illumination.

168. The pins of the lamp fit into longitudinal slots cut in a spring-loaded flanged tube, and the lamp's centre contact is pressed against a contact in the tube by means of a screwed cover on the front panel. A phosphor bronze spider is interposed between the cover and the lamp to protect the lamp.

Servicing

To change a lamp

169. Unscrew the brass cover and, with a straight pull, withdraw the lamp. Before replacing the lamp, ensure that the spring-loaded centre contact is satisfactory, and that the cover is complete with metal spider and sealing ring. The instrument panel is waterproofed and no further servicing should be attempted.

ROOF LIGHT No. 6, MK I

170. Two roof lights (Fig 19(9) and (Fig 23(2))) are fitted internally, one at each side of the vehicle. Each light incorporates a shield and a variable resistance, to enable the direction and intensity of the light to be adjusted, and is protected from vibration by a felt pad fitted to the base.

Servicing

To change a lamp

171. Press in the lamp, turn it anti-clockwise and withdraw.

To alter the position of the shield

172. Unscrew the three securing screws and carefully withdraw the shield (Fig 29(2)) from the light body; the screws also secure the body to the base. Turn the shield to the required position and fit the securing screws. The new position can be identified and recorded by means of the pointer (1) on the shield and the letter on the body. If the body is withdrawn from the base, ensure that the switch lever is located in the cut-away on assembly.

- 1 Pointer
- 2 Bulb shield
- 3 Bulb guard
(not fitted in
this installation)
- 4 Support plate
- 5 Switch handle
- 6 Felt pad

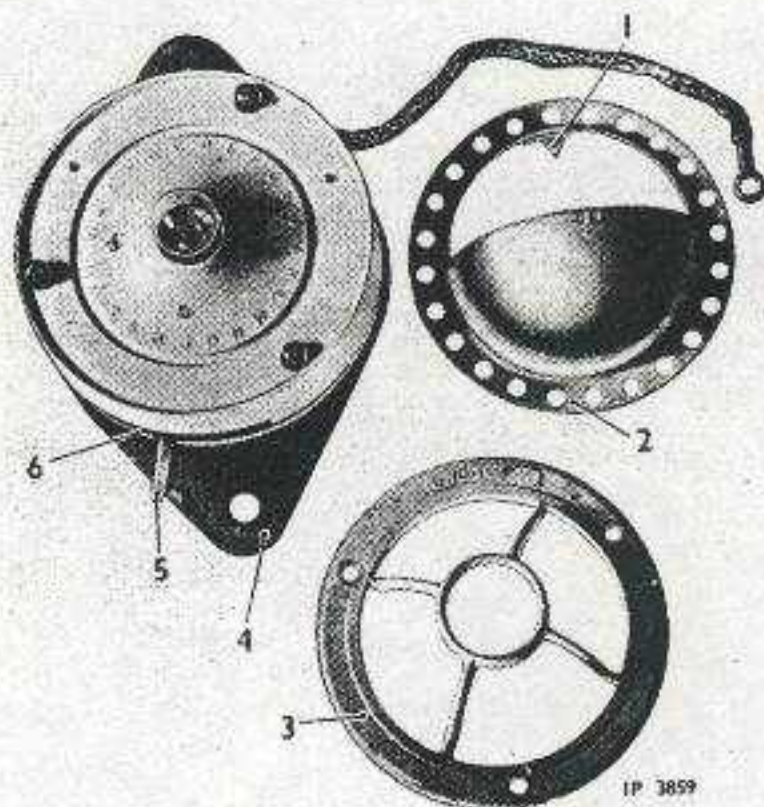


Fig 29 Roof light

STARTING

STARTER No. 1, MK 2 OR STARTER No. 1, MK 2/1

173. The vehicle may be fitted with either Mk 2 or Mk 2/1 starter.

174. The starter (Fig 11(8)) is a four-pole, series, axial type motor with a built-in solenoid switch and is mounted on the exhaust side of the engine crankcase.

175. The starter requires no servicing, other than the tightening of securing bolts, between major overhauls.

Fault finding

176. The following table is included for use in the event of failure of the starter circuit or motor.

STARTER FAULT FINDING TABLE

<i>Indication</i>	<i>Possible cause</i>
(a) Starter fails to rotate	
(i) Warning lights do not glow	Discharged batteries. Ignition switch OFF. Faulty ignition switch. Faulty connections at batteries, distribution box, generator panel or switchboard. 10A circuit breaker open due to fault in one of following circuits:- Starter solenoid, Ignition warning light, thermometer, fuel gauge, oil pressure switch, or instrument panel light.
(ii) Warning lights on	Faulty connections at switchboard or ignition junction box. Faulty starter switch. Faulty starter connections. Faulty starter. Partially discharged batteries.
(b) Starter rotates but slowly	Partially discharged batteries. Faulty connections in starter circuit. Faulty starter.
(c) Starter rotates but fails to rotate engine crankshaft	Faulty starter.

CHARGING

GENERATOR No. 2, MK 1 OR GENERATOR No. 2, MK 2

177. The generator (Fig 13) is located in a cradle pivoted to a mounting bracket attached to the induction side of the engine crankcase, and is belt driven from the crankshaft by twin belts. The belts are tensioned by means of an adjuster attached to the generator cradle.

178. The generator has a maximum controlled output of 25A at 28V. It is driven through an integral two-speed gearbox which automatically changes the speed of the generator armature at 2,000 r.p.m. (generator pulley speed). With the driving pulley running at speeds below 2,000 r.p.m. the armature runs at approximately four times the pulley speed and at speeds above 2,000 r.p.m. at approximately $1\frac{1}{2}$ times the pulley speed.

179. The generator gearbox is connected by flexible pipes to the engine lubricating system. Oil from the main gallery enters the gearbox through an inlet pipe on top of the generator and after circulating around the gears returns through an outlet pipe to the engine sump. Seals prevent oil reaching the electrical components of the generator.

180. The generator is ventilated by a fan on the armature shaft which draws in air through a gauze in the commutator end cover. The air leaves the generator through a gauze in the top of the main casing.

181. In this installation the engine compartment is waterproofed, hence there is no necessity to waterproof the generator.

For other installations provision is made to waterproof the generator by screwing fording caps over the air inlet and outlet gauzes. When running sealed, a breather pipe is fitted to the generator in place of one of the waterproof test plugs.

Note: *In this installation the breather is not fitted and therefore the generator must not be sealed.*

The fording caps are housed on the fuse cover of the generator panel (Fig 19(6)) the large cap fitting over the smaller. When the fording caps are removed from the generator panel, a pair of switches operate to reduce the maximum generator output to 6A, and to cause the ignition warning light to glow.

Servicing

182. Driving belt adjustment - see para 74.

Lubrication

183. The oil feed to the generator gearbox does not operate until the engine has been started, and takes a few minutes to fill the gearbox. Consequently, when starting from cold, the gearbox may be noisy until filled with oil.

184. Periodically examine the air outlet gauze on the top of the generator for traces of oil. If oil is present, remove the gauze and examine the internal surfaces of the air outlet block. If more than a slight film of oil is present, a leaking oil seal must be suspected and the defect should be reported.

185. When a replacement generator is fitted, or if the vehicle has been standing idle for three weeks or more, a $\frac{1}{4}$ pint of engine oil (OMD-110) should be poured into the generator gearbox filler hole (Fig 13) before the engine is started. This is essential to prevent failure of the generator bearings through lack of lubrication.

186. The generator, and oil feed pipes and unions should be checked for security at the specified periods.

The gearbox has a normal noise level when running and changing gear. If any unusual noise occurs, gearbox trouble is indicated and the engine must be stopped and the defect reported.

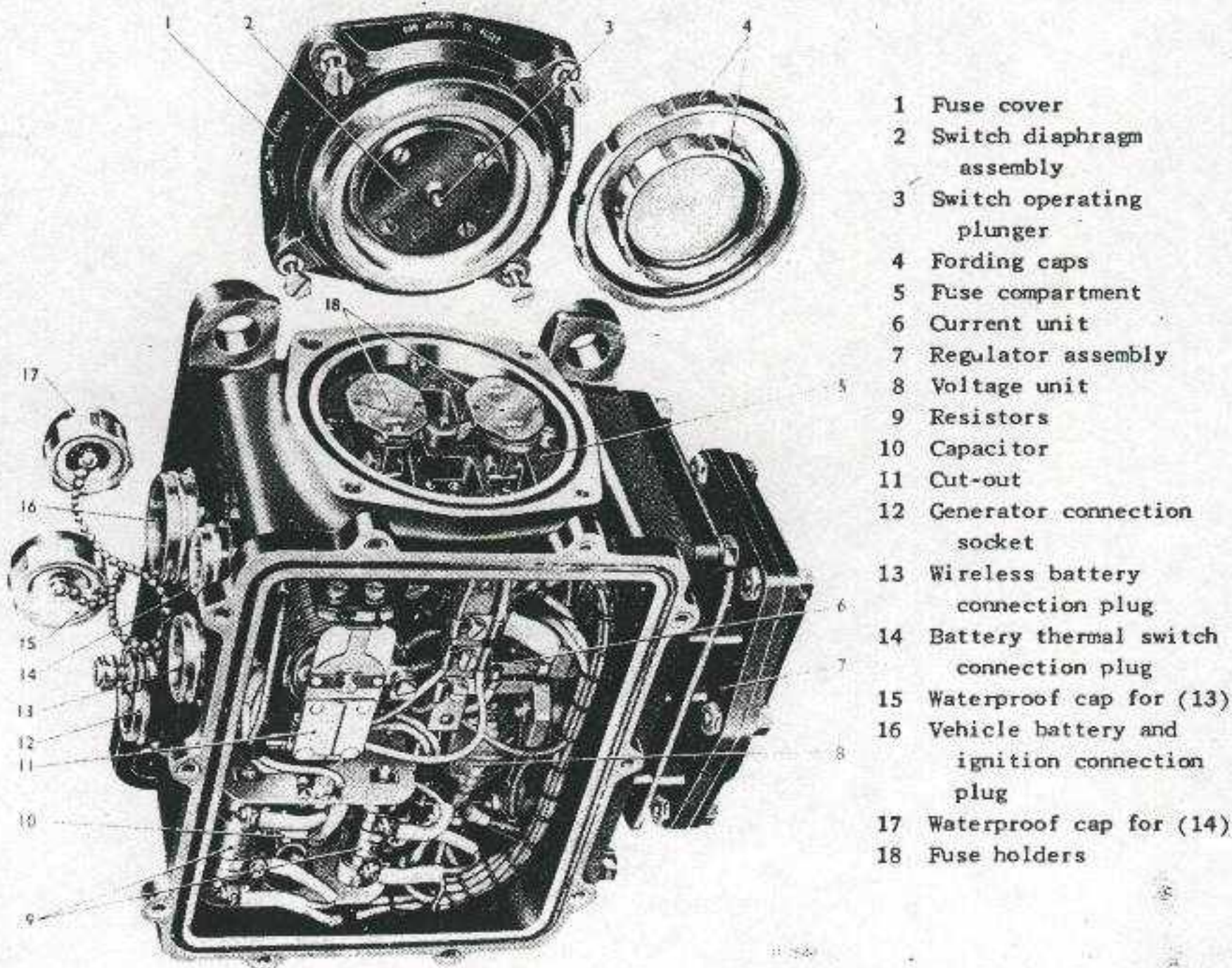
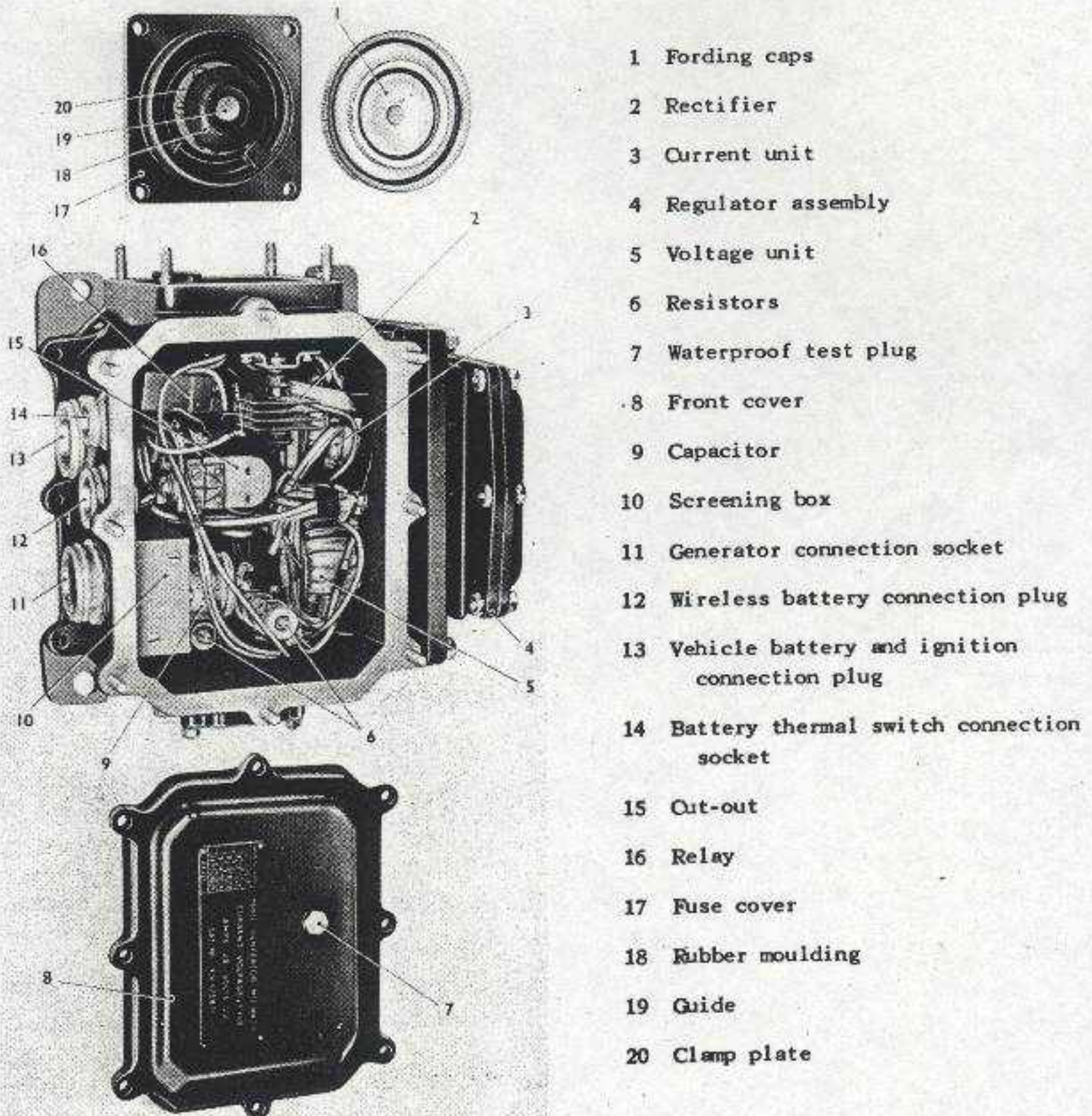


Fig 30 Generator panel, No.2, Mk I

GENERATOR PANEL

187. The generator panel (Fig 19(6)) is situated on the rear left wall of the fighting compartment. It controls the output of the generator under the current-voltage control system. It is a tropicalized and waterproofed unit and connections to it are made by means of breeze type plugs. Either one of two marks of panel may be fitted i.e., Panel Generator No.2 Mk 1 (Fig 30) or Panel Generator No.2 Mk 2/1 (Fig 31).

188. Housed in the panel are a carbon pile regulator with trimmer resistances, a cut-out, relay and rectifier (ancillaries to the cut-out), two switches, two fuses, wireless interference suppression capacitors and fording caps for waterproofing the generator.



- 1 Fording caps
- 2 Rectifier
- 3 Current unit
- 4 Regulator assembly
- 5 Voltage unit
- 6 Resistors
- 7 Waterproof test plug
- 8 Front cover
- 9 Capacitor
- 10 Screening box
- 11 Generator connection socket
- 12 Wireless battery connection plug
- 13 Vehicle battery and ignition connection plug
- 14 Battery thermal switch connection socket
- 15 Cut-out
- 16 Relay
- 17 Fuse cover
- 18 Rubber moulding
- 19 Guide
- 20 Clamp plate

IP 6735

Fig 31 Generator panel, No.2, Mk 2/1

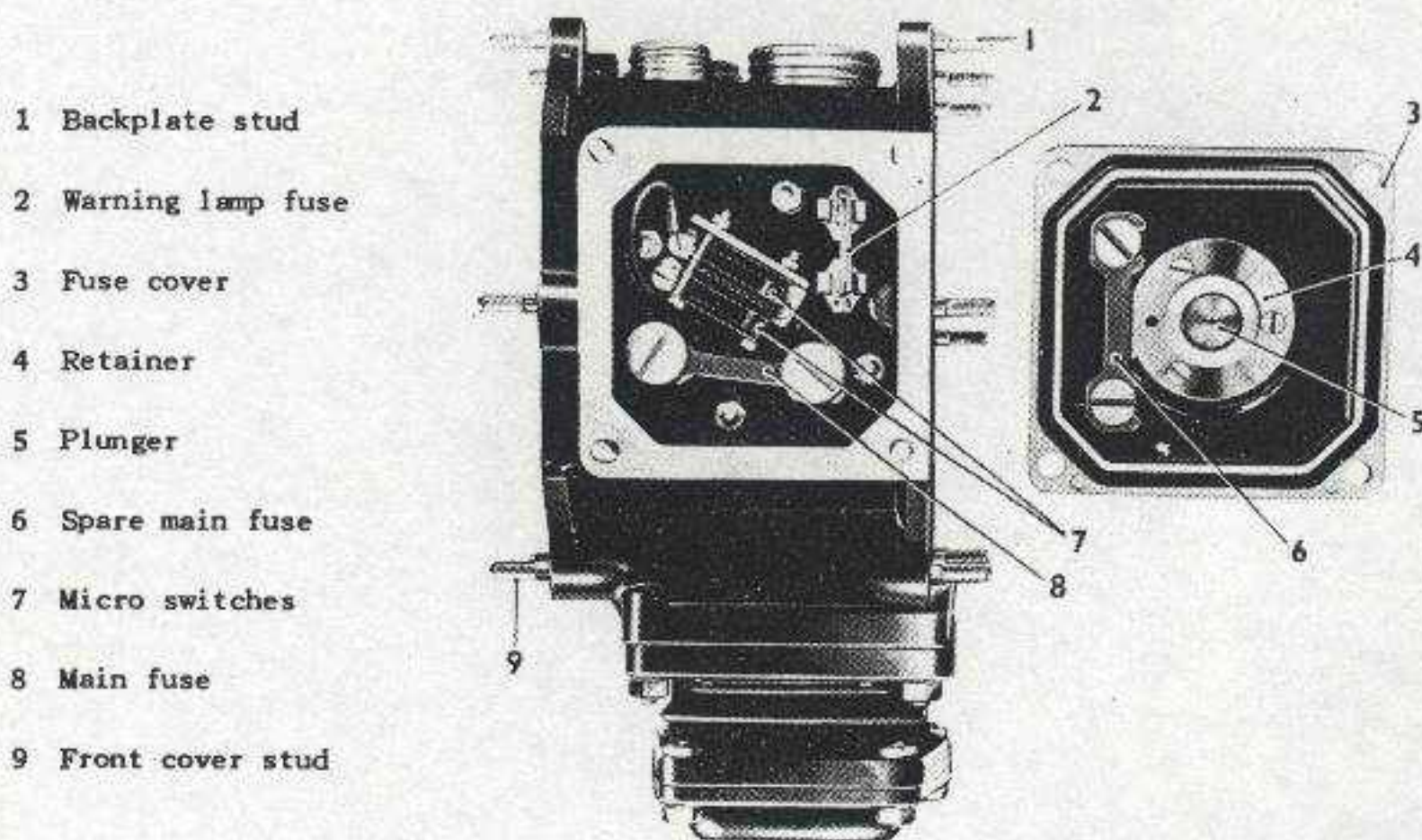
189. The carbon pile regulator comprises two units mounted on a common frame fitted to the side of the panel. One unit is for voltage control and the other for current limitation. The pile housing embodies fins for heat dissipation.

190. The fuses and switches are located on the same base fitted to one end of the panel. A protecting cover encloses the assembly. This cover is engraved FOR ACCESS TO FUSES REMOVE THIS COVER.

191. The fuses for the Mk 1 panel are 25A (No.23 S.W.G. tinned copper wire) and 5A (No.35 S.W.G. tinned copper wire). They are connected in the main charging circuit and in the warning lamp circuit respectively. On panels not incorporating Mod. No.5, the gauge of the fuse wire is No.21 and No.30 respectively.

192. Spare fuse wire is wrapped round each holder and the fuse rating is engraved on the holders and on the base to prevent mistakes when renewing fuses.

193. In the Mk 2/1 panel the main fuse (Fig 32(8)) is a special strip-type (50A fusing) and the warning light fuse (2) is 5A (No.30 S.W.G. tinned copper). Three spare main fuses (6) are carried in the fuse cover and spare fuse wire is wrapped round the warning light fuse holder.



IP 6736

Fig 32 No.2, Mk 2/1 generator panel fuse
and switch compartment

194. The two switches fitted to the Mk 1 panel are of the strip type and are located on the underside of the fuse base. The Mk 2/1 panel switches are of the micro type and are located on top of the fuse base. In both panels the switches are operated by spring-loaded plungers. The smaller generator fording cap locates over the projecting end of the plunger and the larger cap screws on the fuse cover to press the small cap against the plunger and so open the switches. Removal of the fording caps results in the switches closing.

195. The closing of one switch causes the regulator to limit the generator output to 6A, and the closing of the other causes the warning light to glow thus indicating that the generator is operating at reduced output.

196. In addition to the plug and socket provided for the vehicle battery and generator connections respectively, a four pin plug and a two pin socket are provided for connection to a radio battery and a battery thermal switch. These two items are not fitted in this installation and waterproof sealing caps are fitted to the plug and socket.

Note: *The engine must not be run without the vehicle battery connected.*

Servicing

197. The interior of the panel should on no account be interfered with.

To renew a fuse

198. (a) Ensure engine is stopped.

(b) Remove the fuse cover secured by four screws fitted with plain washers and lockwashers (four nuts and shakeproof washers for Mk 2/1 panel).

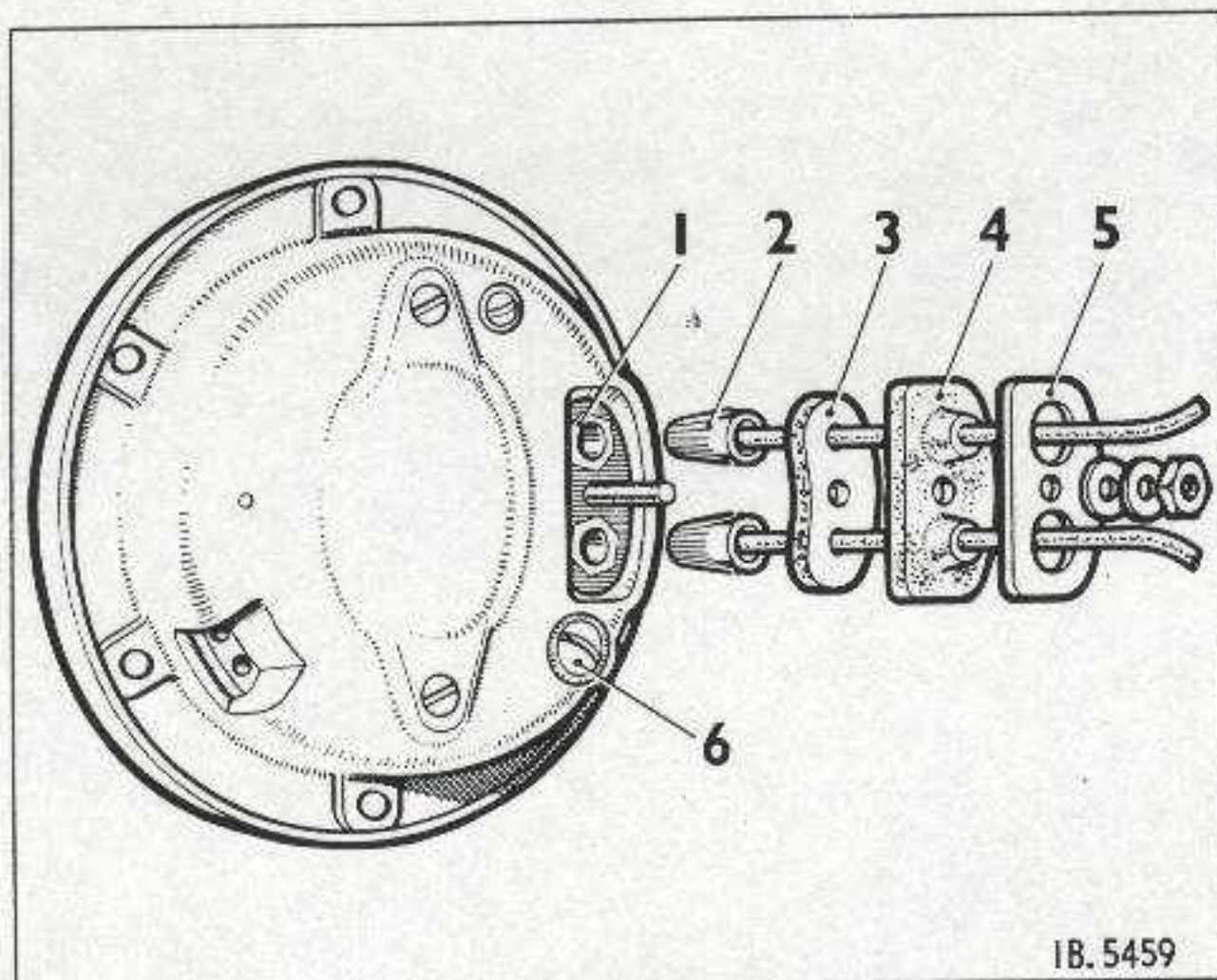
(c) Panel Generator No.2 Mk 1 (Fig 30):- Withdraw the appropriate fuse holder, remove all remains of the burnt fuse, fit a new piece of fuse wire. Ensure that the correct wire is used, spare wire is carried on the fuse holder (para 192). Replace the fuse holder.

(d) Panel Generator No.2 Mk 2/1 (Fig 32):- To renew the warning light fuse proceed as for Mk 1 panel. To renew the main fuse, slacken the nuts securing the fuse and remove the remnants of the old strip. Ensure that the contact faces of the terminals are clean and smooth, place a new strip in position and tighten the nuts. Replace the fuse cover.

Note: *Spare fuse strips are fitted to the fuse cover. No other type of fuse should be used.*

CHARGING FAULT FINDING TABLE

<i>Indication</i>	<i>Possible cause</i>
<p>(a) Warning light on at normal engine speed</p>	<p>Main fuse blown in Generator panel. Faulty generator, dirty commutator and/or brushes. Generator drive broken Faulty connections between generator, generator panel, and distribution panel. Faulty generator panel. Fording caps loose or removed from generator panel.</p>
<p>(b) Warning light flickers at normal engine speeds</p>	<p>Generator drive slipping. Bad connection in charging circuit. Faulty generator. Faulty generator panel.</p>
<p>(c) Low charging rate. Battery gradually becomes discharged</p>	<p>As (b)</p>
<p>(d) High charging rate. Excessive voltage in battery</p>	<p>Faulty generator panel. Generator field connections short-circuited to main connections.</p>



- 1 Terminal pillar
- 2 Cable nipple
- 3 Retaining plate
- 4 Rubber seal
- 5 Clamping plate
- 6 Adjusting screw

IB. 5459

Fig 33 Horn

HORN No. 1, MK I

199. The horn (Fig 33) is a waterproofed high frequency model of normal design consisting of an electro-magnet connected in series with a contact breaker which is operated by an armature carrying a diaphragm and tone disc piston. The armature assembly vibrates at a very high frequency and the movement of the tone disc piston in the front cover gives the warning note.

200. The vehicle cables enter the horn through a rubber gasket which prevents the entry of water; the gasket is held in position by a clamp plate and nut fitted to a terminal stud.

Servicing

201. Adjustment of the horn should not be attempted unless absolutely necessary. When necessary the adjustment will be made by an electrician.

To adjust the horn

- (a) The adjusting screw (Fig 33(6)) is located at the back of the horn adjacent to the terminals.
- (b) Connect the horn in series with an ammeter and a 24 volt battery, and turn the adjusting screw one or two clicks to obtain a reading of 3A on the ammeter. Turn the screw clockwise to raise the current consumption.

Note: A low current consumption gives a weak note. A high consumption results in a rough note when the generator is charging.

HORN PUSH AND DIPSWITCH No. 1, MK I

202. This dual purpose switch (Fig 36(12)) is fitted to the right of the instrument panel. The centrally disposed push-button operates the horn, and the knurled ring operates a two-position type switch which brings into circuit either the main or the auxiliary (dip) lamp filaments in the headlights. The switch is fitted with a screwed cover for protection when not in use and when fording.

WINDSCREEN WIPER

203. The windscreen wiper is secured to the frame of the driver's screen. To enable the screen to be removed and replaced quickly, the wiper lead is fitted with a 3 pin moulded rubber plug which connects to a similarly shrouded socket located to the L.H. rear of the driver. Owing to the disposition and size of the pins the plug can be entered one way only. A blanking plug is attached to the socket to seal it off when the driver's screen is not in use. An ON-OFF switch is fitted on the wiper body.

SUPPRESSION OF ELECTRICAL INTERFERENCE TO WIRELESS SERVICES

204. Good maintenance of the electrical system is essential to obtain full advantage of the VHF wireless sets and to prevent interference (see also para 107).

Important points are as follows:-

- (a) Ensure that there is no intermittant contact on any of the fuses, leads, switches or terminals.
- (b) Keep all connections and mating surfaces clean and free from paint, corrosive and lubricant.
- (c) Keep all bonding strips and earth braids free from corrosion, paint and dirt and ensure that they are firmly secured.
- (d) Ensure that all cable screening is continuous, is not corroded or frayed and is properly earthed at each end. Metal-to-metal contact must be maintained throughout all screened circuits.
- (e) Ensure that components and brackets are firmly secured.
- (f) Do not interfere with the vehicle wiring system, generator cut-out, regulators and switches or any parts of the electrical system which are not understood.
- (g) Avoid making improvised connections to the electrical system.
- (h) Do not paint under bonding strips or other parts intended to be in electrical contact.
- (j) Do not remove any suppression equipment that may be fitted.
- (k) Refrain from using switches unnecessarily.
- (l) Report immediately any defects which may affect the standard of suppression of the vehicle.

GENERATOR No. 2, MK1 or No. 2 MK2

GENERATOR PANEL NO. 2, NR. 2/1

GENERATOR PANEL NO. 2, MK. 1.

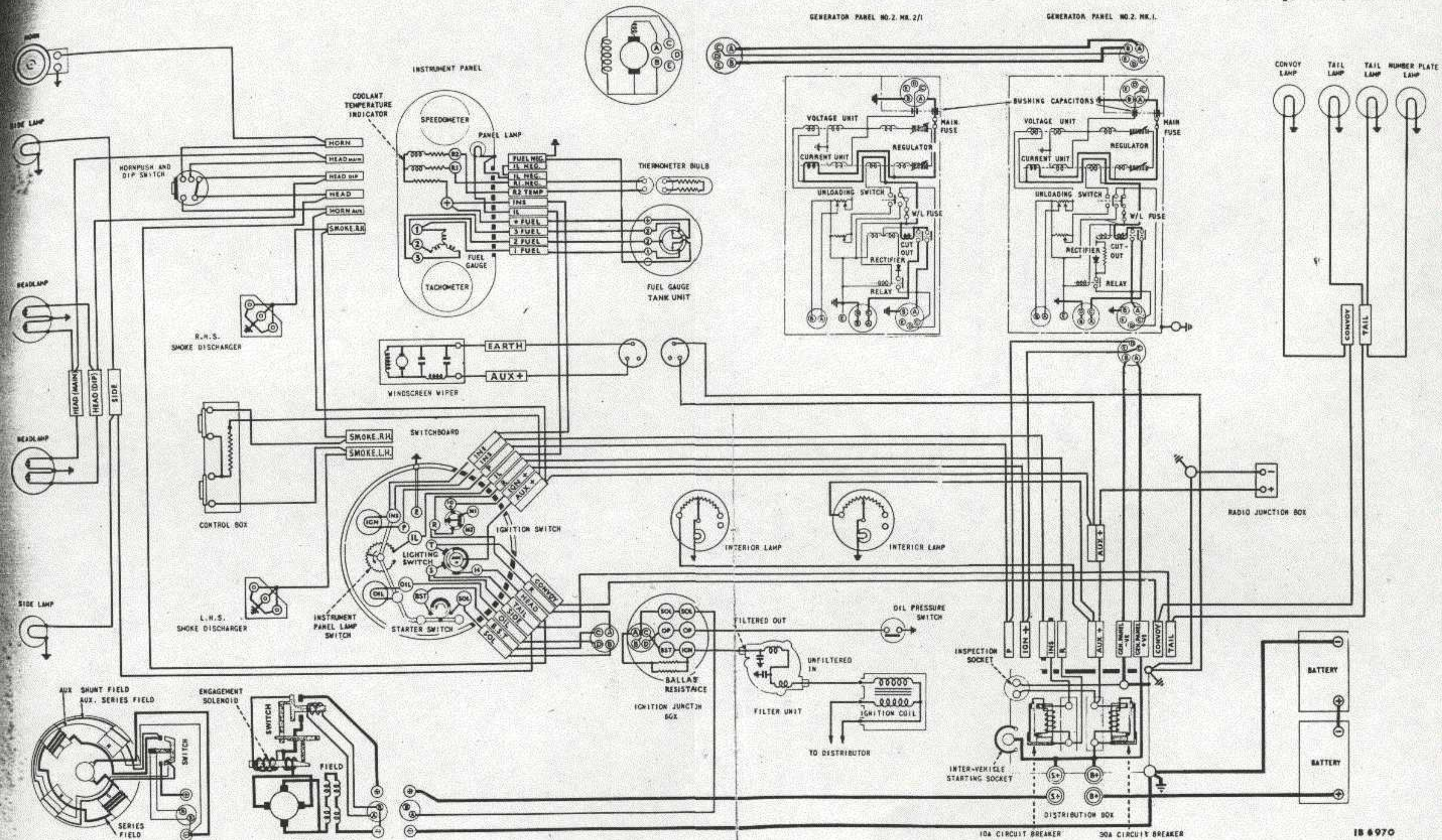


Fig 34 Wiring diagram

13 - FLUID COUPLING

205. The drive from the engine is transmitted to the gearbox through a fluid coupling which is completely automatic in action. The action of the coupling allows the vehicle to remain stationary with a gear engaged when the engine is running at idling speed. Immediately the engine is speeded up, the fluid coupling begins to transmit the drive until, by the time the engine is running at about one third of its maximum speed, the drive is transmitted with only about 10 per cent slip. At high engine speed the amount of slip is about 2 per cent.

OPERATION OF CONTROLS

206. There are no direct controls to the fluid coupling since it transmits the drive automatically as the engine is speeded up.

207. Care must be taken not to allow excessive slip of the fluid coupling whilst driving the vehicle, as this will cause the coupling to overheat. Some causes of excessive slip are:-

- (a) Driving on heavy ground in too high a gear.
- (b) Using too high a gear when some obstruction is retarding the vehicle.

SERVICING

Oil level

208. The only servicing necessary is to ensure that the oil in the coupling is maintained at the correct level. The coupling is fitted with two filler plugs, one being shown in Fig 45(5)). The coupling is full when, with either of the plugs in the centre of the access hole (Fig 19(16)), the oil level reaches the base of the filler plug hole. The capacity is 9.3/4 pints.

209. The level should always be checked when the engine is cold. The oil in the fluid coupling is not normally changed between overhauls.

To check and top up the oil level (1,000 miles task)

- (a) Equipment required:-

Oil injector
Key, fluid coupling
filler plug

Supply of approved lubricant
Starting handle

- (b) Method:-

- (i) Remove the wireless sets.
- (ii) Fit the starting handle to the engine.
- (iii) Turn the engine until one of the filler plugs in the coupling is in the centre of the access hole (Fig 19(16)).

/Note:

Note: Certain vehicles are fitted with a cover over the access hole.

- (iv) Remove the filler plug (key, fluid coupling filler plug) taking care not to allow the plug to fall inside the flywheel housing.
- (v) Check the oil level in the coupling and, if necessary, add oil to bring the level to the bottom of the filler hole (oil gun).
- (vi) Check that the copper and asbestos washer is of the correct type and is clean and serviceable. The washer should be removed from the plug and fitted in the recess round the filler hole before the plug is fitted.

Note: It is most important that the washer fitted to the plug is of the correct type and that it is not replaced with a washer of another type. Although a washer may be found which will fit the plug it is improbable that it will also fit the recess. This will cause a leak at the joint and may also damage the threads or fracture the coupling when being tightened.

- (vii) Replace the plug and tighten sufficiently to make an oiltight joint without using excessive pressure.
- (viii) Start the engine and run it at about 2,000 r.p.m. for about three minutes. Switch off and check both filler plugs for leaks.
- (ix) Replace the wireless sets.

COMMON FAULTS

210. Excessive slip in the fluid coupling.

- (a) Symptom - Engine races in all gears.
- (b) Cause - Low oil level due to lack of servicing or leaks at filler plugs.
- (c) Remedy - Check oil level and top up. Tighten plugs if loose. If tight, report to vehicle mechanic.

14 - GEARBOX

211. The gearbox is of the pre-selective epicyclic type. It is of unit construction with the transfer box (Fig 35) and engine.

The gearbox provides five speeds in one direction only. All five speeds can be used in either a forward or reverse direction by means of the transfer box (para 230).

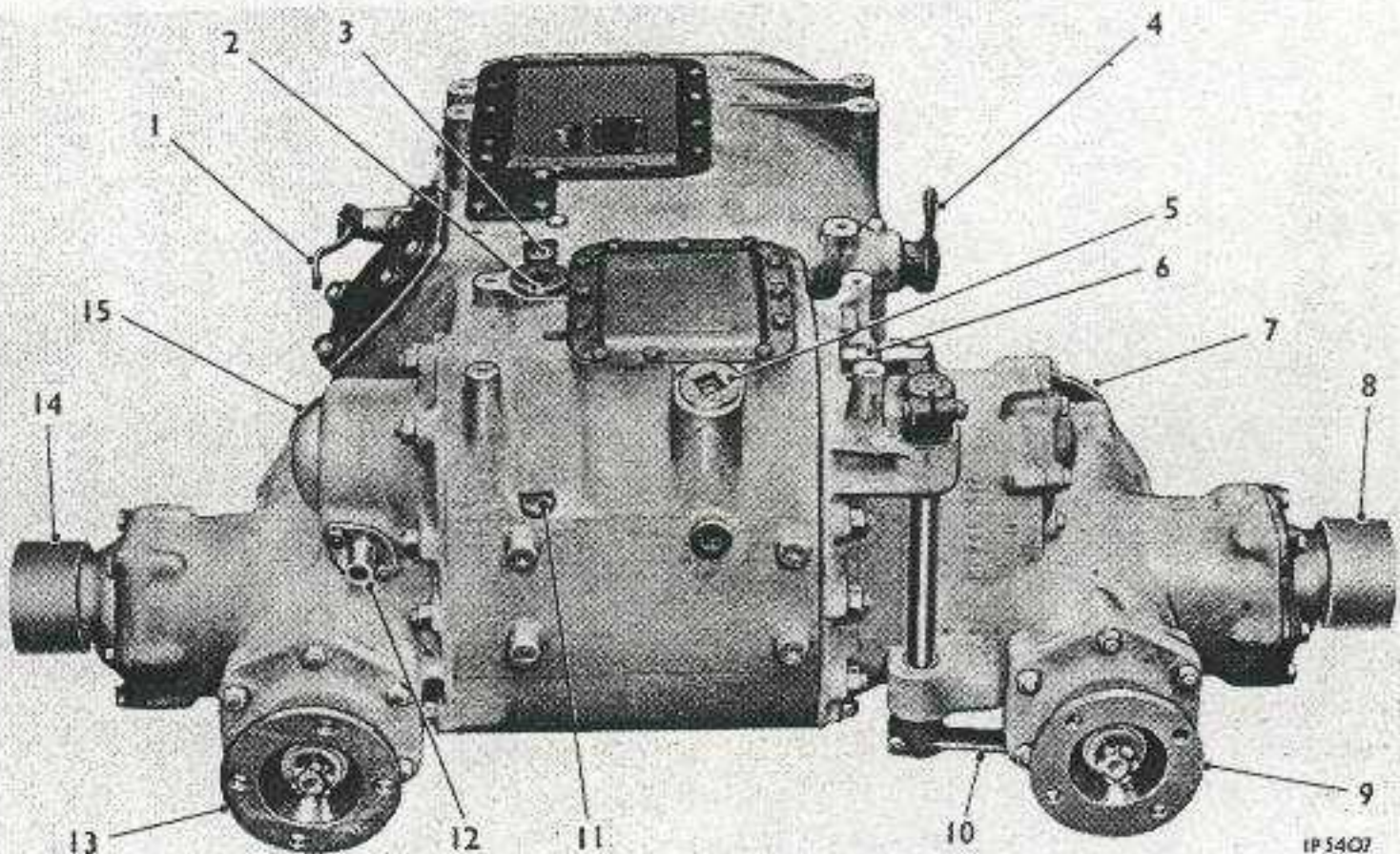
Warning: The gearbox is fitted with a pressure lubrication system the pump for which is driven from the input shaft. Should the vehicle be towed with the transfer box engaged and the engine not running, some parts of the gearbox will be running without lubrication. It is therefore most important that, when a vehicle is being towed, the gearbox is made completely free by engaging neutral in the transfer box (Section 15). Engaging neutral in the gearbox is not sufficient.

OPERATION OF CONTROLS

Gear selector lever

212. The gear selector lever (Fig 36(15)) is mounted in a quadrant to the right of the driver's seat and is provided with the following gear positions:-

1st, 2nd, 3rd, 4th, T. N (T = top, N = neutral)



- | | |
|--------------------------------|---------------------------------|
| 1 Gear selector lever | 8 Mounting trunnion |
| 2 Gearbox oil filler plug | 9 Front left driving coupling |
| 3 Gearbox oil dipstick | 10 Forward/reverse lever |
| 4 Gear change lever | 11 Transfer box oil dipstick |
| 5 Transfer box oil filler plug | 12 Speedometer drive |
| 6 Forward/reverse selector rod | 13 Front right driving coupling |
| 7 Rear left driving coupling | 14 Mounting trunnion |
| | 15 Rear right driving coupling |

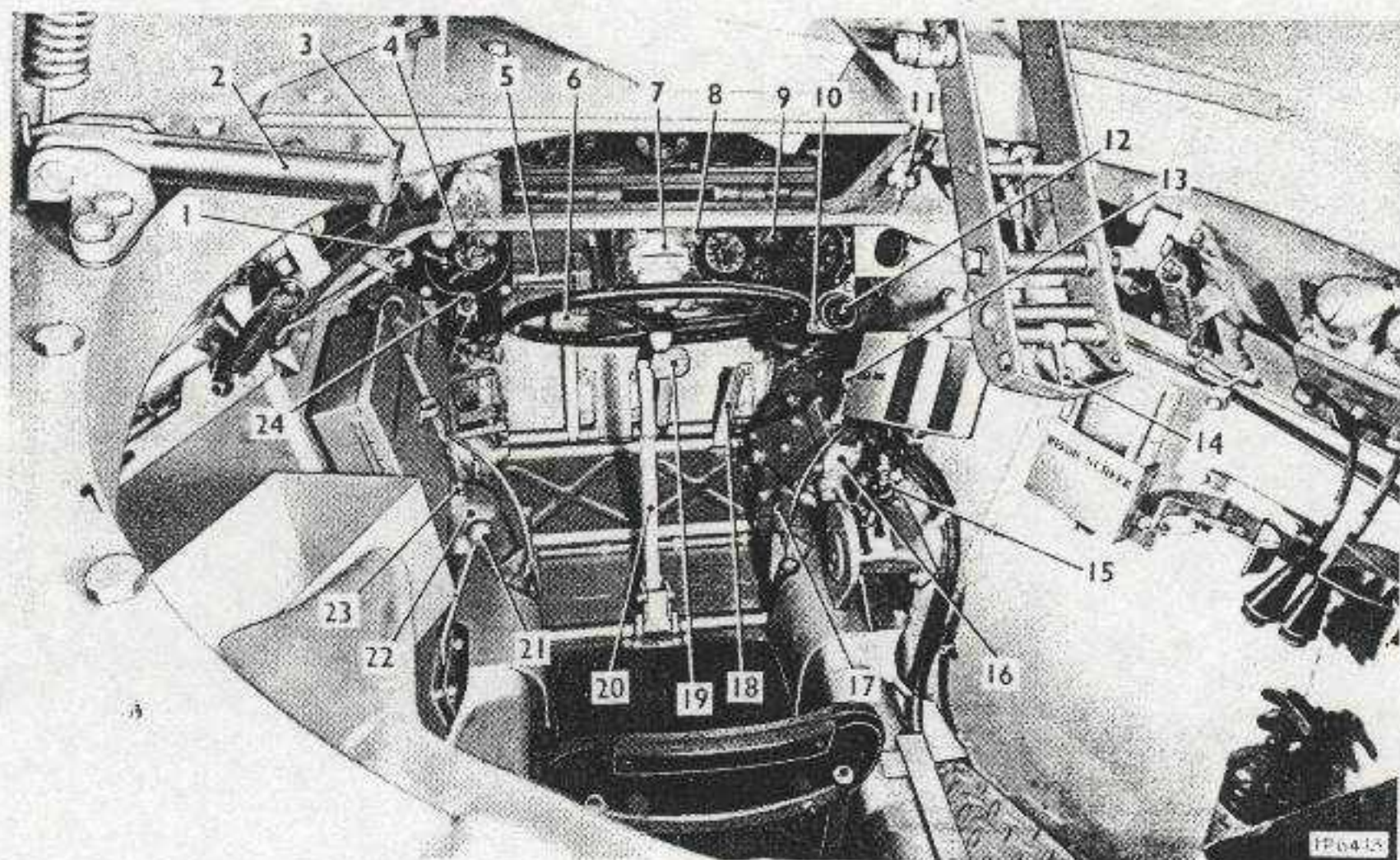
Fig 35 Gearbox and transfer box

213. The gear selector does not engage the gear and the position of the lever is no indication of the gear which is engaged in the gearbox. When the lever is moved it operates a camshaft, in the gearbox, which selects the gear that will be engaged when the gear change pedal (Fig 36(6)) is depressed. The gear is not changed until the pedal is depressed and released.

214. It is most important that, before the engine is started, the selector lever is moved to the neutral position and the pedal operated. The pedal should be operated even if the lever is already in the neutral position.

215. When either 1st or 2nd gear is being selected, it will be necessary to press the button on the top of the selector lever.

216. When any gear is being engaged, the lever should be moved to the required position before the change is made. The lever may be left in position for the next gear for any length of time.



- | | |
|---------------------------------------|-----------------------------------------|
| 1 Carburettor starting device control | 13 Supply tank filler pipe and breather |
| 2 Turret traverse handle | 14 MG firing lever |
| 3 Turret lock | 15 Gear selector lever |
| 4 Switchboard | 16 Brake fluid supply tank |
| 5 Steering cross-shaft bevel box | 17 R.H. front bevel box |
| 6 Gear change pedal | 18 Accelerator pedal |
| 7 Steering bevel box | 19 Footbrake pedal |
| 8 Steering bevel box oil filler plug | 20 Handbrake lever |
| 9 Instrument panel | 21 Forward/reverse lever |
| 10 Speedometer trip re-set | 22 L.H. front bevel box |
| 11 Escape hatch catch | 23 Bevel box relief valve |
| 12 Horn button and dipswitch | 24 Hand throttle control |

Fig 36 Controls

Gear changing

217. The following minimum speeds shown on the tachometer will indicate when the gear change should be made:-

Changing up	-	2,500 r.p.m.
Changing down	-	1,500 r.p.m.

To engage an initial gear

218. With the engine running, the handbrake on and the gearbox in neutral, move the gear selector lever to the 2nd gear position. This operation has no effect on the vehicle and any length of time may elapse before making the next move which is to press the gear change pedal down as far as it will go and release it. This must be done with the engine running at no more than normal idling speed. The gear is now engaged, but the vehicle will not move until an increase in the engine speed causes the fluid coupling to transmit the drive to the gearbox. When ready to move, press the accelerator pedal and at the same time release the handbrake. This procedure ensures that any slip which takes place is in the fluid coupling and not on the brake bands of the gearbox.

Should the vehicle be on very heavy ground or on a very steep hill, engage 1st gear.

To change gear

219. Move the selector lever to the next higher or lower position. When the engine has reached the appropriate speed, press the gear change pedal as far as it will go and release. When changing up, a pause must be made with the pedal fully down while the engine is decelerated. If changing down, the engine must be accelerated by maintaining pressure on the accelerator. Do not at any time "pump" the accelerator while changing gear.

To stop the vehicle

220. Fully release the accelerator pedal and apply the brake. The vehicle will come to a standstill and will remain so with the gear engaged if the accelerator pedal is not touched.

221. To engage neutral, move the selector to the N position and press and release the gear change pedal. It is useful to note that the pedal does not rise as far in neutral as when in gear.

Note: Any sign of jerk or whine when changing gear indicates that the change is not being made correctly and that the transmission is being subjected to unnecessary strain.

SERVICING

Gear change pedal

222. The gear change pedal (Fig 36(6)) must have free movement of at least 1/2 in. to ensure that the linkage is not causing the brake bands in the gearbox to slip. This free travel must be checked with the lowest gear engaged. If less than 1/2 in. or more than 2 in. free travel is obtainable, report to a vehicle mechanic.

Gearbox brake band adjustment

223. The brake bands in the gearbox are fitted with automatic adjusters which operate each time the gear change pedal is depressed. This operation is sufficient to take up normal wear but, owing to excessive slip, some further adjustment may be necessary. This can be done by pressing and releasing the pedal a number of times while the vehicle is stationary.

224. The following procedure should be carried out daily:-

Engage the lowest gear, and depress and release the pedal at least six times. Repeat for each of the other gears. (It is impossible to over-adjust the brake bands since the automatic adjuster ceases to operate when adjustment is correct).

Gearbox oil level

225. The gearbox has a capacity of 10 pints of oil. It is fitted with a combined dipstick and breather (Fig 35(3)) and a filler plug which are accessible after opening a hinged cover (Fig 19(15)) under the gunner's seat.

To check and top up gearbox oil level (1,000 miles task)

226. (a) Equipment required:-

Square key

Supply of OMD-110 (see para 5)

(b) Method:-

- (i) Remove the gunner's seat (Fig 19(17)) by sliding it out of its runners.
- (ii) Open the gearbox access cover (15).
- (iii) Check that the oil level is up to the FULL mark on the dipstick (Fig 35(3)).
- (iv) Top up, if necessary, by first cleaning the area around the filler plug (2), then removing the plug and joint washer and filling to the correct level.
- (v) Replace the dipstick, and filler plug with joint washer and tighten up.
- (vi) Close the access cover and replace the gunner's seat.

To change the gearbox oil (6,000 miles task)

227. The oil should also be changed after the first 500 miles running.

(a) Equipment required:-

10 pints OMD-110 (see para 5)
Container - 1½ gallons

Square key

(b) Method:-

- (i) While the oil is warm, after a run, drive the vehicle on to level ground.
- (ii) Remove the gunner's seat (Fig 19(17)) by sliding it out of its runners.
- (iii) Open the gearbox access cover (15) and clean the area around the filler plug (Fig 35(2)).
- (iv) Remove the filler plug and joint washer.
- (v) Remove the gearbox drain plug access plate (Fig 8(4)).
- (vi) Remove the gearbox drain plug with joint washer and allow the oil to drain into the container.
- (vii) When all the oil has drained, replace the drain plug with joint washer and refill with OMD-110 or approved lubricant to the FULL mark on the dipstick (Fig 35(3)).
- (viii) Replace the filler plug, with joint washer, check the drain plug for leaks and replace the drain plug access plate.
- (ix) Close and fasten the access cover.
- (x) Replace the gunner's seat.

COMMON FAULTS

228. Gearbox brake bands slipping:-

- (a) Symptom - Engine speed increase with no corresponding increase in vehicle speed.
- (b) Cause - Insufficient adjustment on brake bands or faulty adjuster.
- (c) Remedy - Stop the vehicle and switch off the engine. Engage the faulty gear and fully operate the gear change pedal 20 or 30 times. If this does not effect a cure, report to a vehicle mechanic.

229. Gears not engaging:-

(a) Symptom -

- (i) No drive, with the pedal coming right back and requiring considerable effort to depress.
- (ii) No drive, with the pedal remaining in a neutral position.

(b) Cause -

- (i) Gear change pedal not being fully depressed or excessive free movement on pedal.
- (ii) Selector linkage out of adjustment.

(c) Remedy -

- (i) Check that the pedal is being fully depressed. If this does not effect a cure, report to a vehicle mechanic.
- (ii) Report to a vehicle mechanic.

Note: The gearbox may be faulty in only one gear. If this is the case, refrain from using that gear until a vehicle mechanic can be consulted.

15 - THE TRANSFER BOX

230. The transfer box is attached to the rear of the gearbox (Fig 35), by which it is driven, and is supported in trunnion brackets on the bottom plate of the hull.

231. The upper half of the box contains two directional gears in constant mesh with a driving bevel on the output shaft of the gearbox. Positioned coaxially with the directional gears is the mainshaft assembly; a sliding dog splined to the mainshaft enables the drive to be taken from one or the other of the directional gears at will to obtain a forward or reverse motion of the shaft. A selector fork engaged with the sliding dog is actuated by a lever in the driver's compartment.

232. A double helical pinion splined to the right end of the mainshaft is meshed with a similar pinion on the differential assembly in the lower half of the box. The right end of the mainshaft also drives the speedometer. Half shafts connect the differential with the output bevels which drive propeller shafts through tracta joints. The transfer box is provided with a filler plug, dipstick and breather, and a drain plug.

Important: Should the vehicle have to be towed, the transfer box must be in neutral in order to avoid damage to the gearbox (para 211).

OPERATION OF CONTROLS

Forward and reverse lever

233. The forward and reverse lever (Fig 36(21)) is located in a quadrant to the left of the driver's seat. When in the forward position, "forward" gear is engaged; the central position gives "neutral" and when the lever is in the rear position "reverse" gear is engaged.

To engage forward or reverse gear

234. The vehicle must be stationary, gearbox in neutral and the handbrake on. Move the lever to the required position. If the gear will not engage, start the engine, if not already running, and select 1st gear in the gearbox. Depress the gear change pedal and move the forward/reverse lever quickly to the required position. Select neutral in the gearbox.

SERVICING

Control linkage

235. The linkage should be inspected for security, and pivot and link pins lubricated monthly.

Transfer box oil level

236. The transfer box has a capacity of approximately 6 pints. The filler plug and dipstick are accessible after opening the gearbox access cover (Fig 19(15)) under the gunner's seat.

237. A drain plug is fitted to the bottom of the box and is accessible through the drain access plate (Fig 8(5)). *The bronze plug in the front face of the transfer box must not be removed.*

To check and top up the transfer box oil level (1,000 miles task)

238. (a) Equipment required:-

Square key

Supply of OEP-220 (see para 5)

(b) Method:-

- (i) Remove the gunner's seat (Fig 19(17)) by sliding it out of its runners.
- (ii) Open the gearbox access cover (15).
- (iii) Check that the oil is up to the FULL mark on the dipstick (Fig 35(11)).
- (iv) Top up, if necessary, by first cleaning the area around the filler plug (5), then removing the plug and joint washer and filling with OEP-220, or approved lubricant, to the correct level.

- (v) Replace the filler plug with joint washer and tighten up.
- (vi) Close the access cover and replace the gunner's seat.

To change the transfer box oil (3,000 miles task)

239. The oil must also be changed after the first 500 miles of running by a new vehicle.

(a) Equipment required:-

Spanner, 9/16 in. A/F	Square key
6 pins of OEP-220 (see para 5)	Container - 1 gallon

(b) Method:-

- (i) While the oil is warm after a run, drive the vehicle on to level ground.
- (ii) Remove the transfer box drain plug access plate (Fig 8(5)).
- (iii) Remove the gunner's seat (Fig 19(17)) by sliding it out of its runners.
- (iv) Open the gearbox access cover (15).
- (v) Clean the area around the filler plug (Fig 35(5)), then remove the plug and joint washer.
- (vi) Place the container under the bottom access hole, remove the drain plug from the transfer box and allow the oil to drain completely.
- (vii) Ensure that the joint washer is in position and replace and tighten the drain plug.
- (viii) Refill with OEP-220, or approved lubricant, to the correct level indicated on the dipstick (11).
- (ix) Replace the filler plug with joint washer and tighten up.
- (x) Drive the vehicle for a few minutes to assist the oil to penetrate to all parts of the transfer box.
- (xi) Check the oil level and top up if necessary.
- (xii) Check the drain plug for leaks then replace the drain access plate.
- (xiii) Close and fasten the access cover and replace the gunner's seat.

16 - PROPELLER SHAFTS, BEVEL BOXES, TRACTA JOINTS, HUB REDUCTION GEARS AND ROAD WHEEL HUBS

PROPELLER SHAFTS

240. Four propeller shafts transmit the drive from the transfer box to the front and rear bevel boxes (Fig 37).

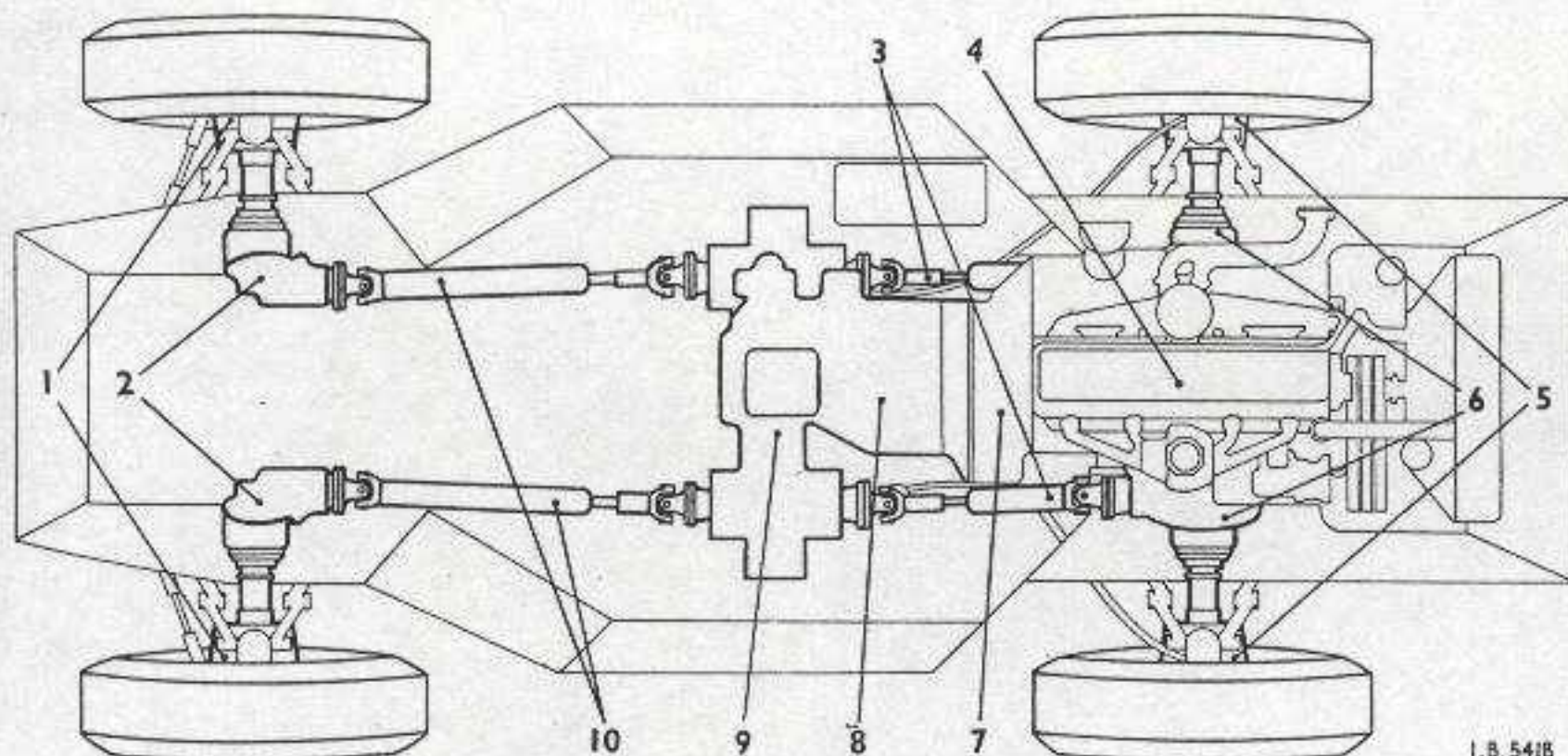
The shafts are provided with lubricating nipples in the universal joints and sliding sleeves. The sliding sleeves should be lubricated every 6,000 miles and the universal joints on vehicle overhaul.

INNER TRACTA JOINTS AND BEVEL BOXES

241. There are four bevel boxes, one to each road wheel. The front bevel boxes are located in the driver's compartment and the rear bevel boxes in the engine compartment. Each bevel box is coupled to the constant velocity tracta joint the housing of which is attached to the bevel box casing making one enclosed unit.

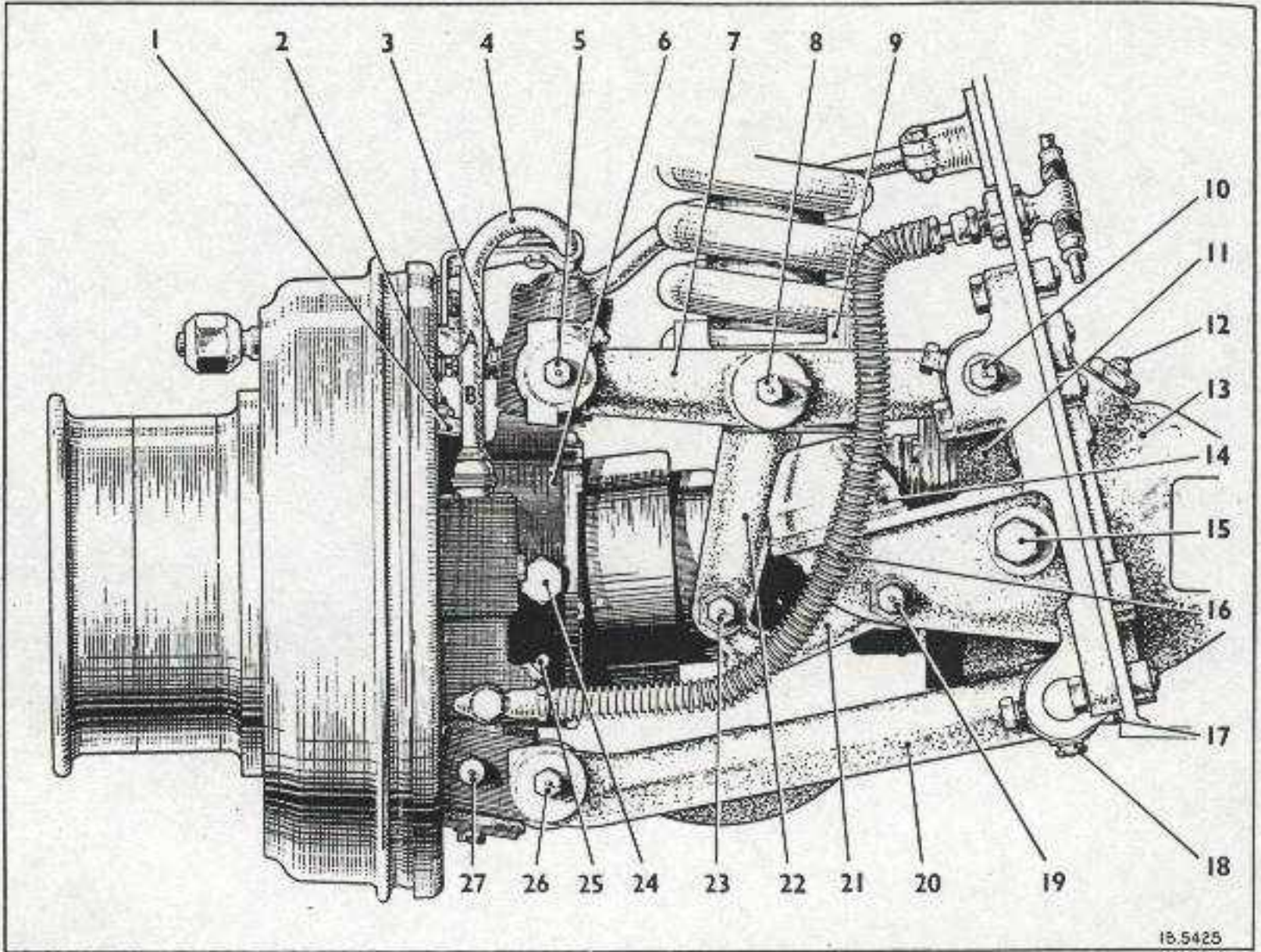
OUTER TRACTA JOINTS, REDUCTION GEARS AND ROAD WHEEL HUBS

242. The drive from the inner tracta joints is transmitted through enclosed articulating shafts to the outer tracta joints, epicyclic hub reduction gears and road wheel hubs. Each outer tracta joint is enclosed in a housing which is attached to the road wheel hub, thus forming one enclosed unit. The road wheel hub carries the hub reduction gears and the hub bearings.



- | | |
|-------------------------|---------------------------|
| 1 Front road wheel hubs | 6 Rear bevel boxes |
| 2 Front bevel boxes | 7 Fluid coupling |
| 3 Rear propeller shafts | 8 Gearbox |
| 4 Engine | 9 Transfer box |
| 5 Rear road wheel hubs | 10 Front propeller shafts |

Fig 37 Transmission layout



- | | | | |
|----|---------------------------------------------------|----|-------------------------------------------------------|
| 1 | Outer tracta joint housing
filler plug | 16 | Brake fluid pipe |
| 2 | Tracta joint housing relief valve | 17 | Inner tracta joint housing
drain plug |
| 3 | Upper steering swivel pin
lubricating nipple | 18 | Lower inner link pin
lubricating nipple (2) |
| 4 | Handbrake cable | 19 | Spring control link fulcrum
pin lubricating nipple |
| 5 | Upper outer link pin
lubricating nipple (2) | 20 | Lower link |
| 6 | Outer tracta joint housing | 21 | Spring control link |
| 7 | Upper link | 22 | Spring seat lever |
| 8 | Spring seat fulcrum pin
lubricating nipple (2) | 23 | Spring seat lever pin
lubricating nipple |
| 9 | Spring seat | 24 | Outer tracta joint housing
oil level plug |
| 10 | Upper inner link pin
lubricating nipple (2) | 25 | Brake bleeder screw |
| 11 | Inner tracta joint housing | 26 | Lower outer link pin
lubricating nipple (2) |
| 12 | Bevel box relief valve | 27 | Lower steering swivel pin
lubricating nipple |
| 13 | Bevel box | A | Square-headed adjuster |
| 14 | Rebound stop | B | Hexagon-headed adjuster |
| 15 | Inner tracta joint housing
filler plug | | |

Fig 38 Front L.H. suspension viewed from rear

SERVICING

Inner tracta joint housings and bevel boxes

To top up the inner tracta joint housings and bevel boxes (1,000 miles task)

243. (a) Equipment required:-

OEP-220 (see para 5)	Oil injector
Spanner, box, B.S.W., 7/16 in.	Cloth

(b) Method:-

The method for topping up is the same for the front and rear units.

- (i) Position the vehicle on level ground and allow a few minutes for the oil to settle.
- (ii) Clean the area around the filler plug, then remove the plug and joint washer.

Note: The filler plugs (Fig 38(15)) and (Fig 39(14)) are located in the inner tracta joint housings on the outer side of the hull.

- (iii) With the oil injector, inject lubricant OEP-220, or approved lubricant, up to the level of the filler hole.
- (iv) Replace the filler plug with joint washer and tighten up.

To drain the inner tracta joint housings and bevel boxes (3,000 miles task)

244. These must also be drained and refilled after the first 500 miles.

(a) Equipment required:-

OEP-220 (see para 5)	Container
Spanner, box, B.S.W., 7/16 in.	Cloth

(b) Method:-

The method for draining is the same for the front and rear units.

- (i) Position the vehicle on level ground.
- (ii) Clean the area around the filler plug (Fig 38(15)) then remove the plug and joint washer.
- (iii) Remove the drain plug - the larger of the two plugs - from the bottom of the inner tracta joint housing (11) and allow the oil to drain completely into the container. Ensure that the drain plug joint washer is not misplaced.

- (iv) Replace the drain plug with joint washer and tighten.
- (v) Refill with clean lubricant as described under topping up (para 243).

Outer tracta joint housings and road wheel hubs

To top up the outer tracta joint housings and road wheel hubs (1,000 miles task)

245. (a) Equipment required:-

OEP-220 (see para 5)	Oil injector
Spanner, B.S.W., 7/16 in.	Cloth

(b) Method:-

The method for topping up is the same for the front and rear units.

- (i) Position the vehicle on level ground and allow a few minutes for the oil to settle.
- (ii) Clean the area around the filler plug (Fig 38(1)), then remove the plug and joint washer.
- (iii) Remove one of the oil level plugs (24) and joint washer.

Note: There are two level plugs for each housing, one in the front and one in the rear. Either may be used.

- (iv) With the oil injector, inject OEP-220, or approved lubricant, until it flows from the level plug hole.
- (v) Replace the filler and level plugs with joint washers and tighten up.

Note: No provision is made for draining the outer tracta joint housings or road wheel hubs.

17 - SUSPENSION AND ROAD WHEELS

SUSPENSION

246. Each road wheel is mounted on an independent suspension assembly (Fig 38 and 39) and each wheel is driven. Each assembly bracket is fixed to the hull and carries two links, an upper and a lower. The outer ends of the links are connected by pivot pins to the outer tracta joint housings at the rear wheel stations and to the swivel pin yokes at the front wheel stations.

247. A helical spring and hydraulic shock absorber are connected to the upper suspension link (Fig 38(7)) and a bracket on the hull, the spring platform being mounted on a pivot pin and connected to the suspension bracket by a spring control link (21). Two rubber pads (14) limit the rebound or downward movement of the suspension links and a rubber buffer, located on the top of the shock absorber, limits the bump or upward movement. The shock absorbers control bump and rebound.

SERVICING

Lubrication

248. There are twelve lubricating nipples on each suspension unit including four on the spring seat pivot and stabilizing link. These points should be lubricated with LG-320, or approved lubricant, every 1,000 miles.

They are as follows:-

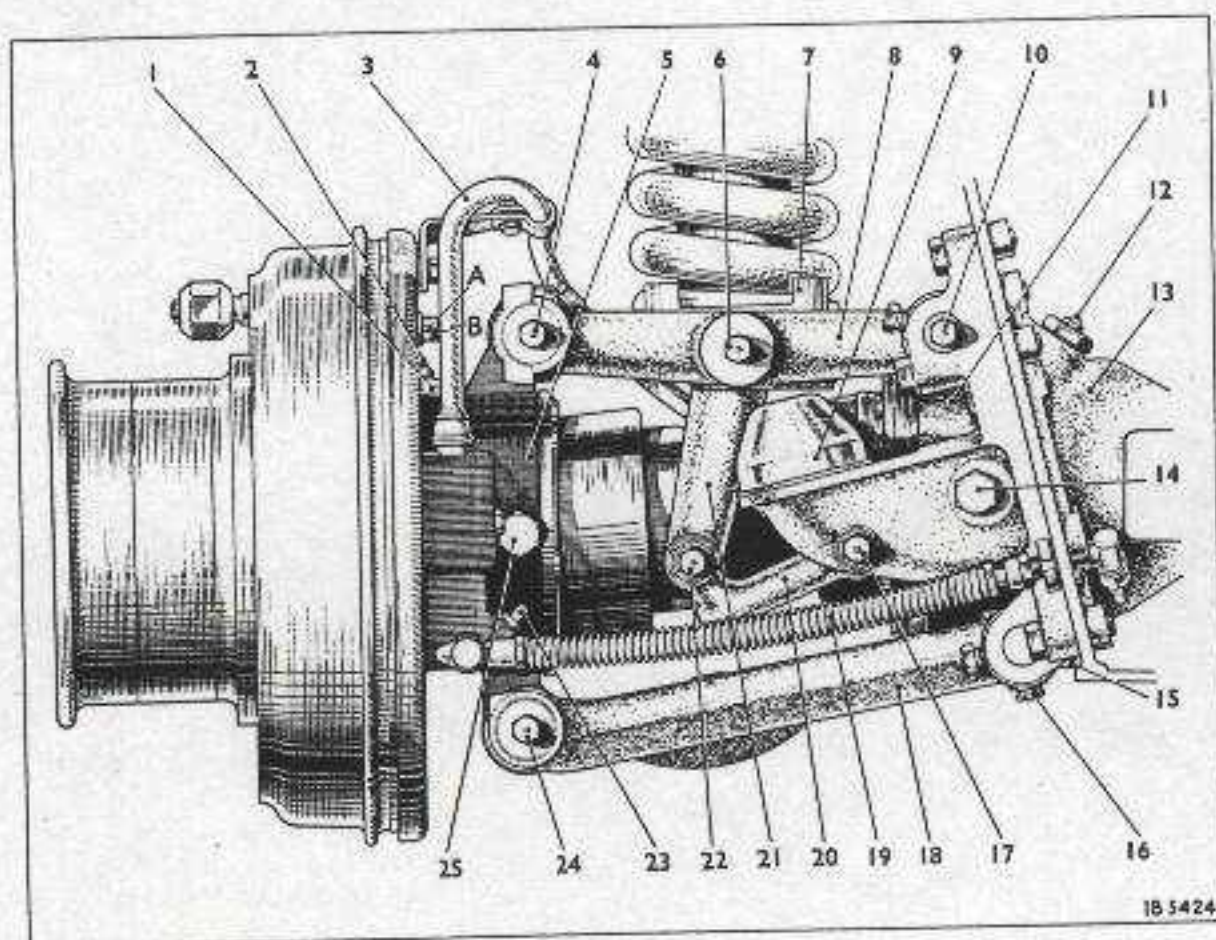
- | | |
|---------------------------------|---------------------------------------------|
| Suspension link pivot pins | - 8 nipples (Fig 38(5), (10) (18) and (26)) |
| Spring seat fulcrum bushes | - 2 nipples (Fig 38(8)) |
| Spring control link fulcrum pin | - 2 nipples (Fig 38(19)) |

Steering linkage and swivel pin lubricators are not included in the above.

Shock absorbers and rebound pads

249. The shock absorbers require no maintenance between vehicle overhauls. The rebound pads should be checked for security periodically.

- 1 Outer tracta joint housing filler plug
- 2 Tracta joint housing relief valve
- 3 Handbrake cable
- 4 Upper outer link pin lubricating nipple (2)
- 5 Outer tracta joint housing
- 6 Spring seat fulcrum pin lubricating nipple (2)
- 7 Spring seat
- 8 Upper link
- 9 Rebound stop
- 10 Upper inner link pin lubricating nipple (2)
- 11 Inner tracta joint housing
- 12 Bevel box relief valve
- 13 Bevel box
- 14 Inner tracta joint housing filler plug
- 15 Inner tracta joint housing drain plug
- 16 Lower inner link pin lubricating nipple (2)
- 17 Spring control link fulcrum pin lubricating nipple



- 18 Lower link
- 19 Brake fluid pipe
- 20 Spring control Link
- 21 Spring seat lever
- 22 Spring seat lever pin lubricating nipple
- 23 Brake bleeder screw

- 24 Lower outer link pin lubricating nipple (2)
- 25 Outer tracta joint housing oil level plug
- A Square-headed adjuster
- B Hexagon-headed adjuster

Fig 39 Rear L.H. suspension viewed from rear

ROAD WHEELS

250. The road wheels are of the twin disc type and are clamped together by a ring of nuts and bolts. The nuts are painted red and should not be moved unless it is necessary to change a tyre. *The tyre must be completely deflated before any attempt is made to loosen the nuts.*

251. An inner ring of nuts secures the wheel to the hub. The nuts on the right-hand side of the vehicle have right-hand threads while those on the left have left-hand threads.

252. The wheels are fitted with 9.00 in. x 16.00 in. R.F. tyres.

253. Vehicle may be fitted with either "Run Flat (R.F.) or Giant Low Pressure Cross Country (C.C.) tyres. It must be noted that the pressures for these tyres are not the same.

254. Run Flat tyres are so constructed that, if punctured, they do not collapse in the normal manner but are able to continue to carry the load at a reduced speed. If a Run Flat tyre is punctured, it should be changed immediately, but if the situation makes this impossible, the vehicle can be operated for about 50 miles provided the speed is restricted to a maximum of 30 miles per hour. It must, however, be borne in mind that the tyre will probably be unserviceable at the end of this time. The effect of the puncture will be to make the steering rather more heavy than usual and the bulge in the tyre will be noticeable.

255. Run Flat tyres must not be deflated to facilitate the passage of soft ground unless it is absolutely unavoidable. Should this emergency deflation be necessary, it must be effected by depressing the valve centre and not by removing the valve core.

256. It is essential that any mileage run on flat tyres be recorded in AB 413. The car should never be run on flat tyres during training.

257. Owing to the shortage of Run Flat tyres, some vehicles may be fitted with tyres of the normal pneumatic type (C.C. tyres). These tyres may also be supplied as replacements for Run Flat tyres.

If a R.F. tyre becomes unserviceable and a replacement is not available, the vehicle must be fitted with a complete set of C.C. tyres. The discarded R.F. tyres which are still serviceable should be retained as spares for issue to other vehicles. (RAC TIB No. 70 refers).

It must be ensured that the vehicle is fitted with a complete set of one type of tyre.

SERVICING

Wheels

258. The road wheel securing nuts should be checked for tightness daily during the first 250 miles running after they have been refitted, and thereafter weekly. The nuts are inclined to work loose until they have bedded down, and if run in this condition the studs and nuts will become damaged and the stud holes in the discs enlarged, necessitating replacement.

To remove and replace a wheel

259. It is necessary to remove wheels in order to change the position of the tyres.

(a) Equipment required:-

Wheel brace	Jack
Jacking blocks	

(b) Method:-

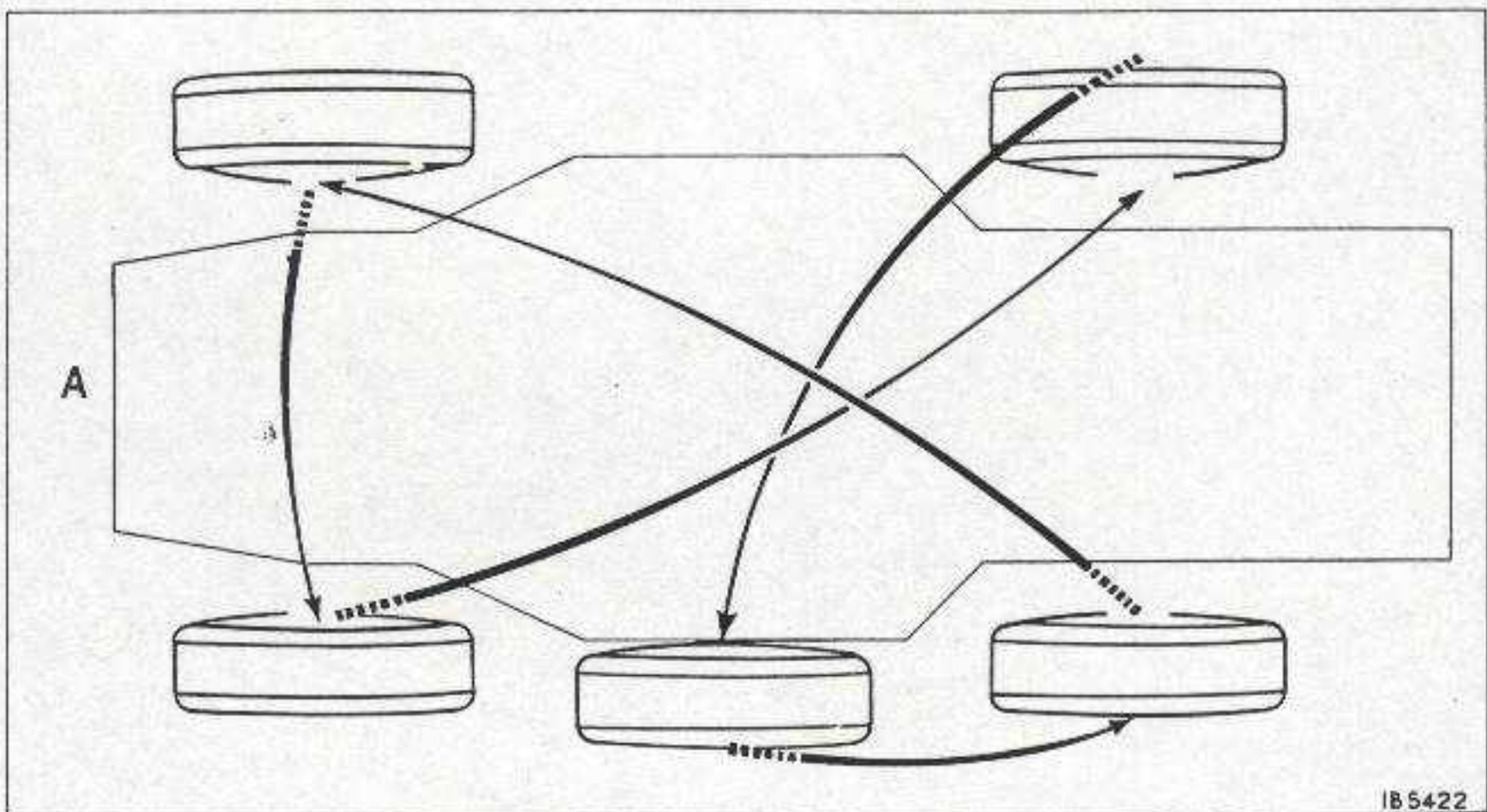
- (i) Drive the vehicle on to level hard ground and apply the hand-brake or scotch the wheels not to be removed.
- (ii) Loosen the inner ring of wheel nuts (eight) with the wheel brace. Do not interfere with the outer ring of nuts (painted red).
- (iii) Jack the wheel clear of the ground (jack and jacking blocks).
- (iv) Remove the wheel nuts and the wheel from the hub.
- (v) Replace in the reverse order of removal, tightening the nuts as much as possible before removing the jack, then finally tightening after the jack is removed. (R.H. threads on right-side, L.H. threads on left-side of the vehicle).
- (vi) Check the tightness of the nuts daily for the first 250 miles running.

Tyres

260. The tyre pressures should be checked daily by means of the pressure gauge in the tool kit and should be as shown under Data on page 9. The correct pressures should be painted on the mudguard above the wheel. If it is necessary to change the type of tyre on the vehicle, the correct figures for that type should be painted on the mudguard immediately. The following additional precautions should also be observed:-

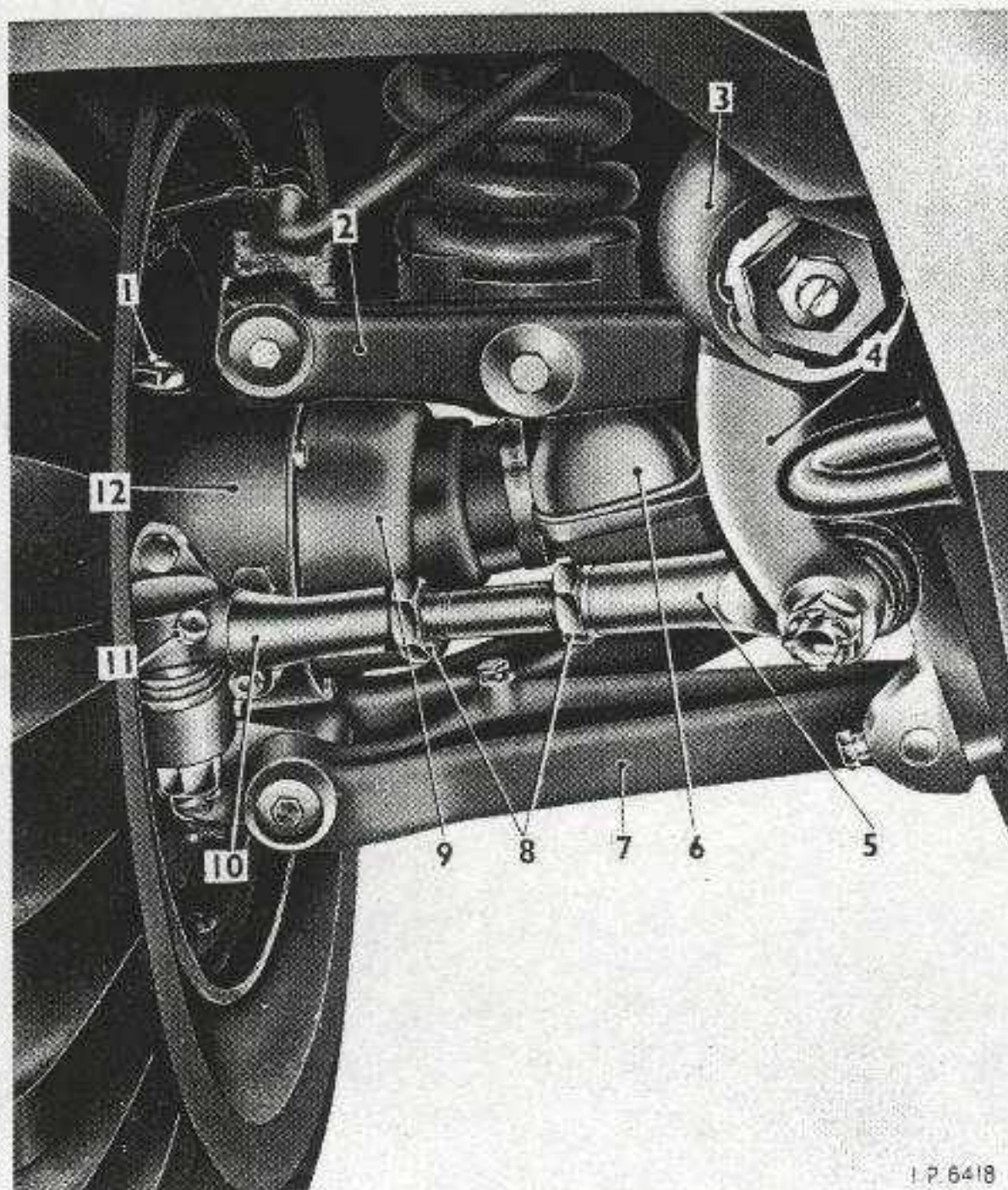
- (a) If the pressure has fallen more than 10 per cent since the last check, the cause must be sought and rectified.
- (b) Tyres must not be deflated to the correct pressure when hot owing to long runs or hot weather.
- (c) All tyre valves should be fitted with caps which must be finger-tight only.
- (d) Changing of Run Flat tyres is done only by a vehicle mechanic.

- (e) The normal wear of tyres should be evened out by changing the wheel positions (Fig 40) every 3,000 miles. This is done by moving the wheels diagonally as follows:-
- (i) Spare to L.H. side rear
 - (ii) L.H. side rear to R.H. side front
 - (iii) R.H. side front to L.H. side front
 - (iv) L.H. side front to R.H. side rear
 - (v) R.H. side rear to Spare
- (f) If the inside of a tyre shows camber wear, or should irregular wear become apparent at low mileage, report to a vehicle mechanic.
- (g) Should it be necessary for the vehicle to remain stationary for a long time, all wheels must be lifted so that the tyres are clear of the ground. The tyres should be covered with sacking as a protection against sunlight and weather.



A - Front

Fig 40 Road wheel changing sequence



- 1 Outer tracta joint housing filler plug
- 2 Upper link
- 3 Steering relay lever box
- 4 Drop arm
- 5 Steering rod
- 6 Bump stop
- 7 Lower link
- 8 Locknuts
- 9 Gaiter
- 10 Ball joint
- 11 Steering rod ball joints lubricating nipple
- 12 Outer tracta joint housing

I.P. 6418

Fig 41 Front R.H. suspension viewed from front

18 - STEERING

DESCRIPTION AND OPERATION

261. The vehicle is steered through the front road wheels. The steering wheel is mounted on a column which comprises an upper or steering bevel box (Fig 36(7)), main steering shaft, and lower or cross-shaft bevel box (5).

262. The cross-shaft bevel box contains a bevel driven recirculating ball device which imparts a transverse motion to the cross-shaft. The outer ends of the cross-shaft are connected by link-rods to the steering levers in the steering relay lever boxes (Fig 41(3)), one on each side of the hull. Mounted on the rear end of the shaft in each relay box is a droparm connected to the front wheel swivel by an adjustable steering rod (5) with ball and socket joints.

263. Turning the steering wheel causes the bevels to rotate the recirculating ball device in the cross-shaft bevel box and move the cross-shaft transversely to move the droparms, steering rods and road wheels.

SERVICING

Steering bevel box

264. The filler plug is situated at the top right side of the bevel box. The bevel box is filled to the level of the filler plug hole.

To check and top up the steering bevel box (1,000 miles task)

265. (a) Equipment required:-

Spanner, B.S.W., 7/16 in. OEP-220 (see para 5)
Oil injector

(b) Method:-

- (i) Clean the area around the filler plug (Fig 36(8)) to ensure that dirt does not enter the bevel box.
- (ii) Remove the filler plug and joint washer.
- (iii) Check that the level of the oil is up to the bottom of the filler plug hole.
- (iv) Top up, if necessary, with lubricant OEP-220, or approved lubricant, using an oil injector.
- (v) Replace the filler plug with joint washer and tighten up.

Cross-shaft bevel box

266. The filler plug is situated at the top centre of the cross-shaft bevel box (Fig 36(5)). The box is filled to the level of the filler plug hole. Owing to a very gradual seepage of oil along the cross-steering shaft, the drain plugs in the bottom of the relay lever boxes (Fig 41(3)) on each side of the vehicle should be removed every 6,000 miles and the oil drained. The drain plugs are located inside the vehicle.

To check and top up the cross-shaft bevel box (1,000 miles task)

267. (a) Equipment required:-

Spanner, B.S.W., 7/16 in. OEP-220 (see para 5)
Oil injector

(b) Method:-

- (i) With the vehicle on level ground, remove the filler plug and joint washer from the top centre of the cross-shaft bevel box (Fig 36(5)).
- (ii) Check that the oil level is up to the level of the filler hole.

- (iii) Top up, if necessary, with OEP-220, or approved lubricant, using an oil injector.
- (iv) Replace the plug with joint washer and tighten up.

Steering linkage

268. The two ball joints on each steering rod (Fig 41(5)) and the wheel swivels should be lubricated every 1,000 miles. Six lubricating nipples are provided for this purpose.

269. The linkage should be checked for distortion, cracks and other damage daily, and the following thoroughly inspected weekly:-

- (a) Steering column securing bolts, cross-shaft flange nuts.
- (b) Nuts securing thrust bolts on relay boxes.

Road wheel alignment

270. The front road wheels should have $1/8$ in. toe-in (Fig 42). The alignment should be checked and if necessary adjusted by a vehicle mechanic monthly.

To check and adjust road wheel alignment (monthly task)

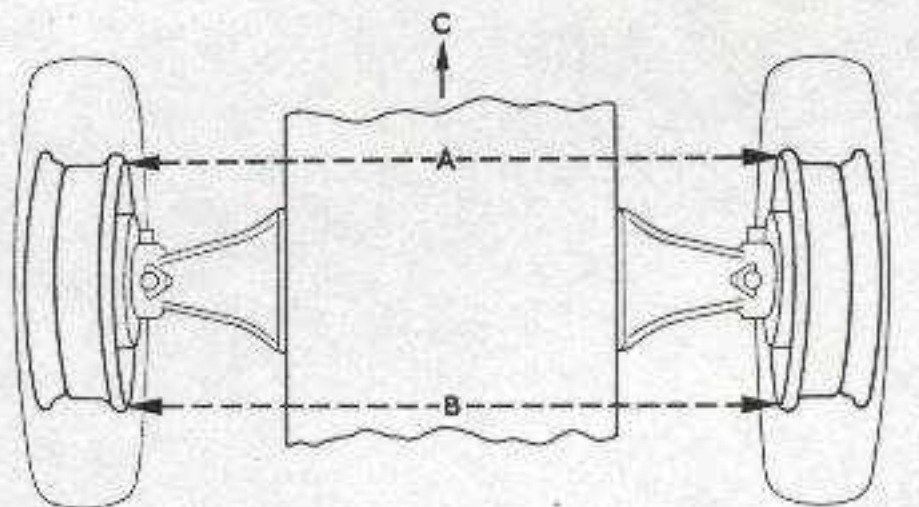
- (a) Equipment required:-

Pipe or stilson wrench
Steel rule

Spanner, B.S.W., $3/4 \times 13/16$ in.
(to fit locknuts on steering rods)
Trammel

- (b) Method:-

- (i) Position the vehicle on a hard level surface and release the handbrake.
- (ii) Check that the extremities of the droparms are equal distances from the hull. This should bring the front wheels in the straight ahead position.
- (iii) With the trammel, measure the distance between the edges of the wheel rims and mark the points on the rims from where the measurement is taken. This measurement must be taken in front of the hubs at the same height as the hub centres as shown at A in Fig 42.



Dimension A to be $1/8$ in. less than dimension B

Fig 42 Toe-in of front road wheels

- (iv) Now roll the vehicle until the marks made on the rims come behind the hubs at the same height as they were when the first measurement was taken, then measure the distance between these marks again. The alignment is correct when the measurement taken in front of the hubs is $1/8$ in. less than the measurement taken at the rear (Fig 42). If the alignment is incorrect to a large extent and before adjusting, first ensure that the wheels are not running out of truth and that the steering linkage components are tightly secured and that the steering rods are not bent.
- (v) When satisfied that the components are secure and undamaged and that the alignment requires adjusting, slacken the locknuts on the steering rods and adjust each rod by the same amount by turning in the required direction until the correct measurements are obtained. Tighten the locknuts.
- (vi) Roll the vehicle forward approximately 3 ft and re-check. Re-adjust if necessary.

19 - BRAKES

272. The brakes are of the double leading shoe type and are hydraulically operated by the footbrake pedal and mechanically operated by the handbrake on all four wheels.

273. The master cylinder, integral with the fluid supply tank (Fig 36(16)), is situated on the right of the driver's seat. Tubing and flexible hoses connect each brake assembly with the master cylinder.

274. Adjustable cables link the handbrake lever with the brake expanders.

275. Each brake assembly consists of a backplate carrying an expander unit, two shoe carrier-plates, two brake shoes and an adjuster unit. The expander unit is situated on one side of the backplate between the ends of the carrier-plates while the adjuster unit is diametrically opposite between the other ends of the carrier-plates.

276. The two brake shoes are each mounted in, and linked to, one of the carrier-plates, which is retained in position by the pull-off springs and steadying bolts.

OPERATION OF CONTROLS

Brake pedal

277. The brake pedal (Fig 36(19)) is situated between the gear change pedal and accelerator and is linked to the push-rod of the master cylinder. Pressure on the pedal causes the master cylinder to apply the pressure to the brake expanders and, in turn, the brake shoes.

Handbrake

278. The handbrake lever (Fig 36(20)) is mounted centrally in front of the driver's seat and is the means of applying all brakes through adjustable rod and cable linkage.

To apply the handbrake

279. Pull the lever back and ensure that the pawl engages with the quadrant to hold the brakes on.

To release the handbrake

280. Pull the lever back, depress the pawl release lever and ease the brake lever forward.

SERVICING

Brake shoe adjustment (weekly task)

281. Adjustment is effected by means of two adjusters which are located on each of the four backplates, one adjuster is square (Fig 38) and adjusts one brake shoe, whilst the other which is formed into a hexagon adjusts the second shoe.

To adjust the brake shoes

282. (a) Equipment required:-

Jack	Spanner
Jacking blocks	Scotches

(b) Method:-

- (i) With the vehicle on level ground and the transfer box in neutral, scotch the road wheels on the side of the vehicle opposite from that where the brakes are to be adjusted, then release the handbrake.
- (ii) Jack up both road wheels on the side of the vehicle where the brakes are to be adjusted.
- (iii) Turn the hexagon adjuster (Fig 38) anti-clockwise two or three turns to release one shoe fully.
- (iv) Rotate the road wheel and check that the other brake shoe is not contacting the drum. If it is, turn the square adjuster anti-clockwise until the shoe is clear.
- (v) Now turn the square adjuster clockwise until a shoe contacts the drum just sufficiently to offer a slight resistance when the road wheel is rotated.

- (vi) Turn the hexagon adjuster clockwise until a slight increase in resistance is felt when rotating the road wheel.
- (vii) Finally turn the square adjuster $3/4$ turn anti-clockwise.

Note: *The design of the adjuster unit is such that when the square adjuster is turned, it also turns the hexagon adjuster by the same amount; but the hexagon adjuster can be turned independently.*

- (viii) Using the same procedure, adjust the brake shoes on the other wheel that is jacked.
- (ix) Repeat the operations for the remaining brakes.

Handbrake

283. The handbrake should not normally require adjusting between vehicle overhauls. If, however, movement of the lever becomes excessive when applying the brakes, it should be reported.

The hydraulic system

To check and top up the master cylinder supply tank (weekly task)

284. (a) Equipment required:-

Spanner, B.S.W., $3/4$ in. Brake fluid OF-20 (see para 5)
Piece of clean cloth

(b) Method:-

- (i) Clean the area around the base of the filler pipe (Fig 36(13)) of the supply tank and remove the pipe and joint washer.
- (ii) Check that the level of fluid is up to the threads in the top of the filler hole.
- (iii) If the level is low, top up with clean brake fluid OF-20 or approved fluid.
- (iv) Replace the filler pipe and joint washer and tighten up. Ensure that the breather vent in the top of the filler pipe is clear.

To bleed the brakes

285. Since the hydraulic system incorporates a de-aerator, it is unlikely that the brakes will require bleeding unless some part of the system is renewed.

(a) Equipment required:-

Brake fluid OF-20 or OF-24
(see para 5)
Small jar

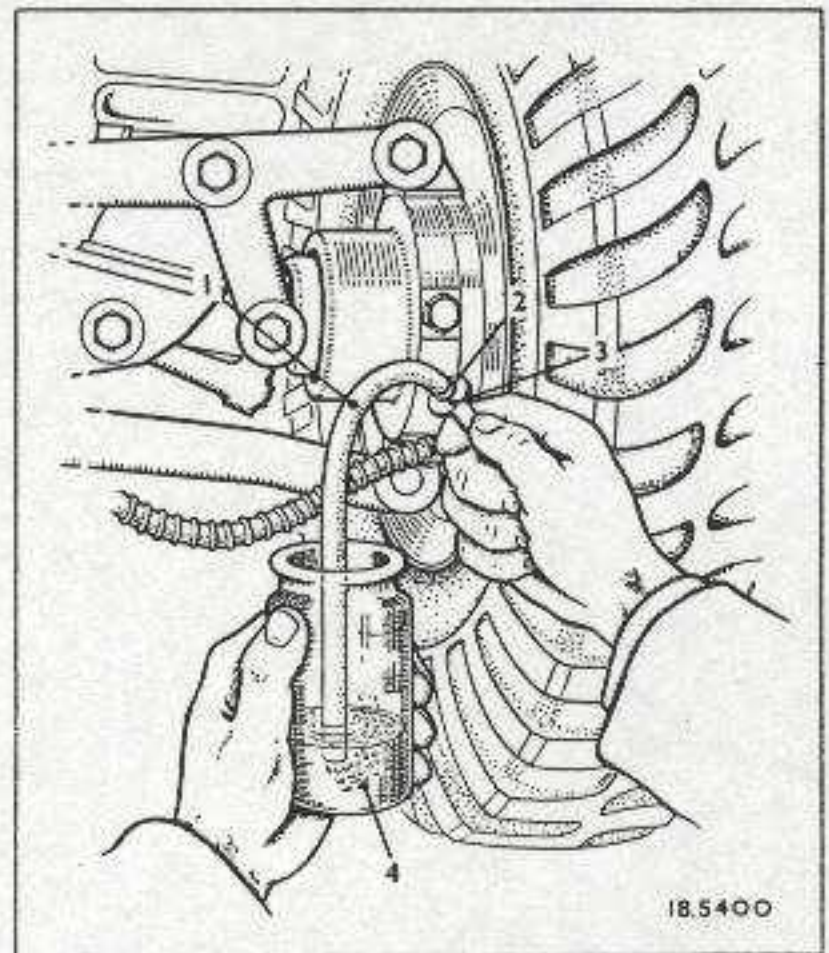
Spanner, B.S.W., 3/16 in.
Bleed tube

(b) Method:-

- (i) Check the level of the fluid in the supply tank (Fig 36(16)) and top up with clean fluid if necessary.

Note: Fluid bled from the system should not immediately be used for topping up the supply tank. However, if it is clean and allowed to stand for four or five hours until it is clear of all air bubbles, it may be used again.

- (ii) Starting at either of the rear brakes, thoroughly clean the bleeder screw (Fig 39(23)) then push one end of the rubber tube over the screw and place the free end in the jar with sufficient brake fluid in it to cover the end of the tube (Fig 43). The diameter of the tube should be such that it is a snug fit on the bleeder screw.
- (iii) Whilst an assistant in the driver's seat fully depresses and releases the footbrake pedal continuously, unscrew the bleeder screw one full turn (anti-clockwise). The pedal should be slowly depressed and released through the full limit of its travel, with a slight pause between each movement, until air bubbles cease to appear from the end of the tube. Then as the pedal is being depressed, tighten the bleeder screw. The supply tank must be kept topped up so that it is at least half full during the process of bleeding.
- (iv) Repeat the procedure of bleeding from the other rear brake, then from the two front brakes.
- (v) When the whole system has been bled, check the footbrake pedal movement and if it feels "spongy", ensure that there are no leaks from any of the pipes or connections, then repeat the bleeding operations. When it is considered that the system is satisfactory, top up the supply tank and replace the filler pipe.



1 Rubber tube 3 Spanner
2 Bleeder screw 4 Brake fluid

Fig 43 Bleeding the brakes

20 - FIRE FIGHTING EQUIPMENT

DESCRIPTION

286. Two types of fire extinguishers are carried on the vehicle. Originally these were as follows:-

- (a) One Pyrene (carbon tetra-chloride) extinguisher carried inside the vehicle forward of the right-hand side escape panel.
- (b) Two methyl bromide extinguishers carried externally, one on the front of the hull and one on the rear.

Subsequently these are being replaced by the following:-

- (c) One wet water (red) expendable extinguisher which replaces (a) above.
- (d) Two chlorobromomethane (green) expendable extinguishers which replace (b) above.

OPERATION

To operate a Pyrene (carbon tetra-chloride) extinguisher

287. Hold the body of the extinguisher, release the handle by turning it anti-clockwise, then pump with quick strokes and direct the jet at the base of the flames.

Caution: *The fumes are dangerous in a confined space. The crew should not enter the vehicle until the fumes have dispersed. Keep spray away from the skin.*

To operate a methyl bromide extinguisher

288. Hold the extinguisher upside down and strike the striker knob (Fig 44(2)) on a hard surface. Keep the extinguisher upside down and when the jet emerges, direct it at the base of the flames sweeping it from side to side.

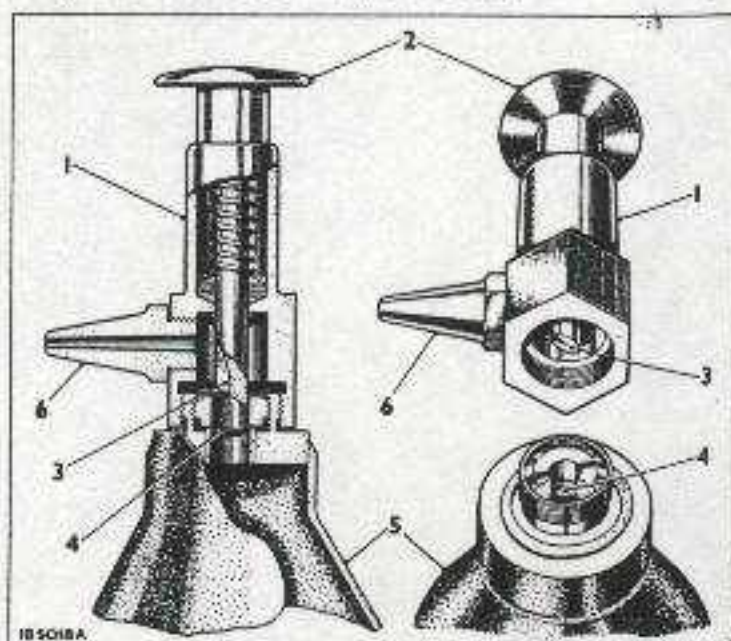
Caution: *Methyl bromide liquid and fumes are injurious. The extinguisher should only be used from outside the vehicle in the open air. The crew should not enter the vehicle until all the fumes have dispersed.*

To operate a wet water or chlorobromomethane extinguisher

289. Since the duration of discharge is limited, get in the best position for fighting the fire before striking the head.

Important: *Both the extinguishers must be held with the discharge head downwards and operated with one hand only.*

Strike the striker knob (Fig 44A(7) or (13)) on a hard surface and from a position as near the fire as possible, direct the spray cone at the near flames first, sweeping from side to side, progressing the cone over the fire area but leaving no flame behind it. The extinguisher may be tilted up to an angle of 45 deg each side from the vertical if necessary. The rate of discharge cannot be



1 Piercing head	4 Sealing disc
2 Striker knob	5 Cylinder
3 Striker	6 Nozzle

Fig 44 Methyl-bromide fire extinguisher

controlled; once the discharge starts the extinguisher will empty completely. After discharge the empty extinguisher should be discarded and a replacement obtained.

Caution: *The fumes from chlorobromomethane liquid are dangerous in a confined space. The crew must not enter the vehicle until the fumes have dispersed.*

SERVICING

To check Pyrene extinguishers (daily and weekly tasks)

290. Daily, remove the extinguisher and inspect for damage. Shake it to ensure presence of the liquid content.

291. Weekly, remove the filler plug and check that the extinguisher is filled to the filler hole with carbon tetra-chloride. Total capacity 2 pints.

To check methyl bromide fire extinguishers (daily and weekly tasks)

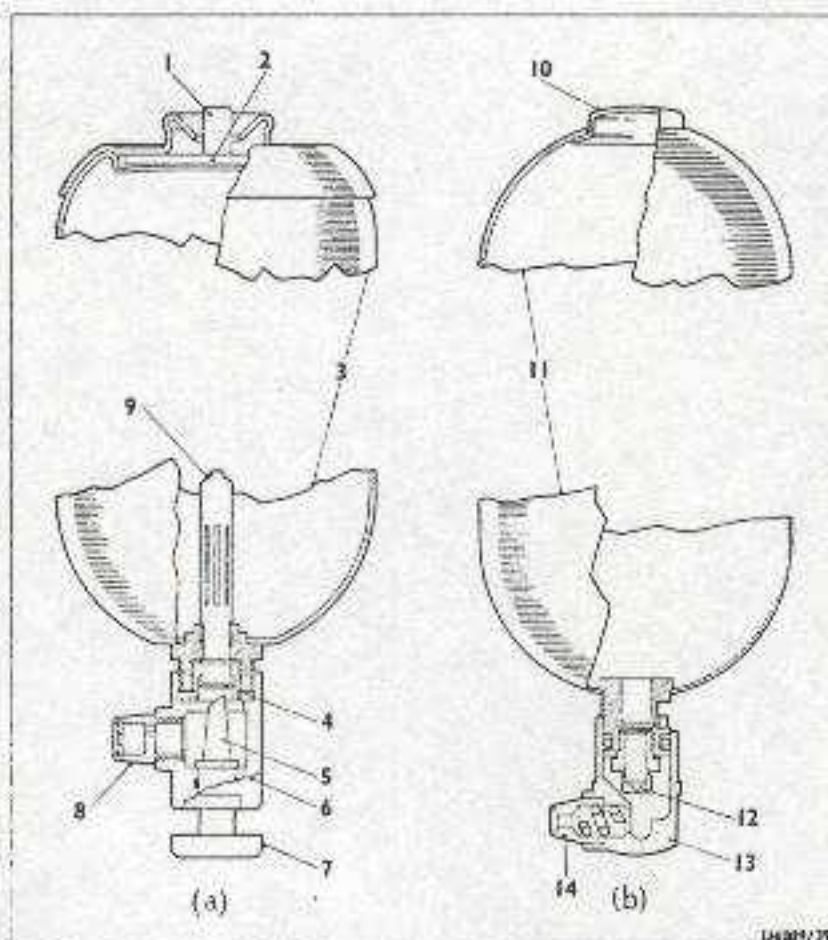
292. Daily, remove the extinguisher and shake it to ensure that it is full. Check the operation of the quick release strap.

293. Weekly, unscrew the piercing head (Fig 44(1)) and examine the sealing disc (4). If the disc is intact, check that the nozzle (6) is clear and replace the head.

To check wet water and chlorobromomethane fire extinguishers (daily task)

293A. Remove the extinguisher and inspect for damage. Shake it to ensure presence of the liquid content. Check the pressure indicators by attempting to rattle the disc (Fig 44(2)) or applying thumb pressure to the metal cap (10). If the disc can be rattled or the indicator cap pressed in from convex to concave form, the extinguisher should be discarded and a replacement obtained.

Note: *These extinguishers are sealed and cannot be unscrewed for examination and no further examination is necessary.*



- 1 Pressure indicator disc centre
 - 2 Pressure indicator disc
 - 3 Body
 - 4 Sealing disc
 - 5 Striker
 - 6 Piercing head
 - 7 Striker knob
 - 8 Discharge head
 - 9 Outlet tube
 - 10 Pressure indicator cap
 - 11 Body
 - 12 Break-off sealing cap
 - 13 Striker knob
 - 14 Discharge head
- (a) S. Jones make
(b) Pyrene make

Fig 44A Wet water and chlorobromomethane fire extinguishers

21 - HINTS AND TIPS ON DRIVING (including starting up sequence)

294. The following information has already been covered in previous sections of Chapter 1. This section is included to consolidate, in convenient form, all the important points concerning the use of the driving controls and to bring out any peculiarities of the vehicle under operating conditions. It should thus prove of value to the student already acquainted with Chapter 1 and, in addition, can be used as a guide by the trained "A" and "B" driver who finds it necessary to drive the vehicle before receiving detailed instructions.

STARTING UP SEQUENCE (See para 185)

Engine cold

295. (a) Check that the fuel, oil and coolant levels are correct.
- (b) Check fire extinguishers.
- (c) During cold weather, turn the engine over a few turns by hand.
- (d) Turn the fuel tap (Fig 19(19)) to main supply.
- (e) Check that the handbrake (Fig 36(20)) is fully on. (In cold weather it is possible for the vehicle to move, if the handbrake is not applied, owing to the thickness of the oil in the gearbox and fluid coupling when cold).
- (f) Check that the forward and reverse lever (21) is in the appropriate position for moving off. (Pushed forward for forward gear and pulled back for reverse gear).
- (g) Select the lowest gear in the gearbox. Fully depress and release the gear change pedal (Fig 36(6)) six times. Repeat for each of the other gears.
- (h) Select the neutral position with the selector lever. Depress and release the gear change pedal.
- (i) Check that the hand throttle control (24) is screwed fully clockwise.
- (j) Pull the carburettor starting device control (1) out to the first stop. In very cold weather pull out to the second stop. In sub-zero conditions, pull out to the third stop (para 94).
- (k) Switch on the ignition. Check that the oil pressure indicator (amber) and ignition warning (red) lights on the switchboard (4) glow, and the fuel level indicator registers.

Note: When the ignition key is inserted, the ignition switch can be turned to any of the three positions provided. If the key is removed when the switch is in the locked position, the switch can-

not be moved. If the key is removed when the switch is in any other position than locked, the switch can be turned to ON and OFF only.

- (l) To start the engine, press down the starter switch lever on the switchboard and release it as soon as the engine starts. If the engine does not start within five or six seconds, release the starter lever, wait a few seconds to allow to come to rest, then make another attempt to start.
- (m) If the carburettor starting device control has been pulled out to the third position, return it to the second position immediately the engine starts. Return it to the first position and then to the fully in position as soon as the engine will tick over evenly without the use of the starting device.
- (n) Adjust the hand throttle control to give a fast idling speed of 800-1,000 r.p.m. and observe that the oil pressure indicator and ignition warning lights go out.
- (o) Return the hand throttle control to the normal position when the engine has warmed up (160°F).
- (p) Stop the engine and re-check the oil level.

Engine warm

296. When starting a warm engine, do not use the carburettor starting device.

Starting by towing

297. (a) Prepare the towed vehicle for starting as in para 295 (a) to (k).
- (b) Engage second gear in the towed vehicle. Return the selector lever to the neutral position.
 - (c) Engage the lowest gear in the towing vehicle.
 - (d) Ease off the handbrake and commence towing. As soon as the engine fires, engage neutral gear by depressing and releasing the gear change pedal. Return the carburettor starting device control to the fully in position as soon as possible.

Note: Do not continue towing if the engine does not start readily.

DRIVING

Seat adjustment

298. The seat should be adjusted (para 22) to suit the individual driver.

Handbrake

299. The handbrake is applied by pulling the lever (Fig 36(20)) straight back. The brake is released by pulling back, pressing the pawl release lever and easing the brake lever forward. Always check that the brake is applied before starting the engine. Do not release it until the vehicle is required to move.

Forward and reverse lever

300. The forward and reverse lever (Fig 36(21)) which is to the left of the driver should only be operated when the vehicle is stationary. To change from forward to reverse or vice versa, bring the vehicle to a standstill and as soon as it stops depress the gear change pedal and move the lever smartly from one position to the other.

301. To engage forward or reverse gear from neutral, move the lever to the required position. If the gear cannot be engaged at any time, apply the handbrake, start the engine, if not already running, and select low gear in the gearbox. Depress the gear change pedal and move the forward/reverse lever quickly to the required position. Select neutral in the gearbox.

Gear selector lever

302. Movement of the gear selector lever (Fig 36(15)), which is to the right of the driver, does not affect the operation of the gearbox until the gear change pedal has been operated.

303. When a gear has been engaged in the gearbox and the vehicle is on the move, the selector lever should be placed in position for the gear which is likely to be required next. In this manner the selection can be done at leisure while the actual change is made when necessary.

Gear change pedal

304. Although the gear change pedal (Fig 36(6)) is fitted in the place normally occupied by a clutch pedal it must not be used in the same manner. The pedal should be regarded as a control which changes the gear in the gearbox and does nothing else. It must never be used in such a manner as to allow the brake bands in the gearbox to slip. When operating the pedal, always press it down as far as it will go before releasing.

Moving off

305. Engage the appropriate gear in the transfer box, and 2nd gear in the gearbox. If moving off on very heavy ground or up a very steep hill, engage the lowest gear in the gearbox. Do not touch the accelerator pedal until the vehicle is actually required to move.

306. Move the vehicle by releasing the brake and pressing on the accelerator pedal. If moving up a hill, accelerate slightly before releasing the brake. Owing to the action of the fluid coupling the vehicle can be moved off very smoothly if the controls are correctly operated.

Halting

307. To bring the vehicle to a standstill, release the accelerator pedal and apply the brake. If the halt is only for a few moments, do not engage neutral but engage the appropriate gear for moving off. The vehicle will not move so long as the brake is on and the engine is not accelerated.

308. If the vehicle is to be halted for some time with the engine running, select and engage neutral gear in the gearbox. If the vehicle is to be left for a considerable period, engage the lowest gear after the engine has been stopped.

Changing up

309. When the vehicle is moving, select the next highest gear before the change is required. When the engine speed has reached approximately 2,500 r.p.m., release the accelerator pedal and press the gear change pedales far as it will go. Hold the gear change pedal down for a moment until the engine speed has dropped sufficiently to match the road speed, then release it. If the vehicle jerks when the pedal is released, the pedal has not been held down for the correct length of time.

Changing down

310. When the vehicle is on the move and a lower gear is required, select the next lower gear before the change is required. If operating on hard level going, release the accelerator and allow the vehicle to slow down until the engine speed is approximately 1,500 r.p.m. When the correct engine speed is reached, fully depress the gear change pedal and hold it down. Slightly increase the engine speed by means of the accelerator and release the gear change pedal.

311. On heavy ground or when ascending a steep hill, maintain the pressure on the accelerator and operate the gear change pedal quickly. In both cases the drive will be taken up without jerk if the engine is turning at the correct speed when the gear change pedal is released.

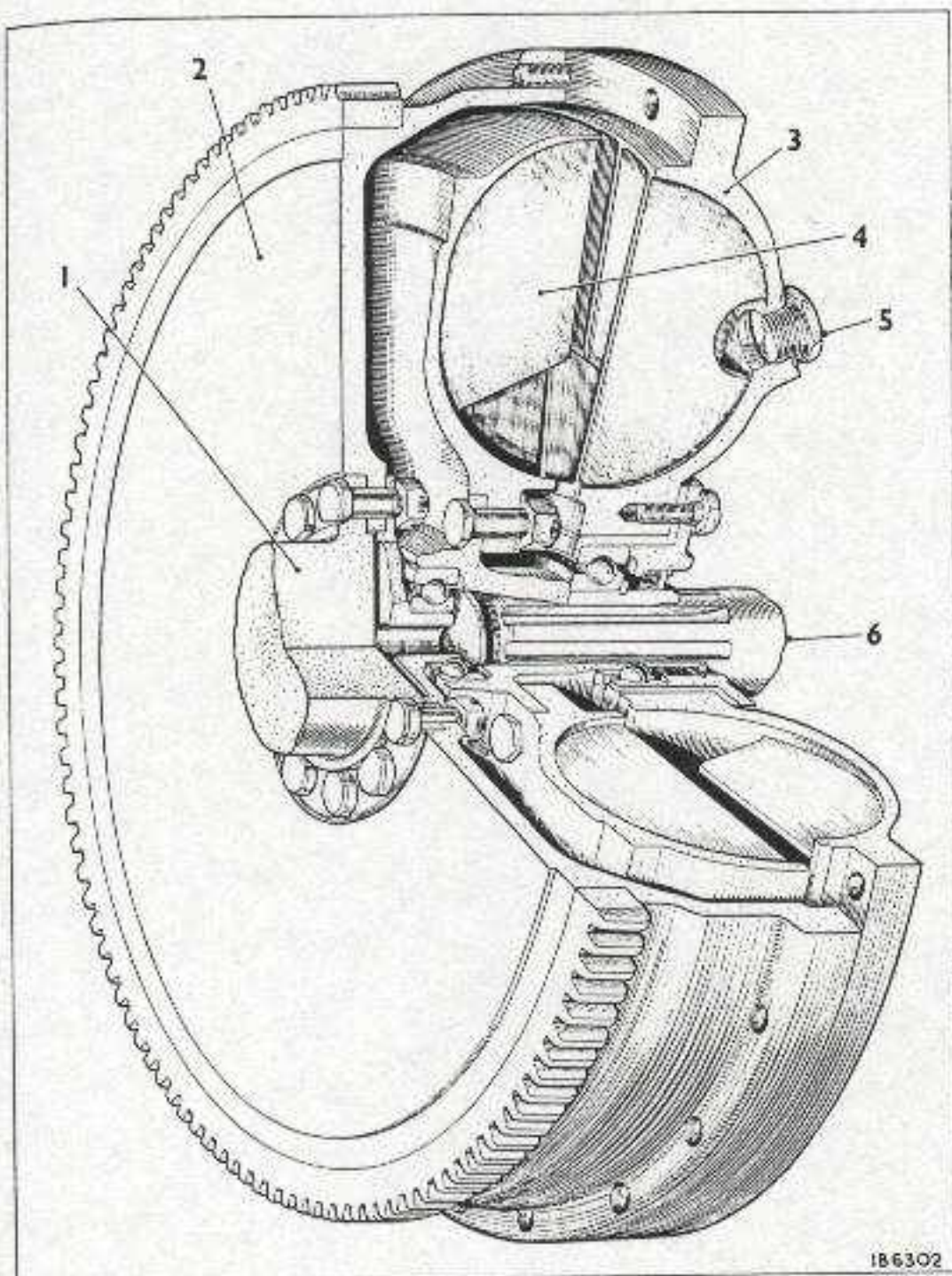
312. When descending a very steep hill it may be necessary to use the brake to keep the vehicle speed down while changing down, and also to prevent the engine being driven too fast by the weight of the vehicle.

Changing from forward to reverse or vice versa

313. When it is necessary to change from forward to reverse or vice versa, release the accelerator pedal and apply the brake to bring the vehicle to a halt. At the instant when the vehicle becomes stationary, depress the gear change pedal, and move the forward and reverse lever smartly from one position to the other. When the new position is reached, release the gear change pedal. The vehicle will now be in a position to move off immediately, in the selected gear, in the opposite direction.

22 - FLUID COUPLING SUPPLEMENT

314. All essential information on the fluid coupling is given in Section 13. In recruit training or when the saving of time is an important factor in designing the syllabus, instruction on the fluid coupling should be confined to that section.
315. This supplement is designed to provide answers to some of the questions which are likely to be asked during instruction. These questions should not, however, be dealt with until the practical instruction in Section 13 has been thoroughly absorbed.
316. The fluid coupling is fitted between the engine and the gearbox and forms a flexible coupling which is able to transmit any proportion of the drive from nearly 100 per cent to none at all.
317. The coupling (Fig 45) consists of a driving member (3) and flywheel (2) which is bolted to the engine crankshaft and a driven member (4) which is splined to the gearbox input shaft (6) of the gearbox.
318. The driving member is integral with the flywheel forming a complete casing around the driven member. The shaft on which the driven member is mounted passes through oil seals, in the driving member, which prevent leakage of fluid.
319. Both members are bowl-shaped, with recesses, formed in the bowls facing each other. These recesses are sub-divided into compartments by vanes which are formed when the members are cast. The space between the members is almost completely filled with oil.
320. When the driving member is rotated, the vanes force the oil against the vanes and into the recesses of the driven member. The rotary movement of the driving member is therefore transmitted to the driven member. As the speed of the driving member increases so the drive, through the oil, to the driven member becomes more positive until both members are rotating at approximately the same speed.
321. From the foregoing it will be realized that, if the driving member is turned slowly, the oil will not exert a very great force on the vanes of the driven member. Should the vehicle be stationary and the engine running at normal idling speed, the force transmitted would not be great enough to make the vehicle move at more than the slightest possible creep. This small amount of movement can be stopped by means of the handbrake.
322. As the engine is accelerated, the oil will exert a progressively greater pressure on the vanes of the driven member and therefore a greater proportion of the drive will be transmitted. When the engine is turning at a speed of 1,500 r.p.m. about 90 per cent of the power developed is transmitted to the driven member. At maximum engine speed, about 98 per cent of the power is transmitted.
323. It must be remembered that, if the vehicle is stationary with the brake on and the engine is driven at any more than normal idling speed, the oil and the coupling will become overheated and serious damage may result.



- 1 Crankshaft
- 2 Flywheel
- 3 Driving member
- 4 Driven member
- 5 Filler plug
- 6 Gearbox input shaft

Fig 45 Fluid coupling

23 - GEARBOX SUPPLEMENT

324. All essential information on the gearbox is given in Section 14. In recruit training or when saving of time is an important factor in designing the syllabus, instruction on the gearbox should be confined to that section.

325. This supplement is designed to provide answers to some of the questions which are likely to be asked during instruction. These questions should not, however, be dealt with until the practical instruction in Section 14 has been thoroughly absorbed.

326. The pre-selective, epicyclic gearbox consists of a train of epicyclic gears and a multi-plate clutch.

327. To engage a gear, other than top gear, part of the train is stopped by applying a brake to one of a series of brake drums in the gearbox. This applies to all except top gear in which a clutch is engaged to provide a straight through drive. The clutch is operated in the same manner as the brakes which engage the other gears.

328. The brakes, which are of the external contracting type, are applied by pressure of a strong spring in the gearbox. This spring is controlled by the gear change pedal.

329. The gear selector lever is connected by means of rods and lever to a camshaft (Fig 46(10)) in the gearbox. This camshaft carries one cam for each gear and is turned by means of a skew gear (12) from the linkage.

330. When the selector lever is moved to a certain gear, the camshaft is turned so that the strut guide (cam follower) (11) affected is pushed towards the strut (9) by the strut guide spring. This pushes the strut against the busbar (7) but as the busbar is already held up by the busbar spring (8), no action takes place.

331. When the gear change pedal is depressed, the busbar operating shaft (3) is rotated. This causes the busbar to be depressed through the medium of the push-rod (6).

332. The strut guide spring is now able to push the strut so that it rests over the groove in the busbar. When the gear change pedal is released, the busbar rises and lifts the strut with it. This applies the brake by lifting the toggle (13) which is connected to the lower link of the brake band by means of a pull-rod. The top link of the brake band is held by the anchor link (4)

333. When the gear change pedal is depressed for the next change of gear, the disengaging spring which is fitted inside the strut, forces the strut away from the busbar. The strut guide is, at this time, held out of the way by the camshaft.

334. The "swinging bucket" arrangement (5) is a device which allows the busbar spring to be compressed more easily than if it were mounted in a more simple manner. This enables a very strong spring to be fitted without making the gearbox difficult for the driver to operate with his foot. The full pressure of the spring is still exerted in holding up the busbar.

335. Each of the brakes is fitted with an automatic adjuster (1) which operates every time the strut is raised. The adjuster is set to take up wear and, when the brake has been tightened up enough, automatically goes out of action until more wear has taken place. It is therefore obvious that the brakes can be adjusted by pressing and releasing the pedal.

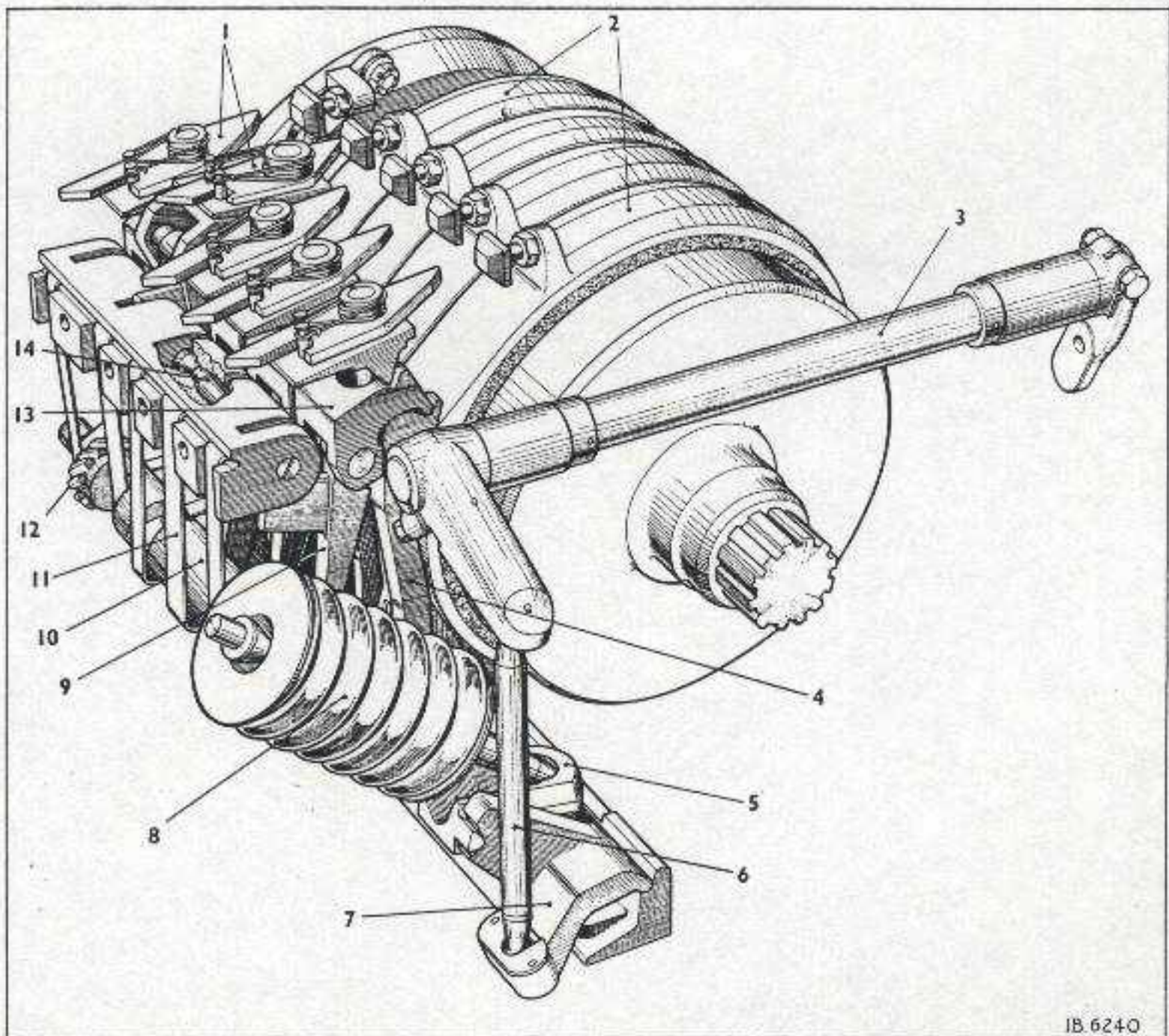
336. In common with all types of gearbox, this one has a device which prevents two gears being engaged at once. This consists of a line of plungers (14) through which projections on the struts have to pass. Sufficient end movement is provided to allow only one strut projection to pass at once.

337. When neutral is selected by means of the selector lever, the camshaft allows the strut guides of two struts to be pushed forward so that they are both engaged by the busbar when the pedal is depressed. When the pedal is released, both struts are lifted but the projections are not able to pass through the line of plungers because the clearance is not great enough. The struts are held in mid-way position so that neither of the brakes is applied and the gearbox is left in neutral.

338. As the busbar spring is held in the compressed position when neutral is engaged, the vehicle should not be left with the gearbox in neutral. Always engage a gear before leaving the vehicle for any length of time.

339. It will sometimes be found that the gear change pedal rises very violently and much higher than normal. This is caused by the strut missing the busbar and the busbar spring being able to force the bar up without the resistance encountered when the brake is applied. This may be caused by incorrect adjustment of the linkage which results in the camshaft not being turned to the correct position, or incorrect operation of the gear change pedal which results in one strut leaving the busbar but the other strut not becoming engaged.

340. Further, if the pedal is not pressed right down, the gear may not be changed at all since the busbar may not be depressed far enough to release the strut already engaged.



- | | | |
|----------------------------------|-------------------|-------------------------------|
| 1 Brake band automatic adjusters | 5 Swinging bucket | 11 Strut guide (cam follower) |
| 2 Brake bands | 6 Busbar push-rod | 12 Camshaft skew gear |
| 3 Busbar operating shaft | 7 Busbar | 13 Toggle |
| 4 Anchor link | 8 Busbar spring | 14 Locking plunger |
| | 9 Strut | |
| | 10 Camshaft | |

Fig 46 Gearbox operation

**GOOD SERVICING IS ESSENTIAL
FOR SUCCESSFUL FORDING**

CHAPTER 2 - PARADE SERVICING

341. The main portion of this chapter is devoted to the servicing duties of the crew at first parade, halt, and last parades and to weekly, monthly and mileage tasks. A section dealing with crew drill is included at the end of the chapter.

I - FIRST PARADE

Crew commander - Mk 1 Liaison vehicle

342. (a) Check fire extinguishers.
(b) Check that the vehicle is stowed correctly.
(c) Assist driver to check the lights.

Crew commander - Mk 2 Reconnaissance vehicle

343. (a) Check fire extinguishers.
(b) Assist driver to check lights.
(c) Check elevation, depression and traverse of MG.
(d) Check that periscopes and side visors are clean and undamaged.
(e) Carry out "opening up" drill on wireless sets (to be done 15 minutes before netting time) - see page 119.
(f) Carry out "prepare to net drill" - see page 119.
(g) If firing is expected, carry out "Servicing before Firing" as follows:-
(i) Dry clean the bores and gas affected parts of the MG and carbine.
(ii) Dry clean barrels of smoke grenade dischargers; load the dischargers.
(iii) Fit expendable muzzle covers.
(iv) Check and, if necessary, prime grenades 36M.
(v) Check ammunition amount and stowage.

- (vi) Check MG sight.
- (vii) Lock the MG and turret in the travelling position.
- (h) Check operation of rear observation flaps, turret flaps and emergency escape hatches; withdraw locking pins.
- (j) Check external and internal stowage.

Driver - Mk 1 Liaison and Mk 2 Reconnaissance vehicles

- 344.
- (a) Check fuel, engine oil and coolant levels.
 - (b) Run engine for two minutes and check that oil and ignition warning lights go out.
 - (c) Switch off and check engine oil level; top up if necessary.
 - (d) Inspect engine compartment for leaks; report leaks found.
 - (e) Check tyre pressures - see DATA, page 9 for correct pressures.
 - (f) Check horn and all lights with the assistance of the crew commander.
 - (g) Select each gear in turn and fully depress and release the gear change pedal at least six times in each gear.
 - (h) Check operation of driver's vision flaps, screen and wiper (if fitted). Clean periscopes. Check operation of front emergency escape hatch.

2 - AT ALL HALTS

Crew commander - Mk 1 Liaison vehicle

345. Check external stowage.

Driver - Mk 1 Liaison vehicle

- 346.
- (a) Check fuel and engine oil levels.
 - (b) Check wheel hubs and brake drums for overheating.
 - (c) Inspect tyres and remove stones, grease and oil.

Gunner - Mk 1 Liaison vehicle

347. Check internal stowage. If not on wireless watch, assist the driver.

Driver - Mk 2 Reconnaissance vehicle

- 348.
- (a) Check fuel and engine oil levels.
 - (b) Inspect tyres and remove stones, grease and oil.

- (c) Check that all stowed equipment is secure.
- (d) Check road wheel hubs and brake drums for overheating.

3 - SERVICING OF ARMAMENT DURING LULL IN FIRING

Gunner - Mk 1 Liaison vehicle

- 349. (a) Ensure that visors are clear. Replace damaged splash screens if necessary.
- (b) Clean and examine MG breech block and check action of firing pin. Oil working parts of MG.
- (c) Check ammunition, stow empty magazines and jettison empty cases.

Driver - Mk 1 Liaison vehicle

- 350. Clean vision devices and replace damaged periscopes.

Crew commander - Mk 2 Reconnaissance vehicle

- 351. (a) Clean periscopic sight if necessary and apply anti-dim compound.
- (b) Jettison empty cases, belts and liners. Replenish ready supply of ammunition.
- (c) Clean and examine MG breech block and check action of firing pin.
- (d) Oil working parts and check security of MG.
- (e) Lock the turret in travelling position.
- (f) Reload smoke grenade dischargers if necessary.

4 - SERVICING OF ARMAMENT IMMEDIATELY AFTER FIRING

Gunner - Mk 1 Liaison vehicle

- 352. (a) Dry clean and oil bore of MG and stow.
- (b) Jettison empty cases and calculate ammunition deficiencies.
- (c) Dry clean and oil smoke grenade dischargers.
- (d) Dry clean and oil working parts of carbine.

Crew commander - Mk 2 Reconnaissance vehicle

- 353. (a) Dry clean and oil bore of MG. Replace cover.
- (b) Lock turret in travelling position.
- (c) Jettison empty cases, belts and liners.

- (d) Replenish ready supply of ammunition and calculate deficiencies.
- (e) Dry clean and oil smoke grenade dischargers.

5 - LAST PARADE

Crew commander - Mk 1 Liaison vehicle

354. (a) Order replenishment of fuel, oil and ammunition.
- (b) Detail weekly, monthly or mileage tasks to be done.
- (c) Complete record sheets in A.B.413.
- (d) Check security of externally stowed equipment.

Crew commander - Mk 2 Reconnaissance vehicle (with assistance of driver as necessary)

355. (a) Order replenishment of fuel, oil and ammunition.
- (b) Detail weekly, monthly, or mileage tasks to be done.
- (c) Complete record sheets in A.B.413.
- (d) If weapons have fired, carry out "Servicing after Firing".
- (e) If weapons have not fired, carry out daily cleaning and servicing of armament.
- (f) Check and clean splash screens of side visors.
- (g) Carry out "closing down drill" on wireless sets when permission has been given by control.
- (h) Carry out servicing of wireless installation - see page 119.
- (j) Clean fighting compartment. Lubricate seat as necessary.
- (k) Check security of all stowed equipment.

Gunner - Mk 1 Liaison vehicle

356. (a) If weapons have been fired:-
- (i) Strip, dry clean, examine, lubricate and assemble.
 - (ii) Dry clean and oil bores.
 - (iii) Stow weapons.

- (b) If weapons have not been fired:-
 - (i) Dry clean and oil all bores.
 - (ii) Stow weapons.
- (c) Dry clean and oil barrels of smoke grenade dischargers.
- (d) Check and clean splash screens and visors.
- (e) Carry out "closing down" drill when permission has been given by control.
- (f) Carry out "Daily Tests" on wireless sets.
- (g) Inspect all fixing bolts and bonding strips on the wireless sets. Rock each set on its mounting and listen in the headsets for signs of loose connections.

Driver - Mk 1 Liaison and Mk 2 Reconnaissance vehicles

- 357.
- (a) Replenish fuel and engine oil, including spare cans.
 - (b) Top up radiator, or carry out anti-frost precautions when applicable.
 - (c) If operating in very dusty conditions, clean air cleaner and renew oil.
 - (d) Examine for damaged steering linkage.
 - (e) Check suspension springs, links and bumper pads for damage, and transmission gaiters for oil leaks and breaks.
 - (f) Inspect tyres. Check pressure when cold.
 - (g) Clean periscopes, approach march screen (if fitted) and driver's compartment. Clean edges of flaps and oil hinges if necessary.
 - (h) Check all lights.
 - (j) Check free movement of gear change pedal.
 - (k) Check free movement of brake pedal. Report faulty brakes.
 - (l) Clean engine compartment and check for leaks.
 - (m) Check road wheel nuts for tightness.
 - (n) Clean driving mirrors.
 - (o) Check that tools are clean, serviceable and stowed correctly.
 - (p) Check that handbrake is ON and lowest gear engaged before leaving the vehicle.

6 - WEEKLY SERVICING TASKS

TASK No.1 - Hull

358. (a) Thoroughly clean out interior of the vehicle and wash or brush down exterior. *Do not use gasoline, kerosine or oil for cleaning.*
- (b) Clean, tighten, adjust and lubricate with oil can (OMD-110), as necessary, the following:-
- (i) All holders, boxes, clips and straps for stowage, tools and spare parts.
 - (ii) Front, side and rear flaps and side vizors.
 - (iii) All seats.
 - (iv) Roof hatches and locks, or turret hatches and catches (when fitted).
 - (v) Mudguards, smoke dischargers, driving mirror and number plates.

TASK No.2 - Batteries

359. (a) Attend to the vehicle batteries as follows:-
- (i) Top up the electrolyte, if necessary, using distilled water only.
 - (ii) Ensure that the air vents are clear, and tighten the filler plugs securely.
 - (iii) Clean and dry the tops of the cells, remove any corrosion and ensure that the terminals are clean and tight.
 - (iv) Smear the terminals with PX7. If this preservative is not available leave the terminals dry and clean. (Do not use grease).
 - (v) Check the security of the batteries and battery containers, and correct fitting of battery container lids.

TASK No.3 - Engine and fuel, oil and cooling systems

360. (a) Clean the outside of the engine (where possible) and all assemblies and components in the engine compartment. Remove oil from rubber hoses.
- (b) Inspect the serviceability and the tightness of accessible clips and unions on:-
- (i) Coolant hoses.

- (ii) Oil pipes and hoses.
- (iii) Fuel pipes.
- (iv) Air cleaner hose.
- (c) Under normal conditions, renew oil in air cleaner and clean out filter (OMD-110).
- (d) Lubricate accelerator pedal and linkages (oil can - OMD-110).
- (e) Check fan coupling for security.
- (f) Check the tension of the fan belts (1/2 in. deflection either way). (Adjustment to be made by a vehicle mechanic).

TASK No.4 - Transmission suspension, steering and brakes

361. (a) Check and tighten if necessary:-

- (i) Spring bracket bolts.
- (ii) Spring pivot pin locking screws.

(b) Check for security, wear, damage and cracks:-

- (i) Track rods and ball joints.
- (ii) Steering relay boxes.
- (iii) Steering drop arms.

(c) Inspect all accessible hydraulic pipe lines for security, leaks and any signs of rubbing and chafing.

(d) Lubricate the following (oil can - OMD-110):-

- (i) Gear change pedal and linkages.
- (ii) Forward and reverse linkages.
- (iii) Gear selector linkage.
- (iv) Handbrake ratchet and linkages.
- (v) Brake pedal lever and linkages.

(e) Adjust brakes (vehicle mechanic).

TASK No.5 - Armament and tools

362. (a) Strip and dry clean armament for weekly inspection. Re-oil, reassemble and check mechanism.

- (b) Clean and check ammunition and magazines.
- (c) Clean gun mounting and check for wear. Test action.
- (d) Check rotation of turret, when fitted, and oil turret lock.
- (e) Check and clean all tools, spares and equipment.

7 - MONTHLY SERVICING TASKS

TASK No.6 - Engine

363. (a) Check and tighten if necessary:-
- (i) Engine and gearbox mounting bolts.
 - (ii) Inlet manifold and carburettor mounting nuts.
 - (iii) Exhaust manifold and flange joint nuts and bolts.
 - (iv) Attached components (e.g. coil, oil filter, resistance boxes, etc.).
- (b) Examine silencer and exhaust pipe for leaks and security.

TASK No.7 - Fuel and electrical systems

364. (a) Check security of:-
- (i) Generator.
 - (ii) Starter motor.
 - (iii) Horn and lights.
- (b) Examine all accessible electrical cables and connections for security and damage.

TASK No.8 - Transmission, suspension and fire extinguishers

365. (a) Examine bevel boxes for security and leaks.
- (b) Examine rebound rubbers for deterioration and damage.
- (c) Inspect for dents in the sealing discs of the Methyl Bromide fire extinguisher bottles.

8 - MILEAGE TASKS

TASK A

366. After the initial 500 miles' running of a new vehicle, overhauled vehicle or change of assembly, it is important that the following tasks are carried out:-

- (a) Change engine oil (OMD-110).
 - (b) Change gearbox oil (OMD-110).
 - (c) Change transfer box oil (OEP-220).
 - (d) Change oil in bevel boxes (OEP-220).
 - (e) Check oil levels in the following and top up as necessary:-
 - (i) Fluid coupling (OM-13).
 - (ii) Road wheel hubs (OEP-220).
 - (iii) Brake master cylinder (OF-24).
 - (f) Check distributor contact breaker gaps (No.1, Mk 2/1 0.019 in. to 0.021 in., No.1, Mk 2 0.010 in. to 0.012 in.) (electrician or vehicle mechanic).
 - (g) Clean sparking plugs and adjust gaps (0.015-0.018 in.) (electrician, or vehicle mechanic).
- Note:** Application of the silicone compound if necessary, must be done economically.
- (h) Check cylinder head nuts for tightness (vehicle mechanic).
 - (i) Check inlet valve clearance (0.010 in. cold) (vehicle mechanic).

TASK B - Every 1,000 miles

367. (a) Check oil levels in the following and top up as necessary:-
- (i) Fluid coupling (OM-13).
 - (ii) Gearbox (OMD-110).
 - (iii) Transfer box (OEP-220).
 - (iv) Bevel boxes (OEP-220).
 - (v) Steering bevel box (OEP-220).
 - (vi) Main steering box (OEP-220).

- (vii) Road wheel hubs (OEP-220).
- (viii) Brake master cylinder (OF-24).
- (b) Lubricate the following with a grease gun (LG-320):-
 - (i) Suspension link bushes - front and swivel pins (24 nipples).
 - (ii) Suspension link bushes - rear (20 nipples).
 - (iii) Spring seat bushes (8 nipples).
 - (iv) Steering ball joints (4 nipples).
- (c) With the engine switched off, depress the gear pedal to the fullest extent in all gears and check that there is clearance between the pedal and the skid plate. Also ensure that there is a minimum free movement of 1/2 in. on the gear pedal with the lowest gear engaged.
- (d) Clean brake master cylinder breather.
- (e) Clean fuel inlet filter at carburetter.

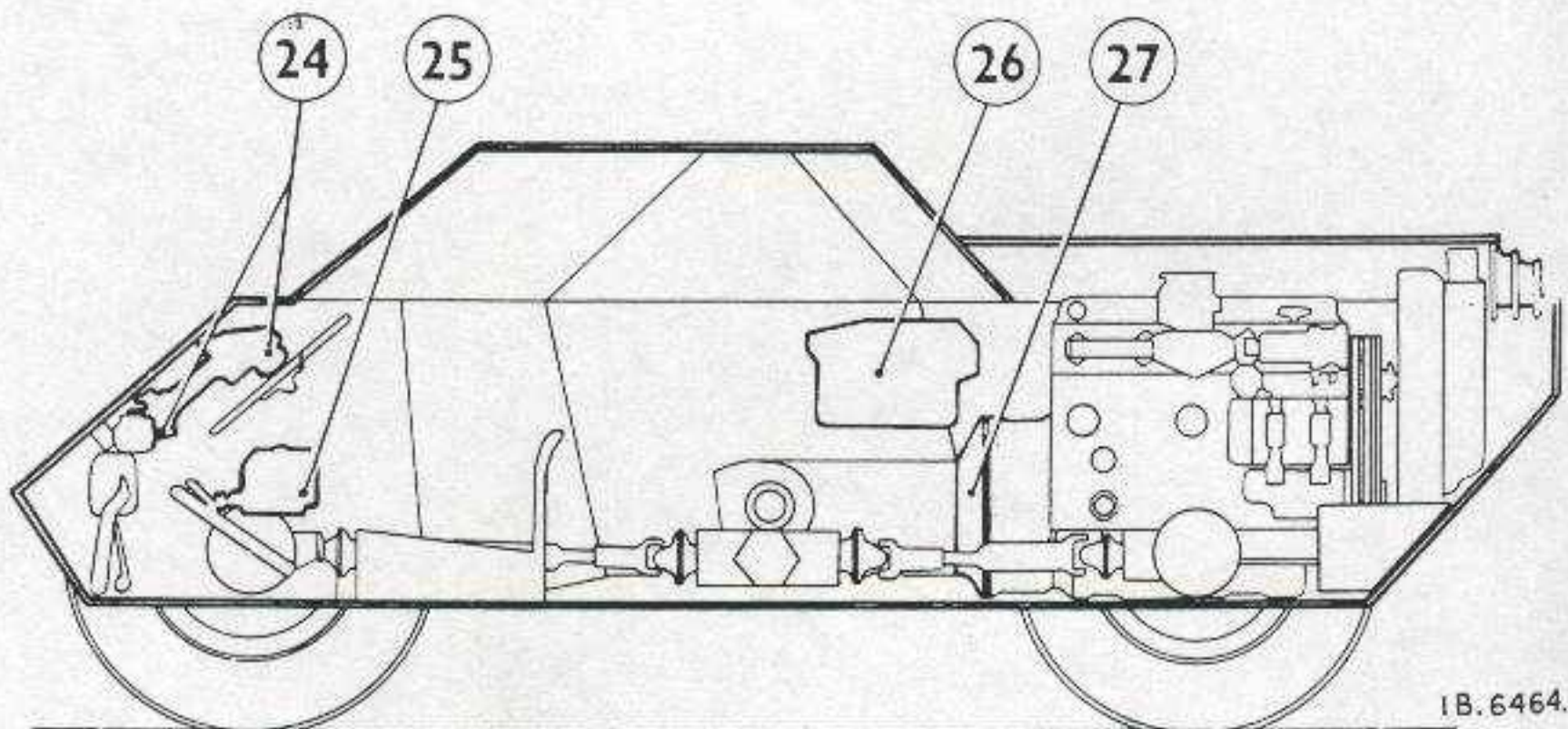
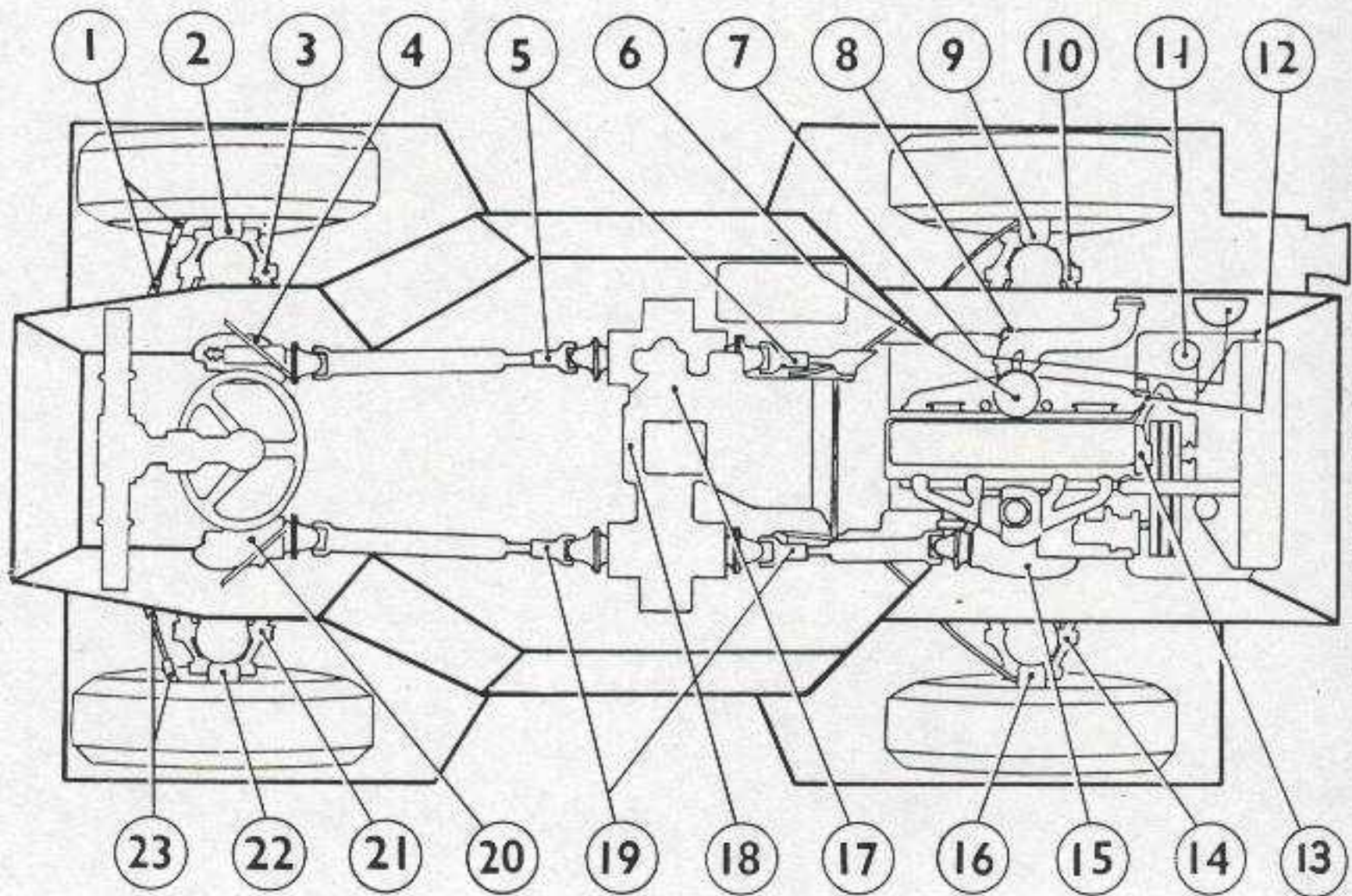
TASK C - Every 3,000 miles

368. (a) Change engine oil (OMD-110).
- (b) Remove distributor rotor and supply a few drops of oil to the top of the distributor spindle and add one drop of oil to each contact breaker pivot pin. Wipe away any surplus oil (OMD-110) (electrician or vehicle mechanic).
 - (c) Lubricate distributor cam as follows (vehicle mechanic) No.1 Mk 2/1 distributor - renew lubricator pad. No.1, Mk 2 distributor - lightly smear cam with grease (XG-271).
 - (d) Check contact breaker gaps (No.1, Mk 2/1 distributor 0.019 in. to 0.021 in., No.1, Mk 2 distributor 0.010 in. to 0.012 in.) (electrician or vehicle mechanic).
 - (e) Clean sparking plugs and adjust gaps (0.015-0.018 in.) (electrician or vehicle mechanic).
- Note:** Application of the silicone compound if necessary, must be done economically.
- (f) Clean fuel filter (vehicle mechanic).
 - (g) Change position of road wheels on vehicle.
 - (h) Change the transfer box oil (OEP-220).
 - (j) Change the oil in the bevel boxes (OEP-220).

TASK D - Every 6,000 miles

369. (a) Renew engine oil filter element and prime filter with clean oil (OMD-110 - 2 pints).
- (b) Change gearbox oil (OMD-110).
- (c) Lubricate the following with a grease gun (LG-320):-
- (i) Propeller shaft sliding joint (4 nipples).
 - (ii) Crankshaft pulley fording seal (1 nipple).
- (d) Lubricate the following with a grease gun (XG-271):-
- Water (coolant) pump bearing of "B" series engine.

9 - LUBRICATION CHART



1B.6464.A

(TURRET NOT SHOWN)

LUBRICATION CHART

ABNORMAL CONDITIONS

Lubrication Chart No.	Component	Remarks	Normal Lubricant	Arctic -40°F to 0°F	Severe Winter 0°F to 20°F	Tropical above 90°F
DAILY						
11	Engine	Top up (See mileage tasks)	OMD-110	OMD-60	OMD-60	OMD-330
26	Air Cleaners	Clean and refill (In dusty conditions)	OMD-110	OMD-60	OMD-60	OMD-330
WEEKLY						
26	Air Cleaners	Clean and refill (In normal conditions)	OMD-110	OMD-60	OMD-60	OMD-330
MILEAGE						
11	Engine	Change oil at first 500 miles, then every 3,000 miles	OMD-110	OMD-60	OMD-60	OMD-330
17	Gearbox	Change oil at first 500 miles, then every 6,000 miles	OMD-110	OMD-60	OMD-60	OMD-330
18	Transfer box	Change oil at first 500 miles, then every 3,000 miles	OEP-220	L. G. U. S. Z.	OEP-110	OEP-220
4,8,15,20	Bevel boxes	Change oil at first 500 miles, then every 3,000 miles	OEP-220	L. G. U. S. Z.	OEP-110	OEP-220
EVERY 1,000 MILES						
18	Transfer box	Top up	OEP-220	L. G. U. S. Z.	OEP-110	OEP-220
27	Fluid coupling	Top up	OM-13	No change	No change	No change
4,8,15,20	Bevel boxes	Top up	OEP-220	L. G. U. S. Z.	OEP-110	OEP-220
25	Brake master cylinder	Top up	OF-24	OF-3	No change	No change
17	Gearbox	Top up	OMD-110	OMD-60	OMD-60	OMD-330
2,9,16,22	Road wheel hubs	Top up	OEP-220	L. G. U. S. Z.	OEP-110	OEP-220
1,23	Steering ball joints	4 nipples	LG-320	LG-380	LG-380	LG-280
24	Steering boxes	Top up	OEP-220	L. G. U. S. Z.	OEP-110	OEP-220
3,21	Suspension links front and steering swivel pins	24 nipples	LG-320	LG-380	LG-380	LG-280
10,14	Suspension links rear	20 nipples	LG-320	LG-380	LG-380	LG-280
-	Spring seat bushes	8 nipples	LG-320	LG-380	LG-380	LG-280
EVERY 3,000 MILES						
6	Distributor spindle	A few drops of clean oil	OMD-110	OMD-60	OMD-60	OMD-330
6	Contact breaker pivots	One drop of clean oil	OMD-110	OMD-60	OMD-60	OMD-330
EVERY 6,000 MILES						
7	Engine oil filter	Renew element and prime filter with 2 pints of clean oil	OMD-110	OMD-60	OMD-60	OMD-330
5,19	Propeller shaft sliding joints	4 nipples	LG-320	LG-380	LG-380	LG-280
12	Crankshaft pulley fording seal	1 nipple	LG-320	LG-380	LG-380	LG-280
15	Coolant pump bearing	1 nipple	XG-271	XG-271	XG-271	XG-271

L.G.U.S.Z. - Lubricant, Gear, Universal, Gun-Zero

Note: Lubricants will be changed to suit abnormal climatic conditions only on instructions from Force Headquarters or War Office.

10 - RECORD SHEETS

370. Crew servicing record sheets are included in the A.B.413 for each vehicle. The completed specimen shown below has been reproduced so that it may be used as an example of the way in which these records should be kept and also as an aid to instruction on their compilation. The following instructions detail how these records should be completed:-

- (a) The "Fuel", "Lubricants" and "Mileage" columns will be completed at Last Parade, the "Other Oils" column denoting the type as well as the quantity drawn.
- (b) As First and Last Parades are completed, the crew commander will enter his initials under the "Parades Completed" column, together with the "Number of crew on parade".
- (c) As each weekly or monthly task is completed, the task number will be entered in the "Tasks Completed" column and if a mileage task is also due it will be carried out on that date, the appropriate letter A, B, C or D being inserted in the space beside the task number.
- (d) Enter major adjustments in the "Remarks" column.
- (e) The record sheets will be kept strictly up to date by the crew commander.
- (f) They will be inspected and signed weekly by the troop commander and monthly, by the squadron commander.

SPECIMEN RECORD SHEET

RECORD OF MILEAGE, FUEL, LUBRICANTS, AND SERVICING TASKS

TO BE KEPT UP TO DATE BY VEHICLE COMMANDER

Date	Fuel re-ceived Gallons	Lubricants		Mileage		Parades completed (to be initialed by Vehicle Commander)		Number of crew on parade		Servicing Tasks to be completed this week								Vehicle Comdr's Initials	REMARKS
		Engine	Other Oils	Journey	Total					1	2	3	4	5	6	7	8		
S 6 DEC 54	3	4 PT	5 LB GREASE	19	1744	JH	JH	3	3									JH	Brakes adjusted
M 7 ..	12	1 PT		71	1815	JH	JH	3	2									JH	
T 8 ..	6	-	1/2 PT OIL 2070-110	31	1846	JH	JH	3	3									JH	Gas-in adjusted
W 9 ..	12	1 PT	2 PT	-	-													JH	
T 10 ..	-	-	-	-	-									5 and 6				JH	L.H. rear wheel replaced
F 11 ..	-	-	-	-	-									7 and A				JH	New fuel filter fitted
S 12 ..	7	1 PT	-	40	1886	JH	JH	3	3					B and 5				JH	

Troop or Platoon Commander's Signature R. Taylor, Lieut.

II - WIRELESS DRILLS AND SERVICING TABLES

CONTENTS

	<i>Page</i>
High frequency stations	
WIRELESS SET, NO.19, MK 3 and 3/1	
Opening up drill	120
Prepare to net drill	120
Closing down drill	120
WIRELESS SET, NO.C12	
Opening up drill	121
Prepare to net drill	122
Netting drill - voice	123
Continuous wave operation	124
Closing down drill	125
WIRELESS SET, NO.88 TYPE A, AFV or NO.31 AFV	
Opening up drill	125
Prepare to net drill	125
Closing down drill	126
DAILY TESTS FOR WS NO.19, MK 3 and 3/1	127
DAILY TESTS FOR WS NO.C12	129
WEEKLY TESTS FOR WS NO.88 TYPE A, AFV or NO.31 AFV	132
ROUTINE TESTING OF CONTROL UNITS AND FEED THROUGH FACILITIES	134
ROUTINE TESTING OF RETRANSMISSION	135
REPLACEMENT OF VALVES, FUSE AND VIBRATOR	135
RUNNING REPAIRS WS NO.19 MK 3 and 3/1	136
Very high frequency stations	
WIRELESS SET NO.C42	
Opening up drill	137
Tuning drill	137
Operating instructions	139
Closing down drill	139
WIRELESS SET, NO.B47	
Opening up drill	140
Tuning drill	140
Closing down drill	141
DAILY TESTING OF VHF STATIONS	142
DAILY TESTS FOR WS NO.C42	142
DAILY TESTS FOR HARNESS TYPE 'B'	143
DAILY TESTS FOR WS NO.B47	145

WIRELESS SET No. 19, MK 3 and 3/1

Opening up drill

371. (a) Erect aerial, check that base is thoroughly clean and dry and that co-axial leads are properly connected.
- (b) Roll up waterproof cover and stow on top of set.
- (c) Connect all headsets to correct drop-leads.
- (d) IC and A ON-OFF switch to ON.
- (e) Supply unit, ON-OFF switch to ON.
- (f) Carry out daily tests.
- (g) Switch B ON-OFF switch to OFF.
- (h) Switch control units to A (and any re-transmission box to N).

Prepare to net drill ("A" Set on blue, e.g. frequency 2.5 mc/s)

372. (a) Meter switch to AVC.
- (b) System switch to R/T or CW according to type of tuning call expected.
- (c) AF GAIN and RF GAIN fully clockwise.
- (d) Frequency range switch to required range.
- (e) Both PA TUNING dial and A FREQUENCY MC/S dial levers to FLICK.
- (f) Turn square knobs until WHITE shows in BLUE windows.
- (g) Hold square knobs and loosen BLUE screws.
- (h) Turn square knobs to ordered frequency (e.g. 2.5 mc/s).
- (i) Both PA TUNING dial and A FREQUENCY MC/S dial levers to SET.
- (j) Turn VARIOMETER until mush in 'phones is loudest.

Closing down drill

373. (a) Carry out Daily Tests.
- (b) Inspect all fixing bolts and bonding strips. Rock the set on its mounting and listen in the headphones for any signs of loose connections.

- (c) Ensure set is clean and dry. If correct, switch supply unit OFF-ON switch to OFF. If dampness is suspected leave supply unit ON to dry out. Report if variometer is suspected to be damp.
- (d) Inspect all connections - aerial, battery, control unit, headsets and key. Clean and dry headsets and stow away where they will not be damaged. Clean and dry key contacts if used.
- (e) Roll down and secure waterproof cover.
- (f) Inspect aerial and aerial insulators. Clean and dry aerial base and sections, then stow.
- (g) Check spares; replace faulty fuses, valves, etc.

WIRELESS SET No.C12

Opening up drill

- 374.
- (a) Erect aerial, ensure length is correct to enable set to be tuned to required frequency i.e., 8 ft rod for 2.0-10.0 mc/s, 12 ft rod for 1.9-10.0 mc/s.
 - (b) Check aerial lead from aerial base to aerial tuning unit, also earth lead from aerial tuning unit.
 - (c) Check connectors from aerial tuning unit to set (coaxial, INPUT and 3 point, DC CONTROL).
 - (d) Check 12 point connector, power supply unit to set.
 - (e) Check set to harness connector. Ensure all harness connections are tight (if harness is not being used connect 5 point No.38).
 - (f) Connect power supply unit to batteries.
 - (g) Connect headgears.
 - (h) Switch control units to A.
 - (j) Switch on harness - junction box J1 centre switch to NORMAL or junction box J2 switch to ON.
 - (k) System switch to VOICE.
 - (l) Stand-by switch to REC. TRANSMIT & I/C.
 - (m) Switch on power supply by turning the ON-OFF switch through the START position to ON.
 - (n) Carry out daily tests.

Prepare to net drill

375. (a) System switch to VOICE.
- (b) Set the flick switch as follows:-
- (i) Press the flick stop and set the flick switch to frequency band of allotted "A" (blue) frequency.
 - (ii) Press the flick stop and set it in the left-hand position for "B" frequency in the 4.0-10.0 mc/s band, centre position for both frequencies in the same band, right-hand position for "B" frequency in the 1.6-4.0 mc/s band.
 - (iii) Check that when the switch is turned in either direction it stops at the correct "A" or "B" frequency position.
- (c) Set flick switch to frequency "A" or "B".
- (d) Turn GAIN control fully clockwise.
- (e) Meter switch to AE CURRENT.
- (f) Appropriate AE COUPLING control to 100.
- (g) Unlock the appropriate aerial tuning control, rotate it until 82 (for frequencies in the L.F. band) or 50 (for frequencies in the H.F. band) shows in the corresponding window.
- (h) Unlock the appropriate FREQUENCY control and set to required frequency as indicated on FREQUENCY dial. Lock the control.
- (j) Press the pressel switch and note if there is any aerial current.
- (k), If there is no current or if there is a current which can be increased by rotating the appropriate aerial tuning control, proceed as follows:-
- (i) Rotate aerial tuning control for maximum at first meter reading. Note the reading.
- Note:** *If the aerial tuning control is tuned through its range from 82 or 50 (see 375(g)) downwards, an aerial current indication will be given by the meter at several points. The first meter reading nearest to 82 or 50 is the only correct one, although the readings obtained lower down the scale may sometimes be higher.*
- (ii) Rotate the appropriate AE COUPLING control clockwise until meter reading starts to fall.
 - (iii) Readjust aerial tuning control for maximum meter reading and compare with reading obtained at (i).

- (iv) If NO increase can be obtained, return AE COUPLING control to 100 and readjust aerial tuning control for maximum current. Lock the controls. If there is an INCREASED reading, repeat (ii) and (iii) until no further increase can be obtained. Lock the controls.
- (1) If, when tuning to frequencies in the L.F. band, there is current which decreases by rotating the appropriate aerial tuning control, proceed as follows:-
 - (i) Rotate the aerial tuning control to 82.
 - (ii) Adjust the appropriate AE COUPLING control for maximum reading and note the meter reading.
 - (iii) Rotate the same control slightly clockwise until reading begins to fall.
 - (iv) Readjust the appropriate aerial tuning control for maximum reading and compare with (ii).
 - (v) If higher, repeat (iii) and (iv) until no further increase can be obtained; lock the controls. If there is no increase reset the aerial tuning control to 82 and readjust the AE COUPLING control for maximum aerial current; lock the controls.
- (m) Release the pressel switch.
- (n) Meter switch to AGC.

Netting drill - voice

376. (a) During tuning call

- (i) Search boldly for control station signal and carefully adjust the appropriate FREQUENCY control for maximum dip on meter.
- (ii) Adjust the GAIN control to a comfortable listening level.

(b) During netting call

- (i) System switch to NET.
- (ii) Adjust FREQUENCY control to zero beat.
- (iii) Lock the FREQUENCY control.
- (iv) System switch to VOICE.

(c) At end of netting call

- (i) Meter switch to AE CURRENT.

- (ii) Unlock aerial tuning control.
- (iii) Press the pressel switch.
- (iv) Adjust aerial tuning control for maximum reading.
- (v) Lock aerial tuning control.

Continuous wave operation

377. (a) Prepare to net.

- (i) Prepare set as for "Prepare to net drill".
- (ii) Disconnect the headgear assembly and in its place connect the key assembly.
- (iii) Plug the headgear assembly into the socket on the key assembly.
- (iv) System switch to CW.
- (v) HET TONE control to central position.

(b) Netting

During tuning call

- (i) Rotate FREQUENCY control until tuning call is heard.
- (ii) Adjust GAIN control to a comfortable level. (A very strong CW signal may swamp the receiver and result in only a weak note being heard. In this case the GAIN control must be turned down.

During netting call

- (iii) System switch to NET.
- (iv) Unlock FREQUENCY control and adjust for zero beat; lock the control.
- (v) System switch to CW.
- (vi) Adjust HET TONE control to obtain a signal of convenient pitch.

At end of netting call

- (vii) Meter switch to AE CURRENT.
- (viii) Unlock aerial tuning control.
- (ix) Press morse key.
- (x) Readjust aerial tuning control for maximum meter reading.
- (xi) Lock aerial tuning control.

Closing down drill

378. (a) Switch the power supply off, see para 374(m).
(b) Switch the harness off, see para 374(j).
(c) Remove the aerial, clean, dry and stow.

WIRELESS SET No.88 Type "A" AFV or No.31 AFV

Note: Existing Control Units No.16 and 17 will normally have the mark "38" or "88" inscribed on them. In these instances the "38" or "88" should be read as "88" or "31" as applicable

The ON-OFF switch on the WS No.88 Type "A" AFV and the ON-OFF position of the VOLUME control on the WS No.31 AFV are of no value, they have been shorted out. The ON-OFF switch is fitted to the respective Power Supply and L.F. Amplifier Units.

Opening up drill

379. (a) Fit the correct aerial into the correct aerial base. The aerial of the No.31 set fits into the aerial base adaptor and is secured by the wingnut on the adaptor.

- (b) Ensure that aerial feeders are properly connected.

Important: Unless the aerial is properly connected to the set do not switch on the sender by pressing the pressel switch otherwise the sending valves will be damaged.

- (c) Turn the SQUELCH control to the OFF position (extreme anti-clock), WS No.31 AFV only.

Prepare to net drill

380. (a) Ensure that the volume control is in the mid-way position.

- (b) Set the ON-OFF switch on the Power Supply and Amplifier Unit to ON.

- (c) Allow two or three minutes for the set to warm up.

- (d) Check calibration of No.31 AFV set by:-

(i) Releasing the TUNING control by turning the knurled thumbscrew marked DIAL LOCK approximately two turns to the left (anti-clockwise).

(ii) Turn TUNING control until calibration mark CAL located midway between channels 36 and 37 is visible through the CHANNEL window.

- (iii) Press the button marked PRESS FOR CALIB. An audio note should be heard in the headphones. Continue turning the TUNING control until ZERO BEAT is obtained, i.e. to a point where a dead spot is obtained.
- (iv) Lock the TUNING control by turning the DIAL LOCK to the right.
- (v) Set the cursor line directly over the calibration mark CAL by turning the CURSOR ADJUSTMENT with a screwdriver or coin.
- (vi) Unlock the TUNING control and set on channel 15. If the set is operating properly another zero beat will occur at this point. If the calibration is off recheck as detailed above. Should the calibration still be off the set is faulty and should be reported.

Note: During wireless silence remove the aerial feeder from the set when calibrating.

- (e) Turn TUNING control to ordered channel and lock dial with DIAL LOCK (No. 31 AFV).

Set the channel switch to ordered channel (No. 88 TYPE "A" AFV).

- (f) Regulate the volume of sound in the headphones to the required level by varying the volume control.

Closing down drill

- 381. (a) Check that all connections are clean and firmly made.
- (b) Ensure all the equipment is clean and dry. The humidity indicator (if fitted) is coloured blue. If it is pink it indicates damp inside the set and necessitates REWE repair.
- (c) Check carrier and fixing bases.
- (d) Turn the SQUELCH control to the OFF position (WS No. 31 AFV only).
- (e) Set the ON-OFF switch on the Power Supply and Amplifier Unit to OFF.
- (f) Remove and stow aerial.
- (g) Check spares if carried.

DAILY TESTS FOR No.19 SETS, MK 3 and 3/1

Part tested	No.	Test	What should happen	What should NOT happen	What is likely to be wrong	What to do about it	
POWER SUPPLY	1	Put switch on supply unit to ON	Red lamp on supply unit lights and one machine runs.	(a) Machine does not run. Lamp does not light.	i. Batteries flat.	Carry out test 2	
					ii. Faulty connection at wireless set junction box.	Check connections.	
					iii. Battery not properly connected.	Connect if possible.	
				(b) Machine runs but lamp does not light.	Bulb burnt out.	Replace bulb.	
			(c) Lamp lights steadily but machine does not run properly.	Machine out of order.	Report. In emergency open unit and check L.T. brushes.		
L.T. VOLTAGE SUPPLY	2	Meter switch to L.T.	Meter reads at least normal, about 11-12 volts.	Meter reads below 10.5 or 10 volts.	i. Batteries need charging.	Run engine or charger.	
					ii. Rotary base junction dirty.	Rotate turret 2 or 3 times.	
H.T.1. VOLTAGE SUPPLY	3	Meter switch to H.T.1.	Meter reads about 275 volts.	(a) Meter reads zero.	Fuse blown.	Replace fuse.	
				(b) Meter reads low.	H.T.1 machine out of order.	Report. In emergency check H.T.1 brushes.	
H.T.2. VOLTAGE SUPPLY	4	Control unit to "A". A OFF-ON switch to ON. Meter switch to H.T.2. System switch to RT. Press pressel.	(a) 2nd machine runs.	(a) 2nd machine does not run.	Faulty pressel. Faulty L.T. brushes. Faulty relay in supply unit.	Try test 5. Check brushes. Examine relay.	
			(b) Meter reads about 500 volts.	(b) Machine runs, but no meter reading.	Fuse blown. Faulty H.T. brushes.	Replace fuse. Check brushes.	
"IC" SYSTEM AND HEADGEARS	5	Control unit to "IC". OFF-ON IC switch to ON. Press pressel and speak. Test all headsets including microphones.	Voice heard in all the headphones of the vehicle including own.	Voice cannot be heard.	i. Snatch plug connections bad.	Clean and check.	
					ii. Faulty headgear	Replace headgear.	
					iii. Internal fault.	Report. See Running Repairs 13 and 14.	
	6	Press button on junction distribution No.1	Buzz heard in phones.	No buzz in phones.	Buzzer needs adjusting.	Adjust buzzer.	
"A" RECEIVER	7	System switch to RT and meter switch to AVC. Turn both gains fully clockwise. Tune in to any strong RT station on each waveband in turn. (A broadcast will do).	(a) Station heard in phones.	i. No station can be heard.	i. Aerial disconnected.	Examine all connections including pig-tail. Report. See Running Repairs 3 & 6.	
					ii. Receiver faulty.		
					ii. Station heard but very noisy.	Receiver faulty. Loose connections.	Report. Check all aerial connections.
					(b) Meter reading is less when set is tuned to station than when it is not.	Meter reading does not alter.	Internal fault.	Report. (Set may still be efficient enough to be worked in an emergency.)
	8	Turn netting switch down. Adjust A FREQUENCY dial.	Whistle is heard.	No whistle is heard.	Internal fault.	Report. See Running Repairs 5.	

Chap. 2 - Sect. 11 Wireless drills and servicing tables

Part tested	No.	Test	What should happen	What should NOT happen	What is likely to be wrong	What to do about it
"A" SENDER NOT TO BE TESTED IF UNDER WIRELESS SILENCE	9	Put meter switch to AE. Press pressel switch and tune VARIOMETER and A PA for highest possible meter reading.	Meter reads its usual value.	Meter does not read or reads very low.	i. Aerial connection faulty. ii. Sender faulty.	Check all connections. Report. See Running Repairs 4, 5, 7, 8 and 9.
	10	Speak loudly into the microphone.	(a) Meter needle kicks.	Meter reading does not alter.	Internal fault.	Report. See Running Repairs 6.
			(b) Sidetone is heard.	No sidetone.	Internal fault.	Report, but set may still send. See Running Repairs 6.
MORSE KEY and CW RECEPTION	11	Switch set to CW. Move HET TONE control.	Whistle heard varying in pitch either side of zero mark.	Whistle does not vary.	Internal fault.	Report. Set may still function satisfactorily except on CW. See Running Repairs 5.
	12	Plug in key and press.	Meter reads higher than test 9.	Meter does not read or reads very low.	i. Fault in key or key lead. ii. Internal fault.	Check key, plug and lead. Report. See Running Repairs 10.
MCW	13	(a) Switch to MCW, press key.	Whistle in phones.	No whistle in phones.	Internal fault.	Report. See Running Repairs 5.
		(b) Return switch to RT.				
PILOT LAMP	14	Put switch on both control units to "B".	Red lamp lights on operator's control unit.	Lamp does not light.	i. Bulb burnt out.	Replace bulb.
					ii. Fuse blown.	Replace fuse in control unit No. 1.
RE-TRANSMISSION NOT UNDER WIRELESS SILENCE	15	Switch control unit Mk. II to "R" and (a) "A → B." (b) "B → A." (c) "A and B." (d) Press pressel switch.	(a) "B" set switched to SEND. (b) "A" set ditto. (c) Both sets on RECEIVE. (d) Both sets on SEND.	(a) & (b) Mush continues in commander's phones when switched to set which should be on SEND. (c) One or both on SEND. (d) As (a) and (b).	Internal fault.	Report.
GENERAL	16	Check all controls when receiving.	Controls should feel "smooth" and work.	Controls jam, feel "rough" or fail to work.	Internal fault.	Report.

DAILY TESTS FOR WS No. C12

Test No.	Part tested	Test	Fault and action
1	Power supply	Switch on power supply unit. Check that pilot lamp lights and vibrator is heard to start	(i) Pilot lamp and vibrator does not operate - check connections from battery. (ii) Pilot lamp does not light - change bulb. (iii) Vibrator does not start - replace fuse; if replacement fuse blows, report.
2	LT	Stand-by switch to REC. TRANSMIT & I/C, system switch to VOICE and meter switch to LT. Check that meter reading exceeds 10.5V.	(i) No meter reading - check that locking rings are tight on connector between power supply unit and set. (ii) Meter reading low - (a) Charge or replace batteries. (b) Check that all connections from the battery are clean and tight. (c) Remove plug from set HARNESS socket and check that a relay in the power supply unit is heard to release and the LT reading falls slightly. If either or both result, report.
3	HT1	Meter switch to HT1. Meter should read 200-280V dependent on the LT voltage.	No meter reading - replace fuse; if replacement fuse blows, report.
4	Transformer	System switch to CW. Check that rotary transformer starts.	Transformer does not start - report.
5	Microphone pressel switch	System switch to VOICE, control units to A, press pressel switch. Check that rotary transformer in power supply unit starts.	Transformer does not start - (i) Try a different headgear. (ii) Check that snatch plug and all harness connectors are properly connected.
6	HT2	Meter switch to HT2, press pressel switch. Meter should read 330-435V dependent on the LT voltage.	No meter reading - replace fuse; if replacement fuse blows, report.

Test No.	Part tested	Test	Fault and action
7	Sender Drive	System switch to VOICE, meter switch to DRIVE, flick switch to A - 1.6-4.9 mc/s, press pressel switch. Meter should indicate at least 100V. Repeat test in remaining three positions of flick switch.	
8	Chassis connection from aerial tuning unit to set	Meter switch to AE CURRENT, press pressel switch. No meter reading.	If there is a reading - switch meter switch to any other position and check that coaxial connector is properly plugged in at both ends.
9	Aerial current	Tune on frequency A and B (see para 375(c) to (n). Aerial tuning unit dial lamps light and normal aerial current indication obtained.	Dial lamps do not light - check that 3-point connector is properly plugged in at both ends. No aerial current - (i) Check that coaxial connector is properly connected. (ii) Check all earth and aerial connections.
10	Modulation	Press pressel switch, speak or whistle into microphone. Fluctuation in meter reading and side-tone in headphone.	No fluctuation or side-tone - replace headgear.
11	Receiver Net	System switch to NET, tune to signal. Beat note and signal heard.	
12	Gain	Meter to AGC. Turn GAIN control fully clockwise - meter reads 6V. GAIN control fully anti-clockwise - meter reads 4V.	
13	Automatic gain control	System switch to VOICE. Tune to no signal - meter reads 8V approximately. Tune to signal - meter dips.	
14	HET TONE control	System switch to CW, tune for CW signal. Pitch varies as control is operated.	

Test No.	Part tested	Test	Fault and action
15	General	Check - (a) Controls (b) Set clean and in good condition (c) Aerial and base	Check that they are working correctly. Check for - (i) Frayed or damaged connectors. (ii) Damaged plugs. (iii) Security of set. Check for cleanliness and security.
16	IC and harness	Check - (a) Side-tone on all headgears. (b) Inter-communication CALL switches (c) All switches and controls on control units and junction boxes etc. (d) Commander's microphone (e) Remote control hand telephone and tank telephone (f) Fuse and lamp (g) Connections	No side-tone on one headgear - change headgear. No call signal - report. Report defects Report defects Report defects Check for - (i) Frayed or damaged connectors. (ii) Damaged plugs. (iii) Security of fittings.

WEEKLY TESTS FOR WS No. 88 TYPE "A" AFV OR No. 31 AFV

Test No.	Test	Result if O.K.	Result if faulty	Possible fault	Action
1	Switch ON the power supply and LF amplifier unit.	Dial lamp lights on the WS, No. 31. Pilot lamp lights on the power supply and LF amplifier unit of the WS, No. 88.	Dial pilot lamp does not light.	(a) Faulty bulb. (b) Fault in vehicle wiring.	Change bulb. Examine socket on end of power supply lead. If in good order report.
2	Listen for vibrator buzz by putting ear close to the power supply and LF amplifier unit.	Vibrator buzz heard.	Vibrator buzz not heard.	(a) Fuse blown. (b) Vibrator faulty. (c) Internal fault.	Replace fuse with spare fuse, see para 384(a). WS No. 88 change vibrator, see para 384(c) WS No. 31. Report. Report.
3	With set on RECEIVE and with switch S2 at 88 or 31, listen on operator's headphones. Vary VOL (volume) control.	(a) Signals received. No "mush" Strength of signals increase as VOL control	No signals but "mush" heard when there is a transmission on a frequency within operating range.	(a) Faulty pigtail in aerial base. (b) Faulty aerial lead. (c) Weak earthing of plates connector aerial feeder No. 2. (d) If signal still not received, internal fault.	Check that pigtail is sound. If not replace pigtail. Replace aerial lead. Check that the hed. hd. screw used for the tapped hole in plate is a tight fit and making good electrical contact. Report.
		(b) "Mush" heard; this increases as the VOL control is turned clockwise. (There is receiver noise with no signal coming in).	"Mush" not heard.	(a) Headgear faulty. (b) Vibrator faulty. (c) Valves V1 or V2 also V4 for No. 88 set in power supply and LF amplifier unit faulty. (d) If "mush" still not heard, internal fault.	Use the headgear at commander's position. If "mush" is now heard, change headgear. See 2(b) above. Change valves, see para 384(b). Report.

Test No.	Test	Result if O.K.	Result if faulty	Possible fault	Action
<p>Important note: Do not perform tests (4) and (5) during a wireless silence unless the aerial feeder has been removed from the set.</p>					
4	With switch S2 set to 88 or 31, press the pressel switch and place ear close to the power supply and LF amplifier unit.	Send/receive relay in unit is heard to click over.	No click.	(a) Faulty pressel switch. (b) Internal fault.	Change heardgear. Report.
5	With switch S2 set to 88 or 31 and with the pressel switch pressed, speak into the microphone.	Voice heard in the headphones. (Receiver "mush" or incoming signals should have disappeared).	Voice not heard in headphones.	(a) Faulty microphone. (b) Valve V1 or V2 also V3 for No. 88 set in power supply and LF amplifier unit faulty. (c) If speech is still not heard in headphones.	Change headgear. Change valve, see para 384(b). Report.
6	With set on receive (i.e. pressel switch released) and with the WS No. 19 switched ON and IC switch on the No. 19 set switched ON and S2 switched to IC.	Intercom, satisfactory between operator and any other member of crew.	No intercom.	(a) Faulty headgear at the other position in the vehicle. (b) Internal fault.	Change headgear. Report.
7	Repeat (6) with power supply and LF amplifier unit switched OFF.	Intercom, satisfactory between operator and any other member of crew.	No intercom.	(a) Faulty headgear at the other position in the vehicle. (b) Internal fault.	Change headgear. Report.
8	Inspect all controls.	Should be free and easy to operate.	(a) Volume control causes noise when rotated. (b) Controls sticking.	(a) Bad contact. (b) Dirty.	Report. Report.
9	Operate set normally on all channels.	Similar results obtained on all channels.	Defective on certain channels.	Internal fault.	Report.

Note: In no circumstances will the WS No. 88 Type "A" APV be opened.

Each wireless set has been provided with a LF Amplifier which has been adjusted to give best performance. If either becomes unserviceable both items should be replaced with another pair if possible.

If the performance of the set seems to be poor or weak on either send or receive it is possible that one of the two valves V1 or V2 in the Power Supply and LF Amplifier Unit is faulty. Replace these valves in turn. If no improvement is obtained report the matter.

ROUTINE TESTING OF CONTROL UNIT No. 16 (OPERATORS) AND CONTROL UNIT No. 17 OR 33 (COMMANDERS) AND FEED THROUGH FACILITIES

Note: EMER TELECOMMUNICATIONS F277 Mod Instr No. 3 covers the removal of the B-set facility from wireless set No. 19, Mk 3 and 3/1, and therefore reference to "B" in the following table should be ignored.

382. (a) Switch ON the Wireless Station and switch ON the A, B and IC switches on the Wireless Set No. 19.
- (b) Set the switches as shown in the Table which follows and listen on each headgear in turn.
- (c) If you cannot get the facility as given in the table, report the matter.
- (d) Be careful to press the pressel switch only when the control unit switch is at IC, otherwise you may transmit unintentionally.

Set Switches			Heard on Commander's Headgear	Heard on Gunner's Headgear	Heard on Operator's Headgear
S1 C.U. No. 17	S2 C.U. No. 16	S3 C.U. No. 16			
IC	A	-	IC B 88 or 31	IC	A
IC	IC	-	A & B IC	A & B IC	A & B 88 or 31 IC
IC	B	-	IC A 88 or 31	IC A	B
IC	88 or 31	-	IC A & B	IC A & B	88 or 31
A	IC	-	A	IC B	B 88 or 31 IC
B	IC	-	B	IC A	A 88 or 31 IC
88 or 31	IC	-	88 or 31	IC A & B	A & B IC
B	A	-	B	IC 88 or 31	A
A	B	-	A	88 or 31	B
A	R	A & B	A & B	IC 88 or 31	A & B
IC	R	A & B	IC 88 or 31	IC	A & B
88 or 31	R	A & B	88 or 31	IC	A & B
A	R	A & 88 or 31	A & 88 or 31	IC B	A & 88 or 31
IC	R	A & 88 or 31	IC B	IC B	A & 88 or 31
88 or 31	R	A & 88 or 31	A & 88 or 31	IC B	A & 88 or 31
88 or 31	88 or 31	-	-	Lamp lights	-
Any	R	-	-	Lamp lights	-

ROUTINE TESTING OF RETRANSMISSION

Note: EMER TELECOMMUNICATIONS F277 Mod Instr No. 3 covers the removal of the B-set facility from wireless set No. 19, Mk 3 and 3/1, and therefore reference to "B" in the following table should be ignored.

383. These tests must NOT be carried out during WIRELESS SILENCE.

Switch ON all sets and turn all GAIN knobs to the fully anti-clockwise position. To test whether a set is heard, turn the VOL (gain) control of that set up, and listen for the "mush".

Set the switches S2 and S3 as indicated in the following table and listen on the operator's headgear.

S2	S3	Result
R	B → A	A set goes to "Send" (ACV current zero) B set heard (via A set side tone)
R	A & B	A and B sets both heard A and B sets both go to "Send" when pressel switch is pressed
R	A → B	B set goes to "Send" A set is heard (via B set side tone)
R	88 or 31 → A	A set goes to "Send" (AVC current zero) WS 88 or 31 heard (via A set side tone)
R	A & 88 or 31	A and WS 88 or 31 both heard A and WS 88 or 31 both go to "Send" when pressel switch is pressed (listen for the relay click on the Power Supply and LF Amplifier Unit)
R	A → 88 or 31	WS 88 or 31 goes to "Send" A set is heard (via 88 or 31 set side tone)

REPLACEMENT OF VALVES, FUSE AND VIBRATOR IN THE POWER SUPPLY AND LF AMPLIFIER UNIT

384. Before any of the above can be replaced the unit must be disconnected and withdrawn from its case, after the retaining screws at the back of the case have been loosened.

(a) To replace the fuse

(i) Remove fuse

(ii) Remove spare fuse from holder and fit it in place of blown fuse.

(b) To change a valve

(i) Push screening can down *lightly* and rotate gently in anti-clockwise direction. When the can is free to be removed it will be pushed upwards by the internal spring.

(ii) Remove the valve carefully using the extracting tool provided.

(iii) When inserting a valve ensure that the pins are correctly placed with regard to the holder before gently pushing it home.

(iv) Replace screening can.

(c) To change the vibrator, WS, No. 88 TYPE 'A', A.F.V. only.

(i) Pull out existing vibrator.

(ii) Push new vibrator firmly home.

Note: The vibrator fitted in the Power Supply and LF Amplifier Unit used in conjunction with WS No. 31 A.F.V. must not be replaced by User.

RUNNING REPAIRS, WS No. 19, MK 3 and 3/1

Failure	Possible cause	Possible cure
<i>Power</i>		
1. Set completely dead.	Failure of power.	See daily test 1(i-iii)
<i>"A" Set</i>		
2. All working except "A" set sender and receiver.	(1) Aerial disconnected.	Examine and replace pigtail if necessary.
3. All working except "A" receiver.	(2) V4A, V2A, V3A, V1A.	Replace valves in turn.
4. All working except "A" sender.	V1A, V1B, V1C.	Replace valves in turn.
5. All working except "A" sender, though "A" receiver gives no CW note or netting whistle.	V2B, V4A, V5A, V6A.	Replace valves in turn.
6. All working except "A" receiver, and meter reading does not rise when sending RT. (See daily servicing test No. 10).	V2B.	Replace valve.
7. "A" sender and receiver not working, but your own voice heard in phones on sending RT.	V3A.	Replace valve.
8. All working except "A" sender, but meter reads with switch set to DRIVE.	V2A.	Replace valve.
9. All working except "A" sender. No reading or only a very low reading with switch set to DRIVE.	V4A.	Replace valve
10. All working except "A" sender on morse.	V2B, V5A.	Replace valves in turn.
11. "A" receiver very noisy.	(1) Faulty key, keylead or plug.	Examine. Repair if possible, otherwise report.
	(2) Internal fault. Report.	
12. Pilot light on operator's control unit out.	(1) Loose aerial connections.	Report. Check, tighten where loose and replace pig-tail if necessary.
13. All working except "IC".	(2) Loose valves. Check.	
	(1) Bulb burnt out.	See daily servicing test No. 14
	(2) Fuze burnt out.	Replace valves in turn.
	V1F, V8B.	

WIRELESS SET No. C42

Opening up drill

385. (a) Erect the 8 ft aerial rod into the aerial base. (A longer or shorter aerial must not be used).
- (b) Check earthing strip between the earthing ring of the aerial base and its mounting and between aerial tuning unit and the vehicle.
- (c) Check security of connection from aerial base to aerial tuning unit.
- (d) Check coaxial lead, aerial tuning unit to set.
- (e) Check 25 point connector, power supply unit to set.
- (f) Check 12 point connector, harness to set. Ensure all harness connections are tight.
- (g) Check that power supply unit POWER switch is OFF.
- (h) Connect wireless junction box to power supply unit.
- (j) Connect headsets.
- (k) Control units selector switch to position A.
- (l) Switch on harness - junction box J1 centre switch to NORMAL or junction box J2 switch to ON.
- (m) Ensure that power supply unit IC and wireless set switches are OFF and STAND-BY/TRAFFIC switch is at STAND-BY.
- (n) Switch power supply unit POWER switch to ON. POWER ON lamp should light; if too bright, turn the lamp cover clockwise.
- (o) IC and wireless set switches to ON and STAND-BY/TRAFFIC switch to TRAFFIC.
- (p) Allow 5 min, 15 min if possible, for set to warm up.
- (q) Carry out daily tests.

Tuning drill

386. (a) Calibration switch to CURSOR ADJ.

Note: The two dials and the centre zero meter are illuminated when the calibration switch is at CURSOR ADJ, CHANNEL ADJ and TUNE RF. The light is out when the switch is at OPERATE.

- (b) Unlock RF and CHANNEL tuning knobs by turning the locking levers fully anti-clockwise.

- (c) Set RF tuning to approximately the required frequency.
- (d) Set CHANNEL tuning to nearest even number of MC/S above or below the required frequency.
- (e) Turn CHANNEL tuning knob until centre zero meter needle reads zero. NEEDLE MUST MOVE IN SAME DIRECTION AS SCALE.
- (f) Rotate CURSOR ADJUSTER knob until cursor on CHANNEL scale is over the calibration line corresponding to the frequency chosen (d).
- (g) Calibration switch to CHANNEL ADJ.
- (h) Rotate channel tuning knob until the CHANNEL scale reads the required frequency.
- (j) Rotate channel tuning knob until centre zero meter reads zero. NEEDLE MUST MOVE IN SAME DIRECTION AS SCALE. Final reading of the CHANNEL scale to be within $\frac{1}{3}$ division of exact frequency required. If it is not, start again at (a).
- (k) Lock channel tuning knob by turning the locking lever clockwise.
- (l) Calibration switch to TUNE RF.
- (m) Rotate RF tuning knob until centre zero meter reads zero. NEEDLE TO MOVE IN SAME DIRECTION AS TOP OF TUNING KNOB.
- (n) Lock RF tuning knob by turning the locking lever clockwise.
- (o) Calibration switch to OPERATE.
- (p) Set SQUELCH control fully anti-clockwise.
- (q) NOISE switch to ON.
- (r) Ensure that there is no incoming signal in headphones.
- (s) Rotate SQUELCH control until SIGNAL lamp lights, turn knob back until light just goes out with no flickering.
- (t) NOISE switch to OFF.

The instructions which follow will be carried out at a time stated by Control so that no interference is caused to stations tuning on receive:-

- (u) HIGH/LOW power switch to HIGH.
- (v) Ensure no incoming signal in headphones.
- (w) Unlock the tune knob on the aerial tuning unit by turning the lock lever fully anti-clockwise.

- (x) Depress the switch on the headgear microphone and rotate the tune knob until a maximum reading is obtained on the tuning meter. During this operation, the set is sending. Do not send longer than necessary.
- (y) Release the pressel switch and lock the tune knob in this position.

Operating instructions

- 387. (a) Set HIGH/LOW power switch as required.
- (b) Squelch should normally be kept in circuit i.e. NOISE switch to OFF. If muting is not required set switch to ON.
- (c) For listening watch only, set the power supply unit STAND-BY/TRAFFIC switch to STAND-BY. On resuming normal watch, set the switch to TRAFFIC, allow a few minutes for the 'sender' to warm up.

Carry out the following check every 10-15 minutes during the first hour. After this period, an hourly check should be sufficient:-

- (d) STAND-BY/TRAFFIC switch to TRAFFIC, see (c).
- (e) Calibration switch to CHANNEL ADJ. If the centre zero meter is not at zero, proceed as follows:-
 - (i) Unlock channel tuning knob.
 - (ii) Readjust for zero.
 - (iii) Lock channel tuning knob.
- (f) Calibration switch to TUNE RF. If centre zero meter is not at zero, proceed as follows:-
 - (i) Unlock RF tuning knob.
 - (ii) Readjust for zero.
 - (iii) Lock RF tuning knob.
- (g) Calibration switch to OPERATE.

Closing down drill

- 388. (a) Switch the power supply off, see para 385(n).
- (b) Switch the harness off, see para 385(1).
- (c) Remove the aerial, clean, dry and stow.

WIRELESS SET No. B47

Opening up drill

389. (a) Erect the 8 ft aerial rod into the aerial base.
- (b) Check aerial base earthing strip.
- (c) Check security of connection from aerial base to aerial tuning unit (ATU).
- (d) Check earthing strip from ATU.
- (e) Check coaxial connector, ATU to wireless set.
- (f) Check 12 point connector, harness to wireless set.
- (g) Connect 2 way power lead from power supply unit to wireless junction box.
- (h) Connect headgear assemblies.
- (j) Set the various switches on the harness boxes to give the desired facility.
- (k) Switch on harness - junction box J2 switch to ON.
- (l) Switch wireless set POWER switch to ON. POWER ON light should glow; if too bright, turn the light cover anti-clockwise.
- (m) Allow one minute for the set to warm up.
- (n) Carry out daily tests.

Tuning drill

390. (a) Calibrator switch to CURS ADJ.
- (b) Unlock tuning control movement by pressing the locking lever downwards.
- Note:** When the lever is in its locking position (i.e. up) it applies a brake to the tuning drive and at the same time disengages the tuning control knob from the tuning drive. The control knob may be rotated irrespective of the position of the locking lever.
- (c) Rotate tuning control knob until the mc/s triangle nearest to the desired frequency appears in the centre of the window.
- (d) Turn tuning control knob until centre zero meter needle reads zero. NEEDLE MUST MOVE IN SAME DIRECTION AS SCALE.
- (e) Turn cursor adjuster until cursor is over the apex of the mc/s triangle.

- (f) Calibrator switch to CHANNEL ADJ.
- (g) Turn tuning control knob until the required frequency on film scale is below cursor (black for even mc/s, white for odd mc/s).
- (h) Turn tuning control knob until centre zero meter needle reads zero. NEEDLE MUST MOVE IN SAME DIRECTION AS SCALE.
- (j) Lock tuning control by turning locking lever up.
- (k) Calibrator switch to NOISE ON HP.
- (l) Put on a headgear assembly and ensure there is NO INCOMING SIGNAL.
- (m) Unlock the tune knob on the ATU by turning the LOCK lever fully anti-clockwise.
- (n) Press the switch (pressel) on the headgear microphone and rotate aerial tune knob for maximum reading on tuning meter.
- (o) Lock the tune knob and release the pressel switch.

Warning: For security reasons and to avoid interference to neighbouring sets, adjustment of the ATU with the set on send should be carried out as rapidly as possible.

- (p) Ensure NO INCOMING SIGNAL.
- (q) Calibrator switch to NOISE OFF HP.
- (r) Rotate squelch clockwise until noise is heard, then slowly turn control anti-clockwise until noise just disappears.

Note: (a) Tuning will require checking after ten minutes, again after thirty minutes and then hourly. To do this proceed as follows:

- (i) Put calibrator switch to CHANNEL ADJ and ensure that meter pointer coincides with the centre zero mark.
 - (ii) If not unlock the tuning control and readjust the frequency setting by following the procedure detailed at (g) to (k) inclusive.
 - (iii) If the indicated error is large or if the direction of the meter pointer opposes the movement of the scale proceed as detailed at (b) to (k) inclusive.
- (b) Squelch sensitivity may require periodic readjustment, if so proceed as detailed at (p) to (r) inclusive.

Closing down drill

- 391. (a) Put wireless set POWER switch to OFF.
- (b) Switch off harness - junction box J2 switch to OFF.
- (c) Remove the aerial, clean, dry and stow.

DAILY TESTING OF VHF STATIONS

392. (a) Ensure opening up drill (m) to (p) is carried out.
- (b) In order to differentiate between set and harness faults the testing of the No. C42 set is done with an 'O' box and one headgear assembly.
- (c) The sequence of daily testing will be:-
- (i) Testing the C42 set without the harness.
 - (ii) Testing the harness using the C42 set.
 - (iii) Testing the B47 set (if fitted).

DAILY TESTS FOR WS No. C42				
Part tested	Test	Correct result	Fault	Action
Power supply	IC and POWER switches to ON. STAND-BY/TRAFFIC switch to TRAFFIC.	(a) Meter reads 24V.	No reading, no light.	(i) Check fuse. (ii) Check vehicle supply to wireless junction box.
		(b) POWER ON light glows.	No light.	(i) Ensure light cover is not closed. (ii) Replace lamp.
Receiver	(a) NOISE switch to ON.	Hiss in phones (after 30 secs)	No hiss.	(i) Change headgear. (ii) Report.
	(b) NOISE switch to OFF, adjust squelch.	SIGNAL light glows. Squelch operates.	(a) Light does not glow.	(i) Check position of light cover. (ii) Check lamp. (iii) Report.
			(b) Light does not go out.	(i) Alter channel in case signals are being received. (ii) Report.
			(c) Squelch inoperative.	Report.
	(c) Calibrator switch to CURSOR ADJ.	Meter deflects on even mc/s. SIGNAL light glows.	No deflection and light does not glow.	(i) Check RF dial on same channel. (ii) Report.
(d) Calibrator switch to CHANNEL ADJ.	Meter deflects on each channel. SIGNAL light glows.	No deflection and light does not glow.	(i) Check RF dial on same channel. (ii) Report.	
Sender. NOT UNDER WIRELESS SILENCE	(a) Calibrator switch to TUNE RF.	Meter deflects SIGNAL light glows. Zero meter on same channel as (d) above.	No deflection and light does not glow.	Report.
	(b) Calibrator switch to OPERATE. Press to send, speak into microphone.	SIGNAL light glows, sidetone heard.	No sidetone.	(i) Check microphone. (ii) Report.
	(c) Press pressel and obtain reading of aerial tuning meter.	Aerial tuning meter given maximum reading.	No reading on meter.	(i) Check coaxial cable. (ii) Check aerial base. (iii) Check aeriels. (iv) Report.
General	(a) Controls.	Working correctly.	Loose or inoperative.	Repair and report.
	(b) Cleanliness.	Free of oil or dirt.	Dirty or oily.	Clean, do not use oily rag.
	(c) Connectors.	Connectors not frayed etc.	Connectors frayed, bonding to plug or socket faulty.	Repair and replace as necessary.
	(d) Security.	Firm in mounting.	Loose.	Tighten.
	(e) Fuses.	Spares in power supply unit.	Missing.	Replace.
Harness and IC.	Connect set to harness and leave tuned on a frequency. Test harness, see para 383.			

Preparation for testing of harness type "B"

393. A table is given of the main control units and junction boxes which may be fitted to the vehicle. This table must be adapted to the particular vehicle harness and each unit tested in a logical sequence.

- (a) Check that all connections between the sets, junction boxes and control units are correctly fitted and the locking rings are tightened.
- (b) Check that junction box J2 is at NORMAL unless a rebroadcast unit B is fitted, when it must be at REB.
- (c) Connect all headgear assemblies.
- (d) Ensure all control units are at IC and GAIN controls at maximum.
- (e) Ensure commander's microphone is at IC.
- (f) If a B unit is fitted ensure it is at NORMAL.
- (g) Check that remote handset is connected and ready for use.

DAILY TESTS FOR HARNESS TYPE "B"

Note: No set must be put to send under wireless service. Tests marked * should be carried out after testing B47 set.

Part tested	Test	Correct result	Fault	Action
Power supply	Centre switch of junction box J1 to NORMAL. J2 junction box switch to ON.	Indicator light glows.	Light does not glow.	(i) Check power supply. (ii) Check fuse. (iii) Check lamp.
Junction box J1	Left-hand switch held at CALL.	Buzz heard in headgears	No buzz.	Report.
	Left-hand switch to 1, press pressel and speak into microphone.	Sidetone heard.	No sidetone.	(i) Headgear faulty. (ii) IC faulty. (iii) Report.
	Left-hand switch to 5gr. Vary GAIN control. Open squelch of C42 set.	Mush heard and varies.	(i) No mush. (ii) No variation.	(i) Harness set connector. (ii) Report.
	Press pressel and speak.	Set goes to send (operation of relay heard) and sidetone heard.	Set does not go to send. No sidetone.	Report.
	Centre switch to REMOTE. Press call button on remote handset.	Buzz heard.	No buzz.	(i) Check cable drum. (ii) Report.
	Left-hand switch to 1. Press pressel of remote handset and speak.	Sidetone on headgear fitted to J1.	No sidetone.	Report.
	Centre switch to BK. IN, left-hand switch to SET. Press pressel of headgear fitted to J1.	Set goes to send.	Set does not go to send.	Report.
	Centre switch to REB. Press pressel of remote handset.	Set goes to send.	Set does not go to send.	Report.
Junction box J2	This box cannot operate alone. For normal conditions of operation, the appropriate tests for a control unit C or a remote control unit B apply. If rebroadcast facilities are provided refer to the tests for the rebroadcast unit B, or the 'R' and 'B' units as applicable. If a rebroadcast unit B is not connected then the screwdriver operated NORMAL/REB switch must be set to NORMAL.			
Control unit C Note: In a one-set installation switch cannot be turned to A.	Switch held at CALL.	Buzz heard in headgears	No buzz.	(i) Headgear faulty. (ii) Report.
	Switch to 1, press pressel and speak.	Sidetone heard.	No sidetone.	(i) Headgear microphone. (ii) Report.
	Switch to A, open squelch of C42 set.	C42 set mush, varied by GAIN control.	No mush. No variation.	Report.
	Close squelch, press pressel.	C42 set switched to send.	Does not send.	Report.
	*Switch to B. Open squelch of B47 set	B47 set mush, varied by GAIN control.	No mush. No variation.	Report.
	*Close squelch, press pressel.	B47 set switched to send.	Does not send.	Report.

Chap. 2 - Sect. 11 Wireless
drills and servicing tables

Part tested	Test	Correct result	Fault	Action	
Control unit D <i>Note: In a one-set installation switch cannot be turned to A.</i>	Switch held at CALL.	Buzz heard in headgear.	No buzz.	(i) Headgear faulty. (iii) Report.	
	Switch to 1, press pressel and speak.	Sidetone heard.	No sidetone.	(i) Headgear microphone. (iii) Report.	
	Switch to A, open squelch of C42 set.	C42 set mush, varied by GAIN control.	No mush. No variation.	Report.	
	*Switch to B.	B47 set mush, varied by GAIN control.	No mush. No variation.	Report.	
Remote control unit R	Bottom left-hand switch to NORMAL, top left-hand switch held at CALL.	Buzz heard in head-gears.	No buzz.	(i) Headgear faulty. (ii) Report.	
	Top left-hand switch to 1, press pressel and speak.	Sidetone heard.	No sidetone.	(i) Headgear faulty. (ii) Report.	
	Top left-hand switch to A, open squelch of C42 set.	C42 set mush, varied by GAIN control.	No mush. No variation.	Report.	
	Close squelch, press pressel and speak.	C42 set switched to send. Sidetone heard.	Does not send.	Report.	
	*Set up B47 set on another frequency. Top left-hand switch to B, open squelch of B47 set.	B47 set mush heard.	No mush.	Report.	
	*Close squelch. Press head-gear pressel and speak.	B47 set switched to send, sidetone heard.	No sidetone.	Report.	
	Bottom left-hand switch to REMOTE, top left-hand switch to 1. Press call button on remote handset.	Buzz heard.	No buzz.	Report.	
	Press remote handset pressel and speak.	Sidetone heard on head-gear connected to R unit.	No sidetone.	Report.	
Remote control unit R (contd)	Top left-hand switch to A or B, bottom right-hand switch to A. Press remote handset pressel and speak.	C42 set switched to send, sidetone heard.	Does not send.	Report.	
	*Bottom right-hand switch to B. Press remote handset pressel and speak.	B47 set switched to send, sidetone heard.	Does not send.	Report.	
	Bottom left-hand switch to AAA, bottom right-hand switch to A. Open squelch of C42 set.	C42 set mush heard in remote handset.	No mush.	Report.	
	Bottom left-hand switch to BK. IN, top left-hand switch to A. Press pressel of headgear fitted to R unit.	C42 set switched to send.	Does not send.	Report.	
	Rebroadcast unit B <i>Note: Turn screwdriver operated NORMAL/REB switch of J2 junction box to REB.</i>	*Switch to AUTO. Open squelch of C42 set and return. Open squelch of B47 set and return. Listen on R unit headgear with R unit top left-hand switch on the set which is to send.	C42 set squelch puts B47 set to send. B47 set squelch puts C42 set to send.	Sets do not go to send.	Report.
		*Switch to BK. IN. Top left-hand switch of R unit at A or B. Press pressel of R unit headgear.	Both sets switched to send.	Sets do not go to send.	Report.
		*Switch to A-B. Switch to B-A. These positions are used for EP sets or for a mixture of HF and VHF sets.	B set switched to send. A set switched to send.	Set does not send. Set does not send.	Report. Report.
		Commander's microphone. <i>Note: The microphone may be fitted to a unit C, D, J1 or J2.</i>	Switch to CALL.	Buzz heard in headgear.	No buzz.	(i) Headgear faulty. (ii) Report.
General	Switch to 1, press pressel and speak.	Sidetone heard.	No sidetone.	(i) Headgear faulty. (iii) Report.	
	Switch to A, open squelch of C42 set, vary GAIN control.	C42 set mush heard, varied by GAIN control.	No mush.	Report.	
	Close squelch. Press pressel and speak.	C42 set switched to send. Sidetone heard.	C42 set not switched to send.	Report.	
	*Switch to B, open squelch of B47 set, vary GAIN control.	B47 set mush heard, varied by GAIN control.	No mush.	Report.	
	*Close squelch. Press pressel and speak.	B47 set switched to send. Sidetone heard.	B47 set not switched to send.	Report.	
	Controls.	Working correctly.	Loose etc.	Repair and report as necessary.	
Cleanliness.	Free of oil and dirt.	Oily or dirty.	Clean.		
Connectors.	Connectors not frayed, continuity of braid unbroken.	Braiding frayed or broken.	Repair and report as necessary.		
Security of units etc.	Firm.	Loose.	Tighten.		

Chap. 2 - Sect. 11 Wireless
drills and servicing tables

DAILY TESTS FOR WS No. 847

Part tested	Test	Correct result	Fault	Action
Power supply	POWER ON/OFF switch to ON.	POWER ON light glows.	Light does not glow, ensure cover is fully clockwise.	(i) Check power supply. (ii) Check fuse. (iii) Listen for vibrator hum. If vibrator hums light wiring faulty. Report.
			Vibrator silent and no light.	(i) Change power connector and repeat test. (ii) If still faulty, report.
Receiver	(a) Calibrator switch to NOISE ON HP.	Hiss comes into phones after 30 secs.	Phones silent.	(i) May be due to stronger carrier, alter frequency. (ii) Still no hiss, report.
	(b) Calibrator switch to NOISE OFF HP. Turn SQUELCH fully clockwise then anti-clockwise.	Hissing noise in phones which then disappears.	Hiss remains in phones.	Internal fault, report.
	(c) Calibrator switch to CURS ADJ.	Dial light glows.	Dial light does not glow.	Report but carry on.
	(d) Unlock and turn tuning control until mc/s point crosses window.	Meter deflects to each side in turn.	(a) Meter does not deflect. (b) Scale does not move.	Internal fault, report.
Sender. NOT UNDER WIRELESS SILENCE.	(a) Calibrator switch to NOISE OFF HP.	Noise disappears.	Noise continues.	Report.
	(b) Press pressel, speak into microphone.	Sidetone heard.	No sidetone.	Report.
	(c) Press pressel and tune aerial, tuning unit for maximum meter reading.	Aerial meter deflection at maximum.	(a) Meter well off scale. (b) No deflection.	Check aerial and aerial base. Check coaxial to ATU. If still faulty, report.
General	(a) Controls.	Working correctly.	Loose etc.	Repair and report as necessary.
	(b) Cleanliness.	Free from oil and dirt.	Oily or dirty.	Clean, do not use oily rag.
	(c) Connectors.	Connectors not frayed, continuity of braid unbroken.	Braiding frayed or broken.	Repair or replace as necessary.
	(d) Security of units etc.	Firm.	Loose.	Tighten.

12 - CREW DRILL - MK I LIAISON VEHICLE

This drill can be introduced at the discretion of Officer Commanding at any time. It should always be carried out on formal parades and should be covered in the teaching of parade maintenance at all training establishments.

CREWS FRONT

Crew commander

394. (a) *Squadron and troop parade*

- (i) Take post four paces in front of and facing the centre of the car.
- (ii) When the crew have taken post and have dressed by the right, turn about and stand at ease.

(b) *Crew parade*

- (i) Take post four paces in front of and facing the centre of the car.
- (ii) Order CREWS FRONT.

Driver and gunner

395. (a) *Squadron and troop parade*

- (i) Take post two paces in front of the front mudguards, the driver on the right.
- (ii) Dress by the right and stand at ease, taking the time from the crew commander.

(b) *Crew parade*

- (i) Fall in as for squadron parade.
- (ii) Stand at ease, taking the time from the driver.

OPEN CAR

Crew commander

396. (a) *Squadron and troop parade*

- (i) Come to attention and turn about.
- (ii) Double to L.H. side of car and untie all sheet cords. Assist to stow net and sheets.
- (iii) Stand to attention four paces in front of and facing the centre of the car.
- (iv) When the car is open, turn about.

(b) *Crew parade*

- (i) Order OPEN CAR.
- (ii) Double to L.H. side of car and untie all sheet cords. Assist to stow net and sheets.
- (iii) Stand to attention four paces in front of and facing the centre of the car.
- (iv) Order to INSPECT CAR.

Driver

397. (a) *Squadron, troop and crew parade*

- (i) Come to attention and turn about.
- (ii) Double to R.H. side of car and untie all sheet cords. Fold and stow net and sheets assisted by crew commander.
- (iii) Unlock engine covers.
- (iv) Stand to attention by R.H. side rear wheel.

(b) *Gunner/operator*

- (i) Come to attention and turn about.
- (ii) Open canvas roof cover, roll and secure.
- (iii) Enter car and open driver's visor, side and rear vision flaps.
- (iv) Stand to attention in fighting compartment facing front.

CLOSE CAR

Crew commander

398. (a) *Squadron and troop parade*

- (i) Come to attention and turn about.
- (ii) Double to L.H. side of car, assist in positioning sheets. Tie all cords on L.H. side.
- (iii) Inspect security of sheets and net.
- (iv) Stand to attention four paces in front of and facing centre of car.
- (v) When car is closed and crew in CREW FRONT position, turn about and stand at ease.

(b) *Crew parade*

- (i) Order CLOSE CAR.
- (ii) Proceed as in (ii) to (v) in (a).

Driver

399. (a) *Squadron, troop and crew parade*

- (i) Come to attention and turn about.
- (ii) Double to R.H. side rear of car and close and lock engine cover.
- (iii) Assist in positioning sheet and nets. Tie all cords on R.H. side.
- (iv) Fall in CREW FRONT.

Gunner

400. (a) *Squadron, troop and crew parade*

- (i) Come to attention and turn about.
- (ii) Mount the car L.H. side front and enter through the roof. Close all flaps. Leave the crew compartment.
- (iii) Unroll the canvas roof cover and secure in position.
- (iv) Fall in CREW FRONT.

MOUNT

401. On the command MOUNT the crew will turn about.

Driver

402. Mount the car at R.H. side front. Enter the car and take up position in driver's seat. Adjust headset.

Gunner

403. Mount the car at L.H. side front. Enter the car and take up position on L.H. side seat. Adjust headset.

Commander

404. Mount the car at R.H. side front. Enter the car and take up position on gunner's seat. Adjust headset.

DISMOUNT

405. All members of the crew will remove headsets and fall in CREW FRONT.

13 - CREW DRILL - MK 2 RECONNAISSANCE VEHICLE

This drill can be introduced at the discretion of Officers Commanding at any time. It should always be carried out on formal parades and should be covered in the teaching of parade servicing at all training establishments.

CREWS FRONT**Crew commander**406. (a) *Squadron and troop parade*

- (i) Take post four paces in front of and facing the centre of the car.
- (ii) When the driver has taken post, turn about and stand at ease.

(b) *Crew parade*

- (i) Take post four paces in front of and facing the centre of the car.
- (ii) Order CREWS FRONT.

Driver407. (a) *Squadron and troop parade*

- (i) Take post two paces in front of the R.H. front mudguard.
- (ii) Stand at ease, taking the time from the crew commander.

(b) *Crew parade*

- (i) Fall in as for squadron parade.
- (ii) Stand at ease.

OPEN CAR**Crew commander**408. (a) *Squadron and troop parade*

- (i) Come to attention and turn about.
- (ii) Double to L.H. side of car and untie all sheet cords. Assist to stow net and sheets.
- (iii) Stand to attention four paces in front of and facing the centre of the car.
- (iv) When the car is open, turn about.

(b) *Crew parade*

- (i) Order OPEN CAR
- (ii) Double to L.H. side of car and untie all sheet cords. Assist to stow net and sheets.
- (iii) Stand to attention four paces in front of and facing the centre of the car.
- (iv) Order INSPECT CAR.

Driver

409. (a) *Squadron, troop and crew parade*

- (i) Come to attention and turn about.
- (ii) Double to R.H. side of car and untie all sheet cords. Fold and stow net and sheets assisted by crew commander.
- (iii) Unlock and open engine covers and turret flaps or canvas roof cover whichever is applicable.
- (iv) Stand to attention by R.H. side rear wheel.

CLOSE CAR

Crew commander

410. (a) *Squadron and troop parade*

- (i) Come to attention and turn about.
- (ii) Double to L.H. side of car, assist in positioning sheets. Tie all cords on L.H. side.
- (iii) Inspect security of sheets and net.
- (iv) Stand to attention four paces in front of and facing centre of car.
- (v) When car is closed and driver in CREW FRONT position, turn about and stand at ease.

(b) *Crew parade*

- (i) Order CLOSE CAR.
- (ii) Proceed as in (ii) to (v) in (a).

Driver

411. (a) *Squadron, troop and crew parade*

- (i) Come to attention and turn about.
- (ii) Double to R.H. side rear of car and close and lock engine covers and turret flaps.
- (iii) Assist in positioning sheet and nets. Tie all cords on R.H. side.
- (iv) Fall in CREW FRONT.

MOUNT

412. On the command MOUNT the crew will turn about.

Driver

413. Mount the car at R.H. side front. Enter the car and take up position in driver's seat. Adjust headset.

Commander

414. Mount the car at R.H. side front. Enter the car and take up position on gunner's seat. Adjust headset.

DISMOUNT

415. The crew will remove headsets and fall in CREW FRONT.

CHAPTER 3 - TOOLS, SPARES AND STOWAGE

INTRODUCTION

416. This chapter is included as an amplification of the Table of Tools and equipment (TOTE) and is intended to be used in the checking and stowage of the vehicle equipment.

The chapter is not intended to be used in place of the TOTE for tool checks.

Where Part Numbers are given they are those which appear in the TOTE.

The TOTE, which may be amended from time to time, must be taken as correct in cases where it differs from the lists shown in this chapter.

The lists will, however, be sufficiently accurate to be of use when stowing a vehicle for the first time or when locating an item of equipment on a vehicle which is already stowed.

Stowage diagrams are included at the end of this chapter.

1 - VEHICLE TOOLS AND ANCILLARIES

Item	Section and Part No.	No. per vehicle		Stowage position and remarks
		Mk 1 Liaison	Mk 2 Recce	
Periscope, No.17, Mk 1	Sect.V5 Pt.No.FV29638	3	4	3 - Hull front in situ 1 - Spare L.H. of driver
Sight, periscopic, AFV, No.3, Mk 1	Sect.V5 Pt.No.FV158021	-	2	1 - Turret roof in situ 1 - Spare L.H. of driver
Screen, thin, c/w glass block TL2776	Sect.LV2 Pt.No.FV55121	3	3	2 - Hull in situ 1 - Spare in container under R.H. hatch
Block, triplex, 7 in. x 3 $\frac{1}{4}$ in. x $\frac{3}{4}$ in. laminated	Sect.LV2 Pt.No.TL2776	3	3	In screen above
Screen, approach march	Sect. Pt.No.FV59291	1	1	As convenient
Case, map, G.S., No.4	Sect.W10 Pt.No.VB10009	1	1	On W/T set
OR				
Board, map, G.S., No.1, Mk 1, with Panels, matt surface	Sect.W10 Pt.No.VC7827 Pt.No.VC7709	-	1	On W/T set
		-	1	

Chap. 3 - Sect. 1 Vehicle
tools and ancillaries

Item	Section and Part No.	No. per vehicle		Stowage position and remarks
		Mk 1 Liaison	Mk 2 Recce	
Box, maps, leather	Sect. Pt.No.	1	-	Stowed at Commander's discretion
Compound, anti- dim, No. 2 in 1½ oz stoneware bottle with flannel	Sect.LV6/MT1 Pt.No.13361	1	1	{ Front of turret in Mk 2 { Recce. vehicle { Under R.H. lower crew { seat in Mk 1 Liaison { vehicle
Box, first aid outfit for tanks and armoured cars	Sect.9A Pt.No.0421	1	1	In front of W/T set
Box, first aid, small	Sect.9A Pt.No.0396	1	1	Wheel guard, R.H. rear
Stretcher, ambu- lance, No. 2 sling, Mk 4	Sect.KC Pt.No.KC5031	2	-	Front L.H. external locker
Extinguisher, fire, tetrachloride type, 1 qt	Sect.LV6/MT1 Pt.No.2212	1	1	In bracket
Bracket, broad back, fire extinguisher	Sect.LV6/MT1 Pt.No.46655	1	1	Forward of R.H. escape door
Extinguisher, fire, bromide, 4 lb type	Sect.LV6/MT1 Pt.No.90269	2	2	In bracket
Bracket, fire extinguisher, methyl bromide	Sect.LV6/MT1 Pt.No.90270	2	2	1 - Glacis plate 1 - Hull, L.H. rear
Respirators, anti- gas, light:- containers, Mk 2 (spare)	Sect.A2 Pt.No.AB10401	3	2	Front L.H. external locker
Respirators, anti- gas, light, not fitted with 5 pouch device - in haversack, light, Mk 1	Sect.A2 Pt.No.AB0380	3	2	Front L.H. external
Gloves, anti-gas, large	Sect. Pt.No.CJ0031	3 pr.	2 pr.	Wrapped in anti-gas capes

Item	Section and Part No.	No. per vehicle		Stowage position and remarks
		Mk 1 Liaison	Mk 2 Recce	
Capes, anti-gas, No.1	Sect. Pt.No.CJ0010	3	2	Front L.H. external locker
Suit, anti-gas, in valise comprising- Hood - 1 Coat - 1 Trousers - 1 pr. Boots - 1 pr. Gloves - 1 pr.	Sect. Pt. No.	1	1	Front L.H. external locker
Ointment, anti- gas, No.3A, 2 oz set boxes	Sect.A2 Pt.No.ABC136	2	2	Container under R.H. lower seat
Bleaching powder, 30%, 2 lb tin	Sect.A2 Pt.No.AB0002	1	1	Front L.H. external locker
Rations, 24 hr/ man packs	Sect. Pt.No.	6	4	3/2 - Inside as convenient 3/2 - Front R.H. external locker
Rations, 10 men compo.	Sect. Pt.No.	1	1	Front R.H. external locker
Jars, vacuum, 1 qt complete	Sect.J2 Pt.No.JB12540	3	-	1 - Front R.H. external locker 2 - Forward of R.H. escape door
Jars, thermos, 1 qt complete	Sect.J2 Pt.No.JA7712	-	2	Forward of R.H. escape door
Cooker, portable, No.2, Mk 2	Sect.J2 Pt.No.JA9000	1	1	Rear L.H. external locker
OR				
Cooker, portable, No.2 (new design)	Sect.J2 Pt.No.	-	1	
Bottle, water, aluminium c/w cup	Sect.A1 Pt.No.AA0342	3	2	2 - Forward of L.H. escape door 1 - Rear R.H. side
Container, water, 4½ gallons	Sect.J2 Pt.No.JB10700	1	1	Rear L.H. wheelguard

Chap. 3 - Sect. 1 Vehicle
tools and ancillaries

Item	Section and Part No.	No. per vehicle		Stowage position and remarks
		Mk 1 Liaison	Mk 2 Recce	
Haversack, W.E. pattern 1944, all ranks	Sect.A1 Pt.No.AA2007	3	2	2 - Centre R.H. external locker 1 - Rear R.H. external locker
Greatcoats, dis- mounted, 1940 pattern	Sect.CE Pt.No. CEO129/48	3	-	Centre R.H. external locker
Greatcoats	Sect.CE Pt.No.CEO112	-	2	Centre R.H. external locker
Blanket, barrack, single, 90 x 60 in.	Sect.KC Pt.No.KC0575	9	6	Centre R.H. external locker
Sheets, ground, No.8	Sect.J1 Pt.No.JA1301	3	2	Centre R.H. external locker
Shovel, G.S.	Sect.J1 Pt.No.JA1320	1	1	Glacis plate
Axe, pick, 4½ lb head	Sect.J1 Pt.No.JA0072	1	1	Glacis plate
Axe, pick, 4½ lb helve, plain	Sect.J1 Pt.No.JA0074	1	1	Glacis plate
Matchet, 15 in. blade W/O sheath and lanyard	Sect.KE Pt.No.KE8277	1	1	In sheath
Matchet, 15 in. blade sheath	Sect.KE Pt.No.KE3513	1	1	Centre R.H. external locker
Frog cutters, wire folding, Mk 1	Sect.CN Pt.No. CH/AA0960	1	1	Container under R.H. crew seat or ammunition box
Cutters, wire, folding, Mk 1*	Sect.W1 Pt.No.WA6561	1	1	In frog
OR				
Cutters, wire, folding, Mk 1	Sect. Pt.No.	1	1	
Gloves, wiring	Sect.W1 Pt.No.WA7176	1 pr.	1 pr.	Container under R.H. lower crew seat

Item	Section and Part No.	No. per vehicle		Stowage position and remarks
		Mk 1 Liaison	Mk 2 Recce	
Jack, lifting, screw, 4 ton triple extension	Sect.LV6/MT1 Pt.No.31443	1	1	Rear L.H. external locker
Cover, waterproof, khaki green, 5 ft x 5 ft	Sect.LV6/MT13 Pt.No.27633	1	-	Container rear of spare
Cover, waterproof, khaki green, 12 ft x 9 ft 4 in.	Sect.LV6/MT13 Pt.No.2496	1	1	Rear L.H. wheelguard
Net, garnished, heather, 14 ft x 14 ft	Sect.E3 Pt.No.HE10151	1	1	Rear L.H. wheelguard
Rope, towing, medium, 15 ft, Mk 2	Sect.LV6/MT11 Pt.No.17378	1	1	External as convenient
Can, lubricating, $\frac{1}{2}$ pt with rigid spout (Wesco)	Sect.LV6/MT1 Pt.No.10128	1	-	In holder
Can, oil, Wesco, $\frac{1}{2}$ pt with flex- ible spout	Sect.LV6/MT1 Pt.No.32797	1	1	In holder
Holder, oil can, 1 pt or $\frac{1}{2}$ pt	Sect.LV6/MT1 Pt.No.27026	1	1	On oil filler tube in engine compartment
Can, oil, cylin- drical, 1 qt	Sect.LV2/TL Pt.No.TL769A	1	1	Rear L.H. external locker or engine compartment
Gun, lubricating, Pom Pom, type A	Sect.LV6/MT1 Pt.No.TT Pom Pom type A	1	1	Rear L.H. external locker
Funnel, fuel, filter type	Sect.LV6/MT15 Pt.No.TD9667	1	1	Rear L.H. external locker
Injector, oil, large	Sect.LV6/MT1 Pt.No.32622	1	1	Rear L.H. external locker
Padlocks	Sect.G1B Pt.No.GA13911	8	9	Lockers, hatches and covers
Key, FV.7, 1-25	Sect. Pt.No.	3	3	

Chap. 3 - Sect. 1 Vehicle
tools and ancillaries

Item	Section and Part No.	No. per vehicle		Stowage position and remarks
		Mk 1 Liaison	Mk 2 Recce	
Lock band, FV.7, 1-25	Sect. Pt.No.	9	10	Padlocks and driver's switchboard
Wheel, road, disc, c/w tyre, 9.00 x 16 R.F. (spare)	Sect.LV6/MT14 Pt.No.90796	1	1	External L.H. side
Pump, tyre, foot, car type, c/w hose and connec- tion	Sect.LV6/MT1 Pt.No.12246	1	1	Rear L.H. external locker
Tyre pressure gauge, 0-90 lb/ sq.in.	Sect.LV6/MT2 Pt.No.4185	1	1	In tool bag.
Chains, non-skid	Sect. Pt.No.	1 set	1 set	Unit transport
Handle, starting	Sect. Pt.No.FV58328	1	1	Rear L.H. external locker
Sand channels	Sect. Pt.No.FV208302	2	2	Glacis plate
Wire, copper, soft, No.20 S.W.G.	Sect.G2A Pt.No.GB11185	$\frac{1}{2}$ lb	$\frac{1}{2}$ lb	Rear L.H. external locker
Mirror, driving	Sect.LV6/MT3 Pt.No.44106	2	2	1 - Front R.H. wheelguard 1 - Front L.H. wheelguard
Holder, vehicle literature, 10 $\frac{1}{2}$ in. x 14 $\frac{1}{2}$ in. x 1 $\frac{1}{2}$ in., Mk 2	Sect.LV6/MT1 Pt.No.9893	1	1	Underneath R.H. hatch
Instruction book	Sect. Pt.No.	1	1	In literature holder
Army book 413	Sect. Pt.No.	1	1	In literature holder
Servicing schedule, W.O. Code No.10836	Sect. Pt.No.	1	1	In literature holder
Stowage diagrams	Sect. Pt.No.	1 set	1 set	In literature holder

Item	Section and Part No.	No. per vehicle		Stowage position and remarks
		Mk 1 Liaison	Mk 2 Recce	
Table of tools and equipment, No.36	Sect. Pt.No.	1	-	In literature holder
Table of tools and equipment, No.205	Sect. Pt.No.	-	1	In literature holder
Bag, tool, empty, No.1	Sect.F1 Pt.No.FA20000	1	1	Rear L.H. external locker
Box, tin, for 3 electric lamp bulbs	Sect.LV6/MT3 Pt.No.ZA39302	1	1	L.H. side of driver
Tape, insulating, $\frac{1}{2}$ in. wide - 2 oz roll	Sect.LV6/MT1 Pt.No.2250	1	1	In tool bag
Plug, sparking, No.1, Mk 1, 14 mm (spare)	Sect.LV6/MT4 Pt.No.3343	2	2	Engine compartment
Vessel, boiling, electric, 3 pt, 750 watt	Sect.LV6/MT3 Pt.No.28260	1	-	Rear L.H. external locker
OR				
Vessel, boiling, No.2, Mk 1	Sect.LV6/MT3 Pt.No.FV159910	1	-	
Hammer, engineers, ball pane, 1 lb 8 oz	Sect.F1 Pt.No.FA14127	1	1	
Screwdriver, 5 in. length of blade	Sect.F1 Pt.No.FA16786	1	1	
Spanner, adjus- table, 11 in.	Sect.F1 Pt.No.FA17005	1	1	In tool bag
Fliers, side cut- ting, 6 in.	Sect.F1 Pt.No.FA15876	1	1	
Spanner, American thread, box tubular, D.E., $\frac{5}{8}$ in. x $\frac{3}{4}$ in.	Sect.F1 Pt.No.FA17055	1	1	

Chap. 3 - Sect. 1 Vehicle
tools and ancillaries

Item	Section and Part No.	No. per vehicle		Stowage position and remarks
		Mk 1 Liaison	Mk 2 Recce	
Spanner, American thread, box tubular, D.E., $\frac{7}{8}$ in. x $\frac{15}{16}$ in.	Sect.F1 Pt.No.FA17057	1	1	
Spanner, American thread, box tubular, D.E., $1\frac{1}{8}$ in. x $1\frac{1}{4}$ in.	Sect.F1 Pt.No.FA17659	1	1	
Spanner, bar, tommy, No.3	Sect.F1 Pt.No.FA17598	1	1	
Spanner, bar, tommy, No.4	Sect.F1 Pt.No.FA17599	1	1	
Spanner, bar, tommy, No.5	Sect.F1 Pt.No.FA17600	1	1	
Spanner, bar, tommy, No.6	Sect.F1 Pt.No.FA17601	1	1	
Spanner, American thread, box tubular, D.E., $\frac{3}{8}$ in. x $\frac{7}{16}$ in.	Sect.F1 Pt.No.FA17052	1	1	In tool bag
Spanner, American thread, box tubular, D.E., $\frac{1}{2}$ in. x $\frac{9}{16}$ in.	Sect.F1 Pt.No.FA17053	1	1	
Spanner, American thread, open jaw, D.E., $\frac{7}{16}$ in. x $\frac{1}{2}$ in. across flats	Sect.F1 Pt.No.FA17096	1	1	
Spanner, American thread, open jaw, D.E., $\frac{9}{16}$ in. x $\frac{5}{8}$ in. across flats	Sect.F1 Pt.No.FA17097	1	1	
Spanner, American thread, open jaw, D.E., $\frac{19}{32}$ in. x $\frac{11}{16}$ in. across flats	Sect.F1 Pt.No.FA17098	1	1	

Item	Section and Part No.	No. per vehicle		Stowage position and remarks
		Mk 1 Liaison	Mk 2 Recce	
Spanner, American thread, open jaw, D.E., $\frac{3}{4}$ in. x $\frac{7}{8}$ in.	Sect.F1 Pt.No.FA77099	-	1	
Spanner, American thread, open jaw, D.E., $\frac{15}{16}$ in. x 1 in.	Sect.F1 Pt.No.FA17101	-	1	
Spanner, socket handles, ratchet, $\frac{1}{2}$ in. sq drive	Sect.F1 Pt.No.FA17410	1	1	
Spanner, socket, B.S.W., $\frac{7}{16}$ in. extra deep for 14 mm sparking plug	Sect.F1 Pt.No.FA17500	1	1	
Spanner, B.S.W., open jaw, D.E., $\frac{3}{8}$ in. x $\frac{7}{16}$ in.	Sect.F1 Pt.No.FA17235	1	1	
Spanner, B.S.W., open jaw, D.E., $\frac{1}{4}$ in. x $\frac{5}{16}$ in.	Sect.F1 Pt.No.FA27234	1	1	In tool bag
Spanner, B.S.W., open jaw, D.E., $\frac{1}{2}$ in. x $\frac{9}{16}$ in.	Sect.F1 Pt.No.FA17236	1	1	
Spanner, B.S.W., open jaw, D.E., $\frac{5}{8}$ in. x $\frac{3}{4}$ in.	Sect.F1 Pt.No.FA17237	1	1	
Spanner, B.S.W., open jaw, D.E., $\frac{11}{16}$ in. x $\frac{13}{16}$ in.	Sect.F1 Pt.No.FA17238	1	1	
Spanner, B.S.W., open jaw, D.E., $\frac{1}{8}$ in. x $\frac{3}{16}$ in.	Sect.F1 Pt.No.FA17233	1	1	
Spanner, B.S.W., box tubular, $\frac{7}{16}$ in. x $\frac{7}{16}$ in.	Sect.F1 Pt.No.FA17220	1	1	
Spanner, B.A., size 0-2	Sect.F1 Pt.No.FA17178	1	1	

Chap. 3 - Sect. 1 Vehicle
tools and ancillaries

Item	Section and Part No.	No. per vehicle		Stowage position and remarks
		Mk 1 Liaison	Mk 2 Recce	
Spanner, B.A., size 1-3	Sect.F1 Pt.No.FA17179	1	1	
Spanner, B.A., size 4-6	Sect.F1 Pt.No.FA17180	1	1	
Spanner, B.A., size 5-7	Sect.F1 Pt.No.FA17181	1	1	
Key, square, male, 5/16 in. x 4 in. long - for fluid coupling filler	Sect. Pt.No.FV55456	1	1	
Key, square, male, 11/16 in. x 7 1/2 in. long - for gearbox and transfer box filler and drain	Sect. Pt.No.FV51302	1	1	In tool bag
Key, hexagon, male, 1/2 in. x 9 in. long - for fuel and engine oil drain	Sect. Pt.No.FV51307	1	1	
Key, square, female, 3/8 in. - for budget locks or engine covers	Sect. Pt.No.FV51304	1	1	
Key, hexagon, male, 1 in. B.S.P.	Sect. Pt.No.FV51303	1	1	
Wheel brace assembly	Sect. Pt.No.FV58330	1	1	
Bucket, water, canvas Mk 5	Sect.51 Pt.No.JA0243	1	1	
Brushes, hand, bass, Mk 1	Sect.KE Pt.No.KE0874	1	1	Rear L.H. external locker
Brushes, cleaning, 11 in.	Sect.LV6/MT1 Pt.No.3569	1	1	
Brushes, 12 in.	Sect.LV6/MT1 Pt.No.3572	1	1	

2 - ARMAMENT, SPARES, TOOLS AND ANCILLARIES

Item	Section and Part No.	No. per vehicle		Stowage position and remarks
		Mk 1 Liaison	Mk 2 Recce	
Gun, machine, Bren, .303 in., Mk 2 c/w tripod	Sect.C1 Pt.No.CA0850	1	-	On mounting or stowed on L.H. side of propeller shaft cover
Magazine, Bren, .303 in. MG, No.1, Mk 2 - 30 rounds	Sect.C1 Pt.No.BE8809	15	-	12 in box 3 in bin forward of L.H. escape door
Box, magazine, Bren, .303 in. MG, Mk 1* - containing 12 - 30 round magazines	Sect.C1 Pt.No.BE6094	1	-	Front of L.H. escape door
Wallet, spare parts, Bren, .303 in. MG, Mk 1	Sect.C1 Pt.No.BE9344	1	-	Container under R.H. lower crew seat
Rod, cleaning cylinder, Bren, .303 in. MG, Mk 2	Sect.C1 Pt.No.BE4199	1	-	Centre R.H. external locker
Rod, cleaning, Bren, .303 in. MG, Mk 5	Sect.C1 Pt.No.BD9225	1	-	Rear L.H. external
Mounting, Bren MG, .303 in.	Sect. Pt.No.FV201686	1	-	On roof or stowed in rear L.H. external locker
Butt, extension, Bren gun	Sect.LV9/ASC Pt.No.FV125967	1	-	On Bren gun or in container under R.H. lower crew seat
Carbine, machine, Sten, 9 mm, Mk 3	Sect.B3 Pt.No.BE8380	1	1	Front R.H. side
Magazine, machine, Carbine, 9 mm, 32 rounds, Mk 2	Sect.B3 Pt.No.CR14A	10	10	Front R.H. side
Mounting, .30 in., Browning MG	Sect. Pt.No.	-	1	In turret
Gun, machine, cal. .30 in., Browning M1919.A4 fixed	Sect.C1 American Pt.No.A1-01-00400	-	1	In mounting on turret

OR

Chap. 3 - Sect. 2 Armament,
spares, tools and ancillaries

Item	Section and Part No.	No. per vehicle		Stowage position and remarks
		Mk 1 Liaison	Mk 2 Recce	
Gun, machine, cal. .30 in. L.3.A.1	Sect. Pt.No.A001-7142392 OR MG32GA	-	1	
Bag, empty, cartridge case	Sect.LV1/US Pt.No.FV59341	-	1	Attached to MG
Boxes, ammunition, cal. .30 in. (250 rounds)	Sect.C1 American Pt.No.T005-9020995	-	10	1 - in feed tray 4 - in bin on L.H. escape door 4 - in bin on R.H. escape door 1 - in bin forward of L.H. escape door
Belt assembly	Sect.C1 American Pt.No.B1457299	-	10	In ammunition boxes
Extractor, ruptured cartridge, M4	Sect.C1 Pt.No.J012-5503854	-	1	Feed tray - forward in container
Mounting, tripod, MG, cal. .30 in. M2 OR	Sect.C1 Pt.No.A001-6507052	-	1	External
Mounting, tripod, MG, cal. .30 in. L.2.A.1	Sect.C1 Pt.No.MG35GA	-	1	
Rod, cleaning, jointed cal. .30 in. M1 OR	Sect.C1 American Pt.No.A006-6508237	-	1	In cleaning rod case
Rod, cleaning, .303 MG, Mk 5	Sect.C1 Pt.No.BD0133	-	1	
Case, cleaning rod, cal. .30 in. M1	Sect.C1 American Pt.No.B028-5506573	-	1	In turret forward of feed tray

Item	Section and Part No.	No. per vehicle		Stowage position and remarks
		Mk 1 Liaison	Mk 2 Recce	
Can, oil, MG, Mk 1 OR	Sect.C2 Pt.No.BDO133	-	1	Feed tray - forward in container
Oiler, rectangular, 12 oz, with cap and chain	Sect.C2 Pt.No.M003- 0110050	-	1	
Cover, muzzle, MG, .30 in. OR	Sect.C1 American Pt.No.G104- 5573326	-	1	On MG No.2 or behind spare wheel in container
Cover, muzzle, Besa., 7.92 mm MG, No.1, Mk 1	Sect.C2 Pt.No.BG4070	-	1	
Barrel, .30 in. Browning MG (spare) OR	Sect.C1 American Pt.No.A006- 6535233	-	1	In spare barrel cover
Barrel assembly (spare)	Sect.C1 Pt.No.A006- 7148399	-	1	
Brush, cleaning, cal. .30 in. (wire) OR	Sect.C1 American Pt.No.A006- 5504035	-	3	
Brush, cleaning, cal. .30 in.	Sect.C1 Pt.No.B003- 5564174	-	3	
Can, tubular, $\frac{3}{4}$ in. dia. x 2.9/16 in. - with screw top OR	Sect. Pt.No.A005- 6147310	-	1	Container under L.H. seat
Box, small parts, MG, No.4, Mk 1 (empty)	Sect. Pt.No.C1/BE/ 6063	-	1	

Chap. 3 - Sect. 2 Armament,
spares, tools and ancillaries

Item	Section and Part No.	No. per vehicle		Stowage position and remarks
		Mk 1 Liaison	Mk 2 Recce	
Case, spare bolt, M2	Sect. Pt.No.A006- 5559656	-	1	Container under L.H. seat
Envelope, spare parts, one button, M1	Sect. Pt.No.A039- 5559696	-	1	
Cover, spare barrel, cal. .30 in., M9	Sect.C1 Pt.No.A006- 5593026	-	1	Centre R.H. external locker
Bolt assembly (spare)	Sect. Pt.No.A005- 6147299	-	1	
OR				
Bolt	Sect. Pt.No.GIMG- 4801	-	1	
Extractor assembly (spare)	Sect Pt.No.A005- 5621076	-	1	
Pin, firing, assem- bly (spare)	Sect. Pt.No.A005- 5509186	-	1	
Spring, compression, S, 0.045 dia. Stock 0.395 o.d., 103 coils, (L.H. or R.H. wound), driving	Sect. Pt.No.A005- 6212654	-	1	Container under L.H. seat
Roll, tool, canvas, empty, M12	Sect. Pt.No.J012- 6507389	-	1	
Wrench, combination, M6	Sect. Pt.No.J012- 5586334	-	1	
OR				
Drift, No.18, Mk 1	Sect. Pt.No.M3/CM/ 2015	-	1	

Item	Section and Part No.	No. per vehicle		Stowage position and remarks
		Mk 1 Liaison	Mk 2 Recce	
Spring, seat riveted OR	Sect. Pt.No.A005- 6131265	-	1	
Spring, seat, assembly	Sect. Pt.No.C1/MG/ 187SA	-	1	
Seat OR	Sect. Pt.No.A005- 5564137	-	1	
Seat	Sect. Pt.No.C1/MG/ 4800	-	1	
Spring cover, extractor	Sect. Pt.No.A005- 6017513	-	1	
Lever, cocking OR	Sect. Pt.No.A005- 6131317	-	1	Container under L.H. seat
Lever, cocking	Sect. Pt.No.C1/MG/ 4803	-	1	
Fia, cocking lever	Sect. Pt.No.A005- 5020567	-	1	
Rod, driving, spring, assembly	Sect. Pt.No.A005- 6147222	-	1	
Wrench, barrel, bearing plug OR	Sect. Pt.No.J012- 6147277	-	1	
Wrench, socket, front barrel bearing plug, Mk 1 OR	Sect.C2 Pt.No.SM632	-	1	

Chap. 3 - Sect. 2 Armament,
spares, tools and ancillaries

Item	Section and Part No.	No. per vehicle		Stowage position and remarks
		Mk 1 Liaison	Mk 2 Recce	
Wrench, socket, front bearing plug, Mk 1/1	Sect. C2 Pt. No. SM633	-	1	Container under L.H. seat
Discharger, smoke grenade, left	Sect. M1 Pt. No. FV59094	1	1	Front L.H. wheelguard
OR				
Discharger, smoke grenade, left	Sect. M1 Pt. No. FV59292	1	1	
Discharger, smoke grenade, right	Sect. M1 Pt. No. FV59093	1	1	Front R.H. wheelguard
OR				
Discharger, smoke grenade, right	Sect. M1 Pt. No. FV59293	1	1	
Grenade, smoke, No. 80 (for tanks)	Sect. T1 Pt. No. TA6768	12	12	3 - in L.H. discharger 3 - in R.H. discharger 3 - (spare) over L.H. battery 3 - (spare) over air cleaner
Fuze, electric, No. F 103	Sect. Pt. No.	12	12	6 - in dischargers 6 - spare
Cover, muzzle, smoke grenade dischargers	Sect. M1 Pt. No. FV51521	6	6	On dischargers or in container in centre of spare wheel
Grenade, hand, No. 36M	Sect. T1 Pt. No. TA0630	6	6	3 - R.H. of air cleaner 3 - Front of R.H. ammunition bin or L.H. of driver
Bottle, oil, Mk 5	Sect. B1 Pt. No. BA6320	1	1	Container under L.H. seat
Pistol, signal, No. 1, Mk 5	Sect. B1 Pt. No. BB7796	1	1	In case
Case, pistol, signal	Sect. B2 Pt. No. AA0651	1	1	
Cartridge, illuminating, 1 in., J, Mk 5T	Sect. Pt. No. QA5138	12	12	

Item	Section and Part No.	No. per vehicle		Stowage position and remarks
		Mk 1 Liaison	Mk 2 Recce	
Cartridge, signal, red, 1 in., Mk 5T	Sect. Pt.No.QW7AF	12	12	
Cartridge, signal, green, 1 in., Mk 5T	Sect. Pt.No.QW5AF	12	12	
Brush, rod, cleaning, cylinder, .303 in. MG, Mk 2	Sect.C1 Pt.No.BE4198	1	-	
Brush, rod, cleaning, Bren, .303 in., MG, Mk 1	Sect.C1 Pt.No.MG4090	1	-	
Can, oil, MG, Mk 3	Sect.C1 Pt.No.BE6167	1	-	In wallet
Mop, rod, cleaning, cylinder, .303 in., MG, Mk 2	Sect.C1 Pt.No.BE9207	1	-	
Pull-through, single, Mk 4A	Sect.B1 Pt.No.BA0517	1	-	
Pull-through, cord, single	Sect.B1 Pt.No.BB0520	1	1	
Gauze, piece	Sect.B1 Pt.No.BB0521	2	2	
Weights	Sect.B1 Pt.No.BB0522	1	1	Container under L.H. seat
Filler, magazine, 9 mm, m/c., carbine, Mk 4	Sect.B3 Pt.No.BE8232	1	1	

3 - WIRELESS EQUIPMENT AND SPARES

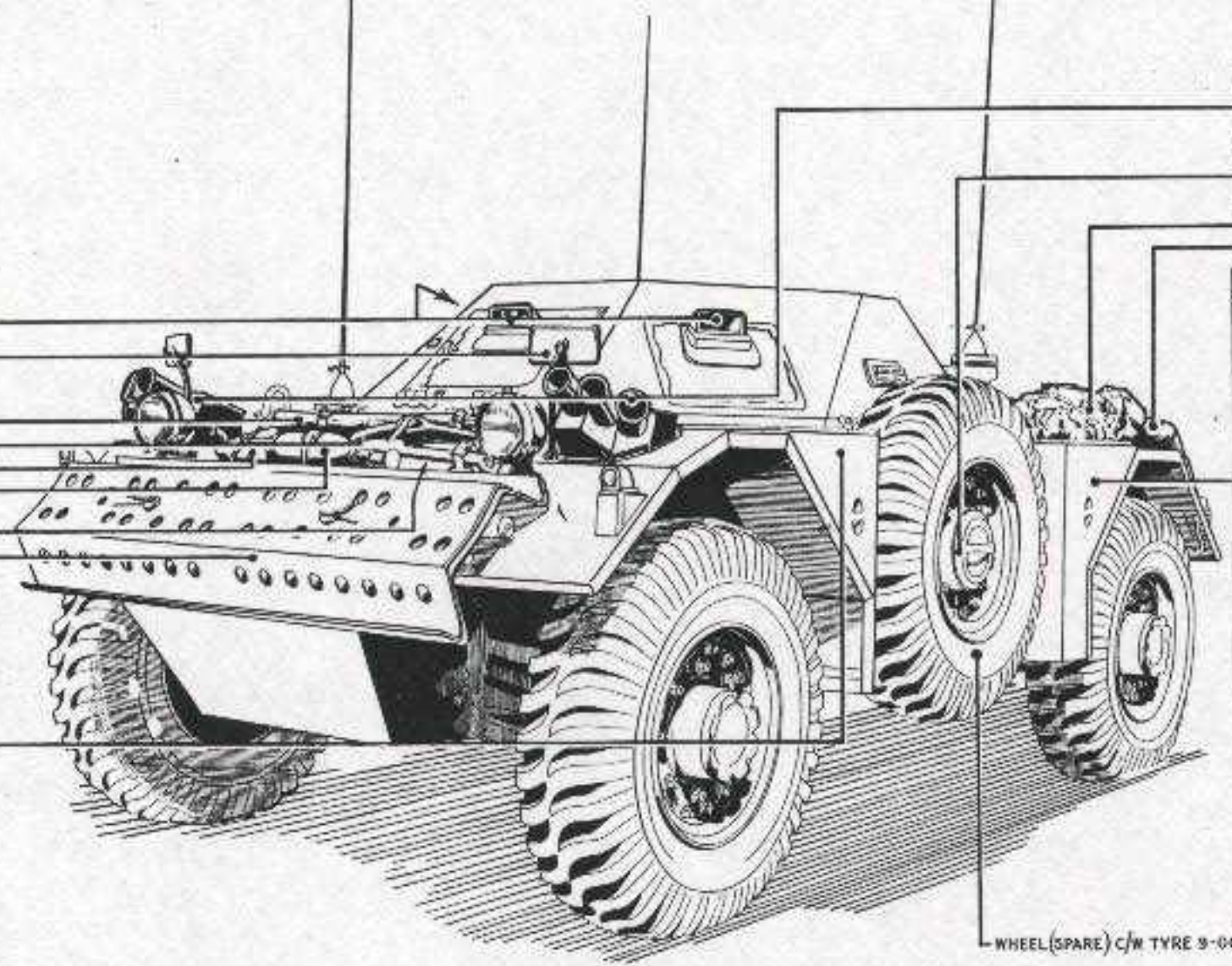
Wireless set, No.19, Mk 3/1	Sect.Z1 Pt.No.ZA25337	1	1	Hull - rear
OR				
Wireless set, No.C42	Sect.Z1 Pt.No.ZA43207	1	1	
Supply unit, No.2	Sect.Z1 Pt.No.ZA.CAN. BR10572	1	1	On top of No.19 W/T set

Chap. 3 - Sect. 3 Wireless
equipment and spares

Item	Section and Part No.	No. per vehicle		Stowage position and remarks
		Mk 1 Liaison	Mk 2 Recce	
Supply unit, vibra- tory, No.12 (24V)	Sect.Z1 Pt.No.ZA43208	1	1	On top of No.C42 W/T set
Wireless set, No.88, type "A" (AFV)	Sect.Z1 Pt.No.ZA35738	1	1	On top of No.19 or C42 W/T set
OR				
Wireless set, No.31 (AFV)	Sect.Z1 Pt.No.ZA39058	1	1	
Power supply and L.F. amplifier unit, No.2	Sect.Z1 Pt.No.ZA35737	1	1	On top of No.19 or C42 W/T set
OR				
Power supply and L.F. amplifier unit, No.3 (24V)	Sect.Z1 Pt.No.ZA39057	1	1	
Case, spare W/T parts, 5C, Mk 1/1	Sect.Z1 Pt.No.ZA29300	1	1	Inside as convenient
Antennae rod "F", case carrying, No.2	Sect.Z1 Pt.No.ZA11550	1	1	Glacis plate
Microphone, receiver headgear assembly; No.10 - or other approved alternative	Sect.Y1 Pt.No.ZA21414	3	3	In signal satchel
Connection, 5 point, No.34 - 10 ft 5 in. long	Sect.Z1 Pt.No.ZA27295	1	1	In signal satchel
Satchel, signal, No.1	Sect.Z1 Pt.No.ZA6292	3	3	1 - Inside 2 - Centre R.H. external locker
Lamp, inspection, electric, c/w cable	Sect.LV6/MT3 Pt.No.WD.INS.2	1	1	Under R.H. hatch
W/T Working instruc- tions	Sect. Pt.No.	1	1	In holder

NOTE:-
ROPE, TOWING, LIGHT MK 2 - STOWED AS CONVENIENT.

3 PERISCOPES N°17 MK.1.
MIRRORS DRIVING
AXE PICK HELVE
AXE PICK HEAD 4½ LBS.
SHOVEL G.S.
EXTINGUISHER FIRE METHYL BROMIDE
IN BRACKET
ANTENNAE RODS F CASES CARRYING N°2
2 SAND CHANNELS
LOCKER CONTAINING:-
STRETCHER AMBULANCE MK.2.
SLING MK.4
3 RESPIRATORS ANTI-GAS (LIGHT)
CONTAINER MK.2. (SPARE)
3 RESPIRATORS ANTI-GAS (LIGHT &
NOT FITTED WITH S POUCH DEVICE)
IN HAVERSACK LIGHT MK.1.
3 PAIRS GLOVES ANTI-GAS (LARGE)
WRAPPED IN:-
3 CAPES ANTI-GAS N°1.
SUIT ANTI-GAS IN VALISE
COMPRISING:-
HOOD - - 1
COAT - - 1
TROUSERS - 1 PAIR
BOOTS - 1 "
GLOVES - 1 "
BLEACHING POWDER 30% 2 LB. TIN.



DISCHARGER SMOKE GRENADE
3 SMOKE GRENADES N°80 (FOR TANKS)
IN EACH DISCHARGER.
FUZE ELECTRIC N°F 103 IN DISCHARGERS.
COVERS MUZZLE SMOKE GRENADE,
ON DISCHARGERS OR IN CONTAINER
IN CENTRE OF SPARE WHEEL.
NET GARNISHED HEATHER 14FT x 14FT.
CONTAINER WATER 4½ GALLS.
LOCKER CONTAINING:-
ROD CLEANING .303 M.G. MK.5.
MOUNTING BREN M.G. .303-OR ON ROOF.
COOKER PORTABLE N°2, MK.2.
WHEEL BRACE ASSEMBLY
GUN GREASE TECALEMIT POM. POM. TYPE 'A'.
FUNNEL FUEL FILTER.
WIRE COPPER SOFT.
PUMP TYRE FOOT, CAR TYPE.
C/W HOSE AND CONNECTION.
BAG TOOL N°1 CONTAINING:-
TOOLS VEHICLE TOOLS TYRE
" ENGINE PRESSURE
" SPECIAL GAUGE 5-90 LB.
HANDLE STARTING.
TANK CLEANING KIT.
TAPE INSULATING ½ IN WIDE IN 2 OZ ROLLS.
VESSEL BOILING ELECTRIC 3PT. 750 WATT.
JACK LIFTING SCREW 4 TONS,
TRIPLE EXTENSION.

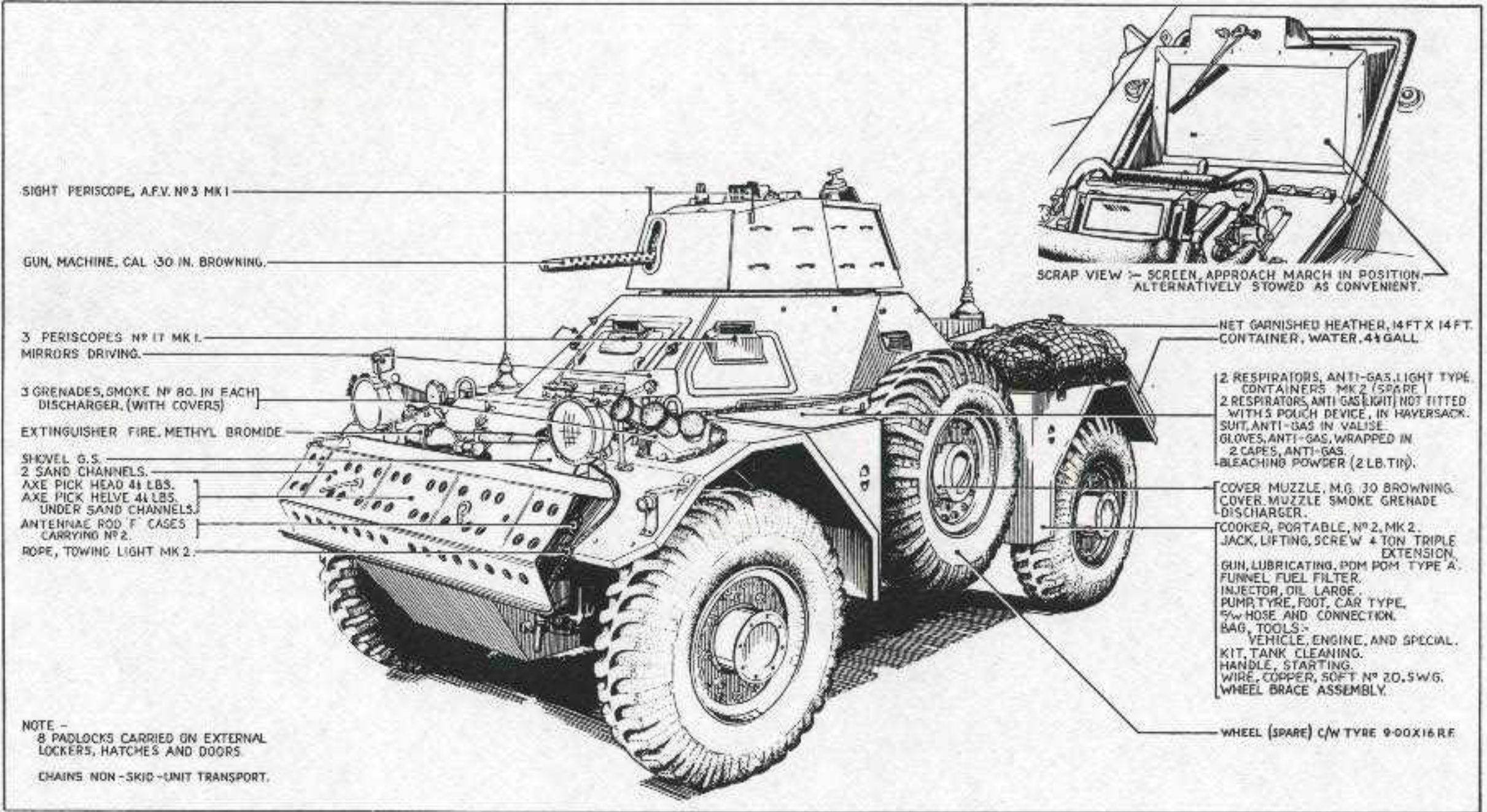
NOTE:-
8 PADLOCKS, 5 FOR EXTERNAL LOCKER.
2 FOR ENGINE COVERS,
1 FOR DRIVERS HATCH.
9 KEYS C/W LOCK BANDS.
CHAINS NON-SKID, }
CASE SPARE VALVES }
IN UNIT TRANSPORT.

WHEEL (SPARE) c/w TYRE 9-00 X 16 R.F.

474

Front and L.H. side exterior stowage
Mk 1 Liaison vehicle

172



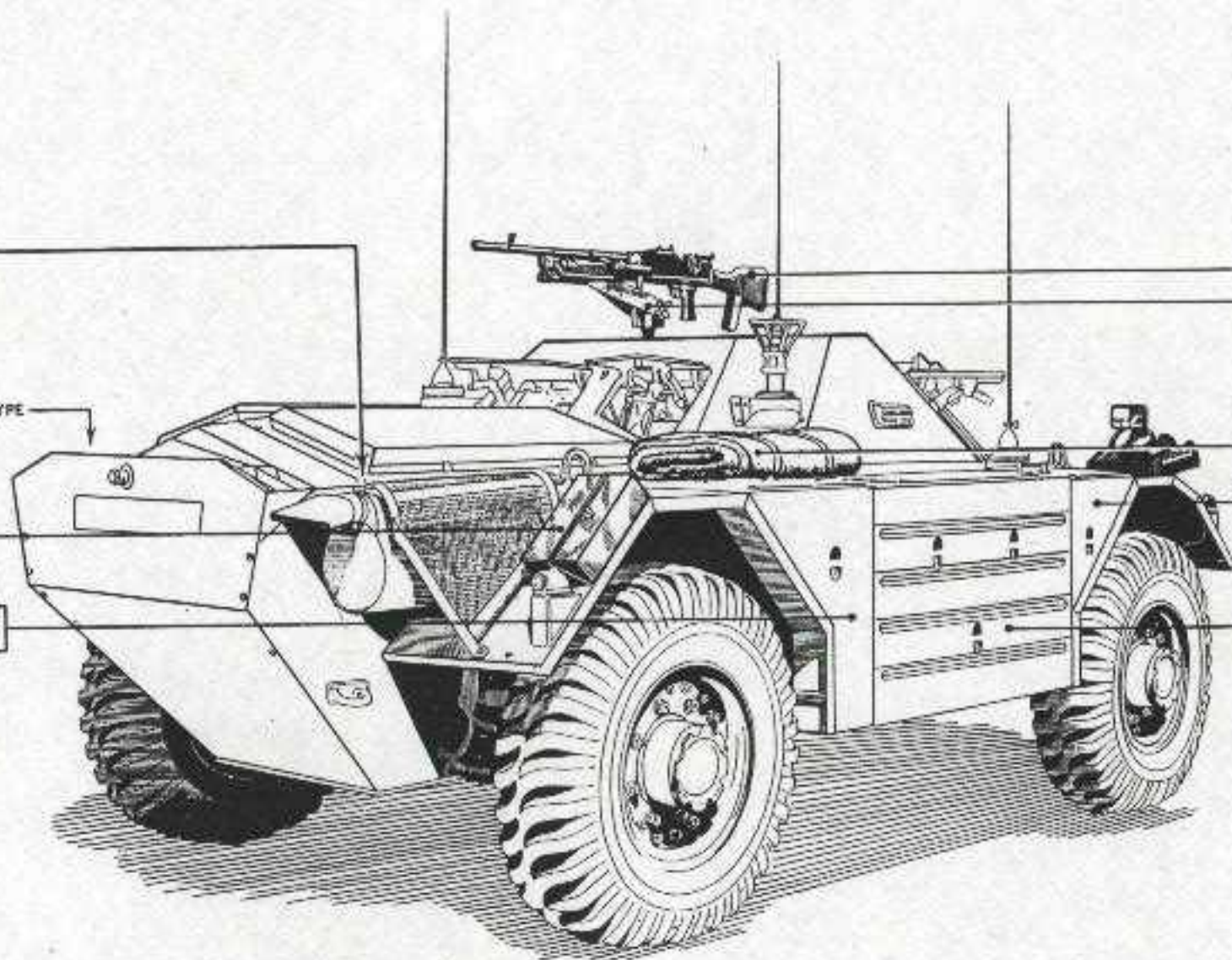
Front and L.H. side exterior stowage
Mk 2 Recce vehicle

2 PLUGS SPARKING (SPARE)
CAN LUBRICATING 1/2 PT. WITH HOLDER.
OIL CAN CYLINDRICAL 1 QT.

EXTINGUISHER FIRE METHYL BROMIDE 4 LB. TYPE

BOX FIRST AID

LOCKER CONTAINING:-
HAVERSACK W.E. PATT. 1944 ALL RANKS



GUN MACHINE BREN .303 IN.
MK 2 C/W BIPOD.
MOUNTING BREN MG. .303 IN.

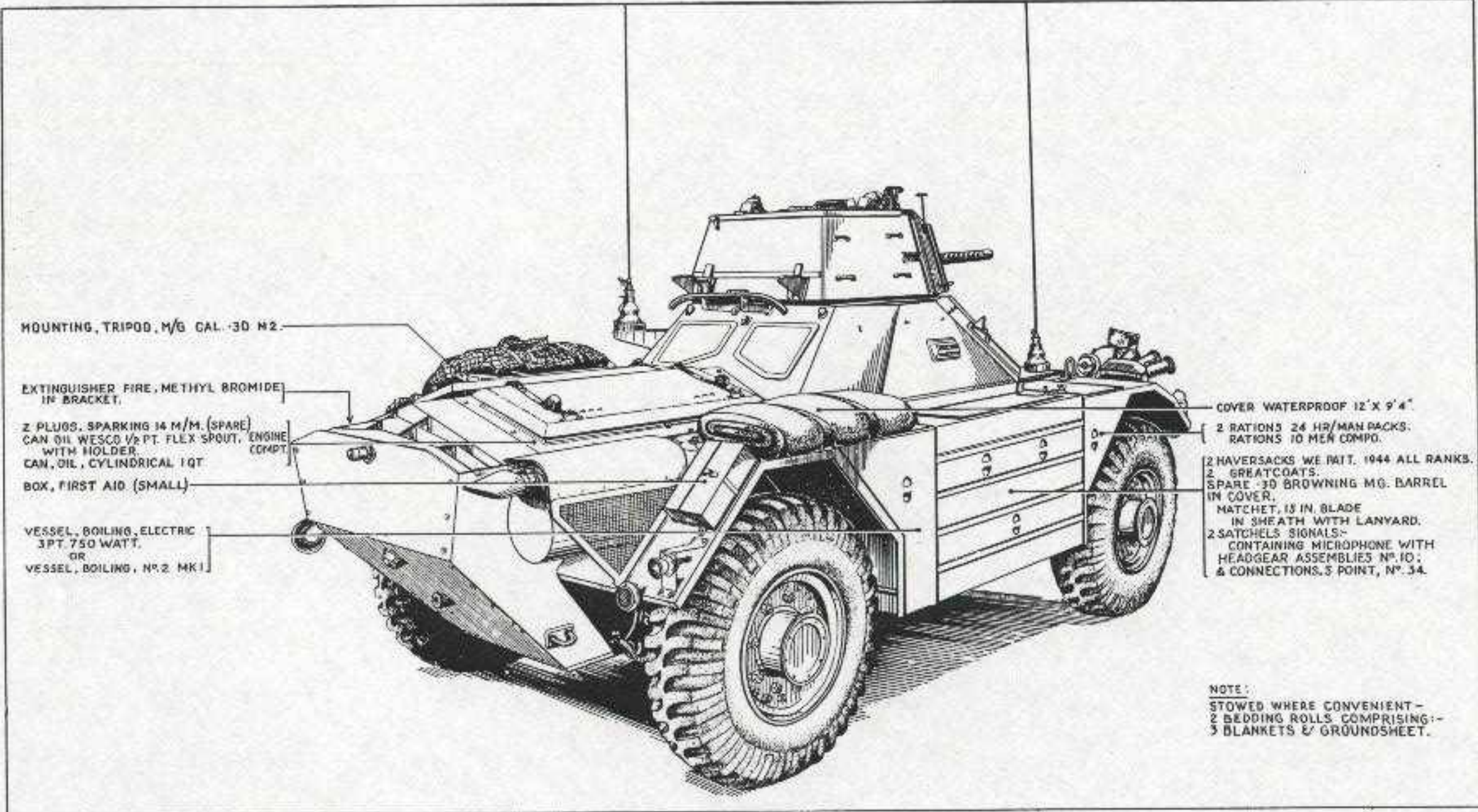
COVER WATERPROOF 12' X 9'4"

LOCKER CONTAINING:-
3 RATIONS 24 HR./MAN PACKS
RATIONS 10 MEN COMPD.
JARS VACUUM 1 QT.

LOCKER CONTAINING:-
ROD CLEANING CYLINDER BREN.
.303 IN. MK. 2
2 HAVERSACKS W.E. PATTERN
1944 ALL RANKS.
3 GREATCOATS DISMOUNTED
1944 PATTERN.
9 BLANKETS BARRACK SINGLE.
(90 IN. x 60 IN.)
3 SHEETS GROUND N° 8.
MATCHET 15 IN. BLADE
IN SHEATH WITH LANYARD.
2 SATCHELS SIGNAL -
CONTAINING MICROPHONE WITH
HEADGEAR ASSEMBLIES &
CONNECTIONS. 5 POINT N° 34.

Rear and R.H. side exterior stowage
Mk I Liaison vehicle

474



MOUNTING, TRIPOD, M/G CAL. 30 M2.

EXTINGUISHER FIRE, METHYL BROMIDE
IN BRACKET.

2 PLUGS, SPARKING 14 M/M. (SPARE)
CAN OIL WESCO 1/2 PT. FLEX SPOUT, ENGINE
WITH HOLDER. ENGINE
CAN, OIL, CYLINDRICAL 1 QT
COMPT

BOX, FIRST AID (SMALL)

VESSEL, BOILING, ELECTRIC
3 PT. 750 WATT.
OR
VESSEL, BOILING, N° 2 MK I

COVER WATERPROOF 12' X 9' 4"

2 RATIONS 24 HR/MAN PACKS.
RATIONS 10 MEN COMPO.

2 HAVERSACKS WE RAIT. 1944 ALL RANKS.
2 GREATCOATS.

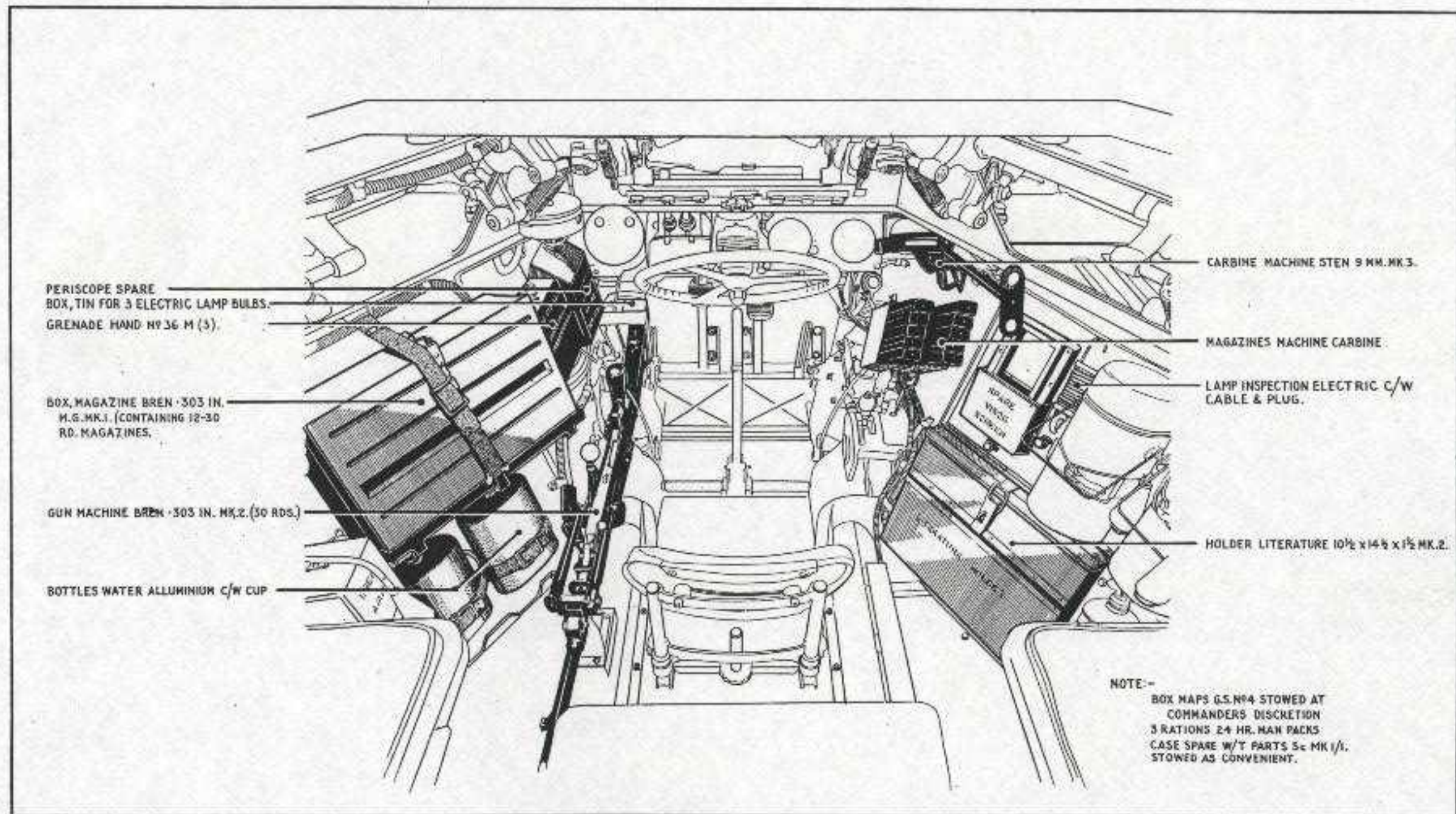
SPARE 30 BROWNING MG. BARREL
IN COVER.

MATCHET, 15 IN. BLADE
IN SHEATH WITH LANYARD.

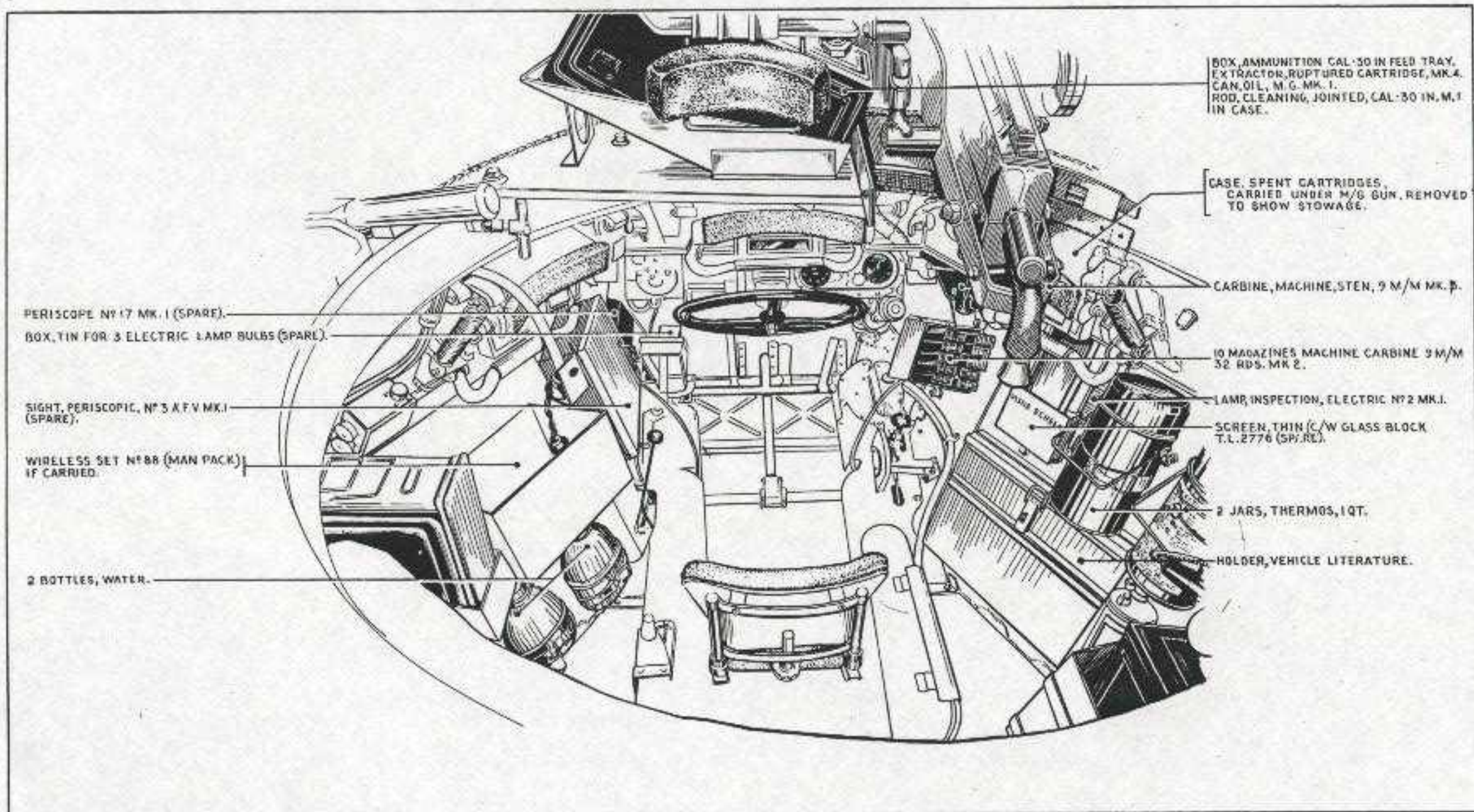
2 SATCHELS SIGNALS-
CONTAINING MICROPHONE WITH
HEADGEAR ASSEMBLIES N° 10;
& CONNECTIONS, 3 POINT, N° 34.

NOTE:
STOWED WHERE CONVENIENT-
2 BEDDING ROLLS COMPRISING:-
3 BLANKETS & GROUND SHEET.

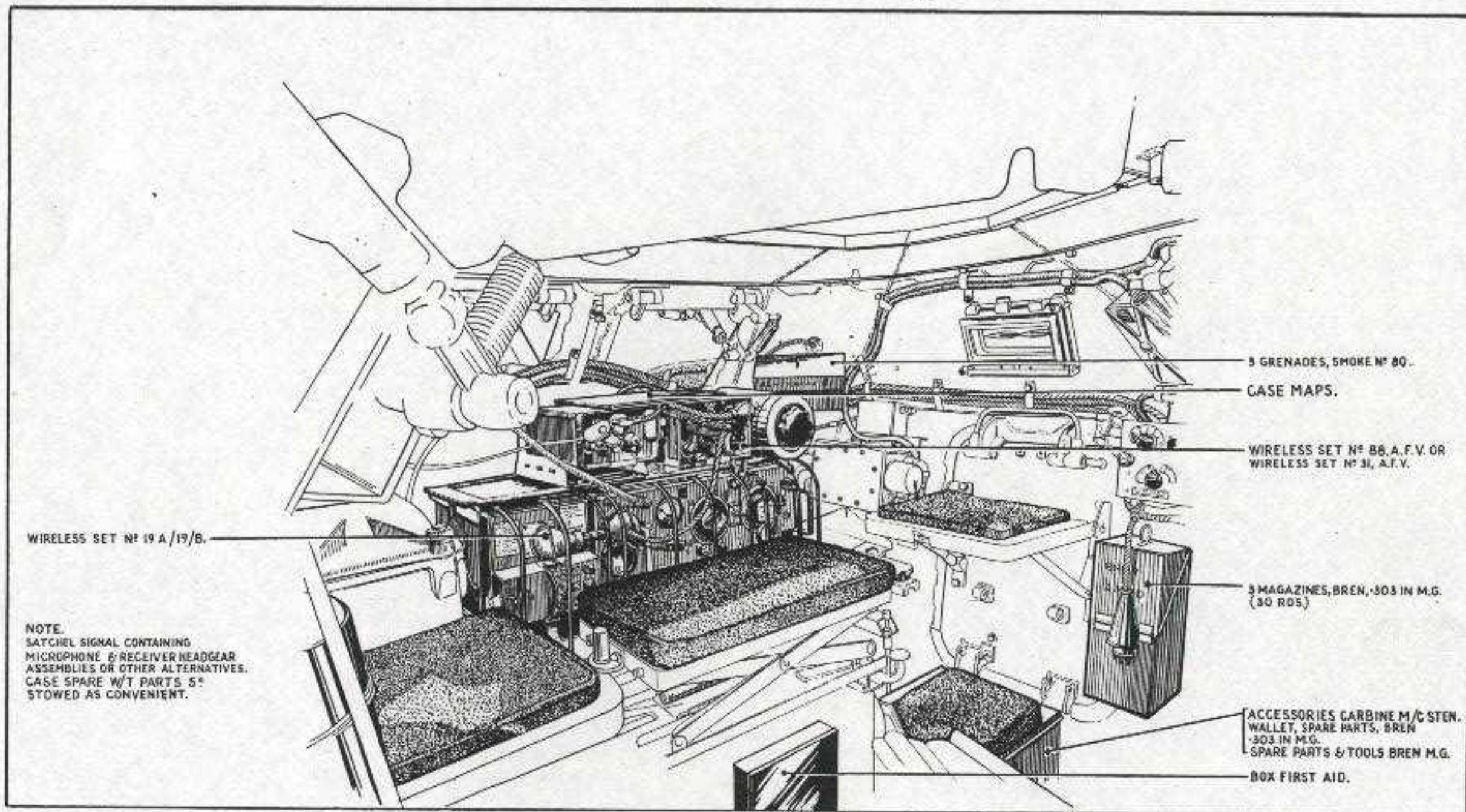
Rear and R.H. side exterior stowage
Mk 2 Recce vehicle



Front interior stowage of hull
Mk I Liaison vehicle

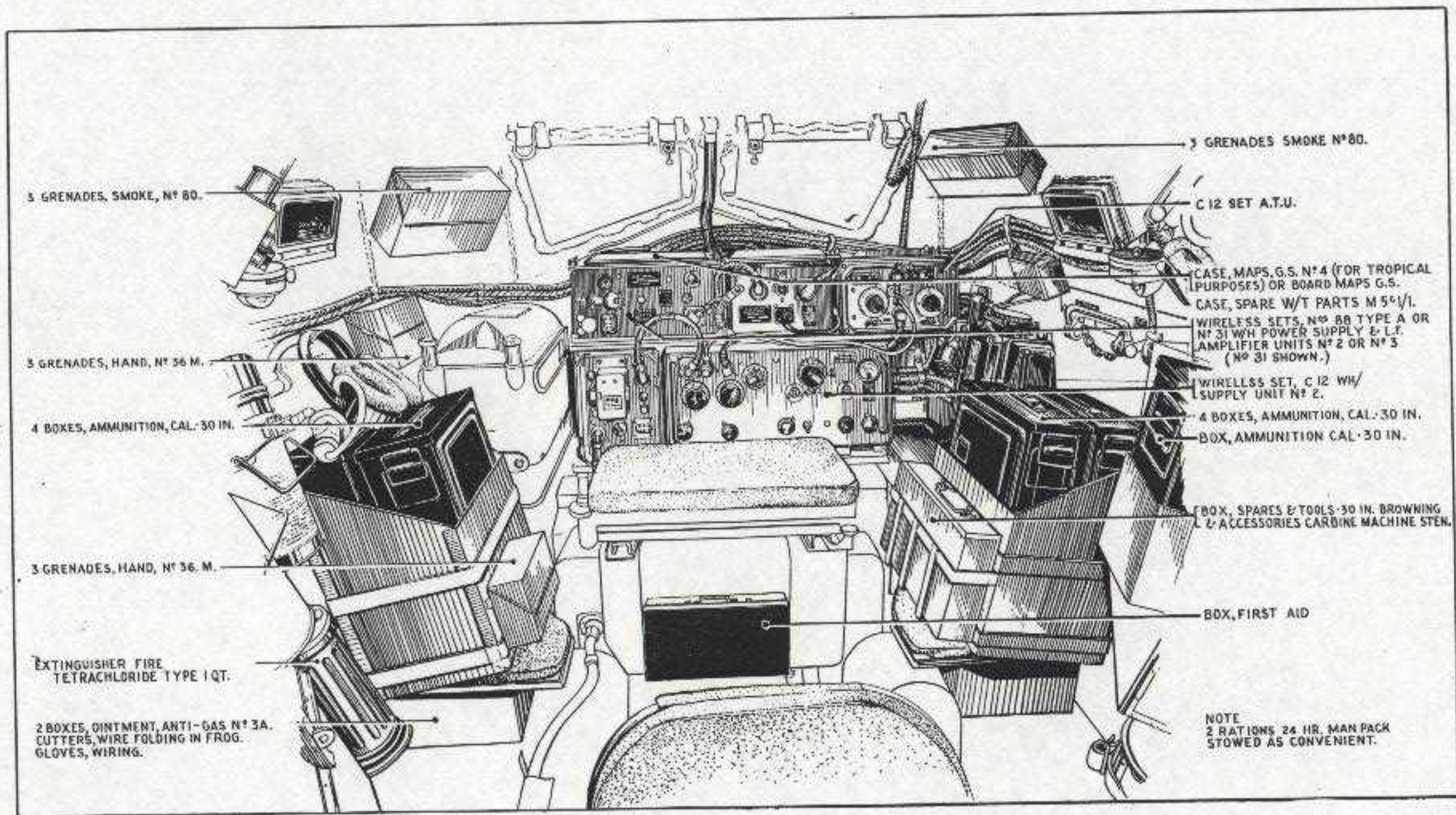


Front interior stowage of hull and turret
Mk 2 Recce vehicle



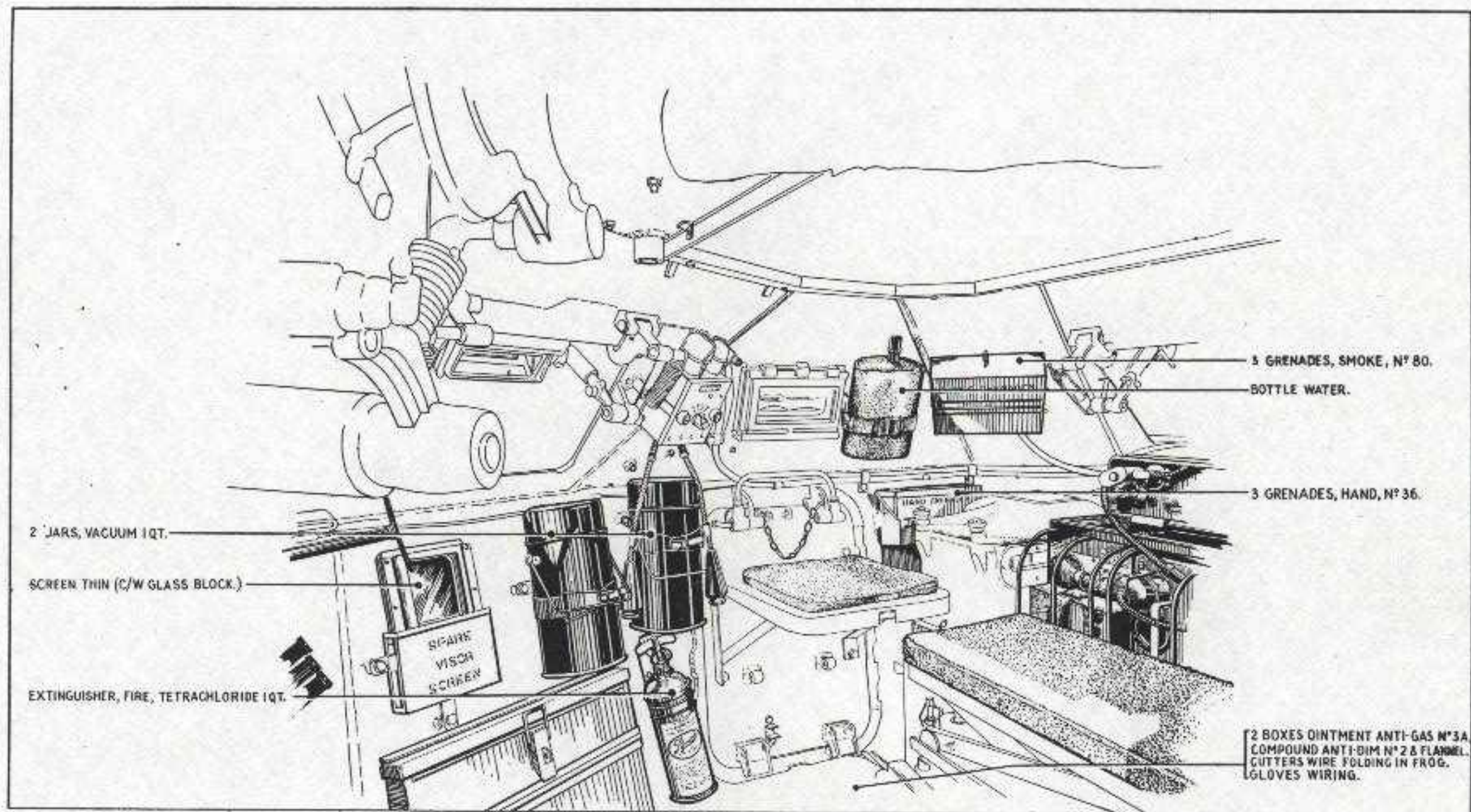
Rear and L.H. side interior stowage of hull
Mk I Liaison vehicle

NOTE: The wireless sets depicted on the sketch are being replaced by later types.



Rear interior stowage of hull and turret
Mk 2 Recce vehicle

NOTE: The wireless sets depicted on the sketch are being replaced by later types.



Rear and R.H. side interior stowage of hull
Mk I Liaison vehicle

CHAPTER 4 - GUIDE TO VEHICLE INSPECTION (Vehicle, Wireless and Armament)

I - INTRODUCTION

417. Inspection of vehicles is important for the following reasons:-

- (a) To check whether crews are operating their vehicles and equipment correctly.
- (b) To check whether routine servicing is being correctly carried out.
- (c) To provide the commanding officer or his representative with an accurate picture of the state of efficiency of the vehicles and equipment within a unit.

418. Of these reasons the first is the most important as, if the crews carry out servicing as instructed, vehicles and their equipment will remain in a high state of efficiency over the longest possible period. All defects which cannot be rectified by the crew will be brought automatically to the notice of the Technical Adjutant.

419. The Parade Servicing System does not eliminate the need for periodic inspection. It is a useful tool, which, if employed with skill and energy, will give good results, but it is not automatic. There is no guarantee that, once laid on, it will continue to produce good results indefinitely.

420. This inspection guide has been compiled to assist in the inspection of vehicles. It does not in any way supersede the report form AF G857A.

421. The guide is laid out in the following manner:-

- (a) The vehicle is inspected one compartment at a time. This method avoids the waste of time in moving about the vehicle when each system is inspected separately.
- (b) The headings in column 2 show the items to be inspected. The sub-headings bring out the points to be examined on each item.
- (c) Column 3 contains notes on location and accessibility, instructions where there may be doubt about the method of testing, reference to appropriate parts of Chapter 1, and indicates which items are part of a specific servicing task.

422. It has not been possible to include every minor part of the vehicle. Items have been included if they qualify under one or more of the following headings:-

- (a) Points requiring routine servicing.
- (b) Points known to be susceptible to failure on this particular vehicle.

- (c) Points vital to operational efficiency.
- (d) Points which, owing to the method of construction or mounting, are inherently vulnerable.

423. In order to check the items listed, the person using the guide must examine components in every part of the vehicle. During this time he must use hands, eyes and ears to discover faults and irregularities not specifically mentioned in the guide.

424. No mention of cleanliness is made in the guide unless the efficiency of the item is primarily dependent on cleanliness. It should be remembered, however, that the presence of dirt anywhere in the vehicle should be the subject of unfavourable comment.

425. The results of an inspection should be recorded on AF G857A (Wheeled) - "A" Vehicle Inspection Report.

426. This form is common to all wheeled A.F.V.s and does not provide a detailed guide to the inspection of any one type. Reports on this form are divided into systems and not into compartments of the vehicle. This is necessary for the information of the Technical Adjutant but the inspection should be carried out in the manner laid down in this chapter, that is, by compartments.

427. The space opposite sub-headings on the AF G857A is somewhat limited but it is not necessary to squeeze reports into this small space. The whole of the space opposite the main headings should be used. The reference number of the sub-heading should be written at the top, followed by details of the defect.

428. Should a defect require a long explanation, the details should be written on a separate sheet of paper and attached to the report form. Note that this has been done should be made in the appropriate space on the form.

429. Definitions of "Class" letters are as follows:-

- S Serviceable
- O To be kept under observation
- A Action by driver or crew
- B Requires 1st echelon repair
- C Requires 2nd, 3rd or 4th echelon repair

2 - DRIVER'S COMPARTMENT

Serial No.	Points to be inspected	Remarks
1	<p><i>Driver's flaps</i></p> <ul style="list-style-type: none"> (a) Operation (b) Locking nuts (c) Lubrication (d) Periscope 	
2	<p><i>Driver's screen</i></p> <ul style="list-style-type: none"> (a) Security (b) Locking catches (c) Cleanliness (d) Operation of wiper 	
3	<p><i>Driver's escape hatch</i></p> <ul style="list-style-type: none"> (a) Operation (b) Lubrication (c) Catches 	
4	<p><i>Switchboard</i></p> <ul style="list-style-type: none"> (a) Operation of switches (b) Operation of warning lights (c) Security of cables 	(b) With ignition switch on, ignition and oil warning lights should light
5	<p><i>Main charging fuse</i></p> <ul style="list-style-type: none"> (a) Fuse (b) Spare fuse wire 	
6	<p><i>Gear change pedal</i></p> <ul style="list-style-type: none"> (a) Operation (b) Free movement (c) Lubrication (d) Linkage 	
7	<p><i>Brake pedal</i></p> <ul style="list-style-type: none"> (a) Operation (b) Linkage 	
8	<p><i>Accelerator</i></p> <ul style="list-style-type: none"> (a) Operation 	

Serial No.	Points to be inspected	Remarks
9	<p><i>Idling speed control</i></p> <p>(a) Operation</p> <p>(b) Security and lubrication of linkage</p>	(a) Check effect on accelerator linkage
10	<p><i>Forward and reverse lever</i></p> <p>(a) Operation</p> <p>(b) Lubrication</p>	
11	<p><i>Gear selector lever</i></p> <p>(a) Operation</p> <p>(b) Lubrication</p> <p>(c) Stop plunger</p>	
12	<p><i>Steering wheel</i></p> <p>(a) Security</p> <p>(b) Free movement</p>	(b) Should not exceed 2 in.
13	<p><i>Steering column and bevel boxes</i></p> <p>(a) Oil levels</p> <p>(b) Leaks</p> <p>(c) Security</p>	(a) See page 88
14	<p><i>Electrical cables</i></p> <p>(a) Condition</p> <p>(b) Security</p>	
15	<p><i>Speedometer and cable</i></p> <p>(a) Condition</p> <p>(b) Security</p>	) See also "Performance Test" page 183
16	<p><i>Starter carburettor control</i></p> <p>(a) Operation</p> <p>(b) Lubrication</p> <p>(c) Linkage</p>	(a) See page 40
17	<p><i>Driver's seat</i></p> <p>(a) Condition of seat and backrest</p> <p>(b) Horizontal and vertical adjustment</p>	

Serial No.	Points to be inspected	Remarks
18	<p><i>Handbrake</i></p> <p>(a) Operation (b) Lubrication</p>	
19	<p><i>Brake master cylinder</i></p> <p>(a) Level of oil (b) Leaks (c) Linkage (d) Unions</p>	

3 - ENGINE COMPARTMENT

Serial No.	Points to be inspected	Remarks
1	<p><i>Engine oil tank</i></p> <p>(a) Check oil levels (b) Last oil change (c) Security (d) Leaks (e) Unions (f) Dipstick (g) Drain plug (h) Breather</p>	<p>(a) See page 28 (b) Task C (Chap. 2)</p> <p>(h) Clear</p>
2	<p><i>Engine oil filter</i></p> <p>(a) Security (b) Leaks (c) Last changed</p>	<p>(c) Task D (Chap. 2)</p>
3	<p><i>Radiator</i></p> <p>(a) Coolant level (b) Steam escape pipe (c) Security of mounting (d) Leaks (e) Security of cowling (f) Air passages (g) Hose connections (h) Filler cap (j) Drain plug</p>	<p>(a) See page 32</p>
4	<p><i>Coolant pump</i></p> <p>(a) Hose connections (b) Leaks (c) Driving belt adjustment</p>	

Serial No.	Points to be inspected	Remarks
5	<p><i>Fan</i></p> <ul style="list-style-type: none"> (a) Blades (b) Belts (c) Coupling bolts 	<ul style="list-style-type: none"> (a) Secure and undamaged (b) Condition and tension. See page 33
6	<p><i>Generator</i></p> <ul style="list-style-type: none"> (a) Security (b) Connections (c) Driving belt adjustment (d) Lubrication 	(c) See under Fan 5(b)
7	<p><i>Ignition coil</i></p> <ul style="list-style-type: none"> (a) Security (b) Leads (c) Connections 	
8	<p><i>Ignition unit</i></p> <ul style="list-style-type: none"> (a) Security of cover (b) Rubber seals (c) Breather pipes (d) Security and condition of all leads (e) Contact breaker adjustment (f) Cleanliness (g) Lubrication 	<ul style="list-style-type: none"> (e) Task A and C (g) Task C
9	<p><i>Sparking plugs</i></p> <ul style="list-style-type: none"> (a) Condition (b) Adjustment (c) Last check 	<ul style="list-style-type: none"> (b) See page 46 (c) Task A and C
10	<p><i>Rocker cover</i></p> <ul style="list-style-type: none"> (a) Security (b) Leaks (c) Breather pipe connection 	(b) Check condition of gasket
11	<p><i>Engine compression</i></p> <p>Test</p>	Test on all cylinders, using starting handle
12	<p><i>Induction and exhaust manifolds</i></p> <ul style="list-style-type: none"> (a) Security (b) Leaks 	

Serial No.	Points to be inspected	Remarks
13	<p><i>Oil cooler</i></p> <ul style="list-style-type: none"> (a) Security (b) Pipe connections (c) Leaks 	
14	<p><i>Air cleaner</i></p> <ul style="list-style-type: none"> (a) Security (b) Oil level (c) Last cleaned 	<ul style="list-style-type: none"> (b) See page 43 (c) Task No. 3 (Chap. 2)
15	<p><i>Carburettor</i></p> <ul style="list-style-type: none"> (a) Security (b) Fuel pipes and unions (c) Leaks (d) Starter and throttle linkage (e) Inlet union filter last cleaned 	<ul style="list-style-type: none"> (d) Check action with driver operating idling speed control, accelerator pedal and starter carburettor control. Check lubrication of linkage (e) Task B
16	<p><i>Engine compartment cover</i></p> <ul style="list-style-type: none"> (a) Operation of catches 	
17	<p><i>Starter motor</i></p> <ul style="list-style-type: none"> (a) Security (b) Leads (c) Operation 	
18	<p><i>Hydraulic brake lines</i></p> <ul style="list-style-type: none"> (a) Security (b) Unions (c) Leaks 	
19	<p><i>Electrical wiring</i></p> <ul style="list-style-type: none"> (a) Security (b) Insulation (c) Connections 	

4 - FIGHTING COMPARTMENT
Commander/gunner's seat and wireless sets to be removed

Serial No.	Points to be inspected	Remarks
1	<p><i>Fluid coupling</i></p> <p>(a) Oil level (b) Leaks (c) Damaged plugs</p>	<p>(a) See page 69 (c) See page 70</p>
2	<p><i>Transfer box</i></p> <p>(a) Leaks (b) Drain plug (c) Oil level (d) Linkage (e) Last oil change</p>	<p>(a) Task B (d) Ball joints and bell crank secure. Pins secure and lubricated (e) Task D</p>
3	<p><i>Propeller shaft couplings</i></p> <p>(a) Lubrication (b) Security</p>	<p>(a) Task D</p>
4	<p><i>Gearbox</i></p> <p>(a) Oil level (b) Security (c) Leaks (d) Drain plug (e) Last oil change</p>	<p>(e) Task A and D</p>
5	<p><i>Batteries</i></p> <p>(a) Security (b) Cleanliness (c) Terminals (d) Filler plugs, vent holes clear (e) Electrolyte level (f) Specific gravity (g) Leaks (h) Ability to turn cold engine</p>	<p>(b) Task No. 2 (f) Electrician</p>
6	<p><i>Bevel boxes</i></p> <p>(a) Security (b) Oil level (c) Leaks</p>	<p>(b) Task B</p>

Serial No.	Points to be inspected	Remarks
7	<p><i>Handbrake linkage</i></p> <ul style="list-style-type: none"> (a) Security (b) Lubrication 	
8	<p><i>Gear selector linkage</i></p> <ul style="list-style-type: none"> (a) Security (b) Operation (c) Lubrication 	
9	<p><i>Fuel tank</i></p> <ul style="list-style-type: none"> (a) Security (b) Leaks (c) Breather pipe (d) Fuel filter 	(c) See page 35
10	<p><i>Gunner's seat</i></p> <ul style="list-style-type: none"> (a) Condition (b) Operation (c) Lubrication 	
11	<p><i>Emergency escape hatches</i></p> <ul style="list-style-type: none"> (a) Security (b) Ease of operation (c) Lubrication (d) Locking pins 	
12	<p><i>Side visors</i></p> <ul style="list-style-type: none"> (a) Clean (b) Splash screens 	
13	<p><i>Fire extinguishers</i></p> <ul style="list-style-type: none"> (a) Security of bracket (b) Contents 	
14	<p><i>Turret (Mk 2 Recce vehicle only)</i></p> <ul style="list-style-type: none"> (a) Freedom of rotation (b) Flaps (c) Locking (d) Lubrication 	

Serial No.	Points to be inspected	Remarks
3	<p><i>Aerial connections</i></p> <ul style="list-style-type: none"> (a) Lead secure in elbows (b) Elbow clips (c) Aerial secure (d) Aerial base connections 	
4	<p><i>Variometer</i></p> <ul style="list-style-type: none"> (a) Cover (b) Earthing strip (c) Control not too stiff (d) Scale clean and dry 	<ul style="list-style-type: none"> (b) If fitted (c) Can conveniently be turned by hand (d) Discolouration of the scale indicates dampness
5	<p><i>Control units</i></p> <ul style="list-style-type: none"> (a) Connections (b) Clips (c) Switches (d) Warning lamp (e) Security 	<ul style="list-style-type: none"> (c) Ease of operation and security of grub screws
6	<p><i>6 and 12 point connectors</i></p> <ul style="list-style-type: none"> (a) Securing clips (b) Pins (c) Locating grooves 	<ul style="list-style-type: none"> (a) Securing cables to wall (b) Check that pins are not bent (c) Not damaged
7	<p><i>Headsets</i></p> <ul style="list-style-type: none"> (a) Leads (b) Earpiece insulators (c) Snatch plugs (d) Stowage hooks (e) Sets clean and dry (f) Condition of satchels (g) Rubber earpads 	<p>Include spare headsets</p> <ul style="list-style-type: none"> (a) Check that leads are correct length and not frayed (d) If fitted
8	<p><i>Wireless set</i></p> <ul style="list-style-type: none"> (a) Connections and clips secure (b) Earthing strips (c) Controls and switches secure (d) Controls easy to turn (e) Set clean and dry 	

Serial No.	Points to be inspected	Remarks
9	<i>Emergency crew control</i> (a) Operation (b) Driver's buzzer	If fitted (a) Test with all headsets fitted
10	<i>Spare parts and valves</i> Check contents of boxes	
11	<i>Aerials</i> Check case and all sections of aerial	
12	Carry out daily servicing tests	

7 - EXTERIOR OF VEHICLE

Serial No.	Points to be inspected	Remarks
1	<i>'A' Aerial</i> (a) Rubber base (b) Wing nuts (c) Joints tight	
2	<i>Methyl bromide fire extinguishers</i> (a) Security of brackets (b) Condition of extinguishers	One on front of hull, the other L.H. side rear (b) See page 95
3	<i>Drinking water can</i> (a) Cleanliness (b) Condition (c) Security	
4	<i>External lights and horn</i> (a) Security of mountings (b) Leads (c) Operation	(c) Check with driver operating switches

Serial No.	Points to be inspected	Remarks
5	<i>Driving mirrors</i> (a) Condition (b) Security	
6	<i>Wheelguards</i> (a) Condition (b) Security	
7	<i>Road wheels</i> (a) Security of hub and wheel nuts	(a) L.H. side wheel nuts have left-hand threads
8	<i>Tyres</i> (a) Condition (b) Pressure (c) Wear (d) Last changed	(b) See page 12 (d) Task C
9	<i>Suspension</i> (a) Condition (b) Security (c) Springs	Task No. 4
10	<i>Suspension links</i> Lubrication	See page 83
11	<i>Outer tracta joint housings</i> (a) Oil level (b) Leaks	(a) See page 82
12	<i>Shock absorbers and bumpers</i> Condition	
13	<i>Steering linkage</i> (a) Security (b) Lubrication	
14	<i>Road wheel alignment</i> (a) Check (b) Last checked	(a) See page 89

<i>Serial No.</i>	<i>Points to be inspected</i>	<i>Remarks</i>
15	<i>Silencer</i> (a) Security (b) Condition	
16	<i>Exhaust pipe</i> (a) Security (b) Leaks	
17	<i>Bottom access plates and plugs</i> (a) Security	

8 - GENERAL, EQUIPMENT, RECORDS ETC.

<i>Serial No.</i>	<i>Points to be inspected</i>	<i>Remarks</i>
1	<i>Tools and equipment</i> Check against TOTE	
2	<i>Stowage</i> (a) Items complete and serviceable (b) Condition of boxes, holders and clips	(a) See Chapter 3
3	<i>AB 413</i> (a) Cleanliness (b) Specification (c) Servicing records (d) Major repairs (e) Modifications	

9 - RUNNING ENGINE AND PERFORMANCE TESTS

Serial No.	Points to be inspected	Remarks
Start from cold and check:-		
1	<i>Starter carburetter</i> Action	
2	<i>Battery</i> Turns engine fast enough	
3	<i>Lubrication, cooling and fuel systems</i> (a) Leaks (b) Levels (c) Oil pressure warning light	See pages 26, 27, 32 and 36 See page 26
When engine is warm:-		
4	<i>Running of engine</i> (a) Even firing (b) Clean exhaust (c) No knocks	
5	<i>Temperature</i>	Should be approximately 160 degrees F. after 10 minutes running at fast idling speed
6	<i>Controls</i> (a) Idling speed control (b) Accelerator	
7	<i>Wireless set</i> (a) Intercommunication (b) Check for faulty suppression	(a) Check all headsets
Performance test:-		
8	<i>Gearbox</i> (a) Selection (b) Operation of pedal (c) Gears not slipping	Check on level ground and gradient

Serial No.	Points to be inspected	Remarks
9	<p><i>Steering</i></p> <p>(a) Full lock (b) Steadiness (c) Accuracy at speed (d) Ease of operation</p>	
10	<p><i>Engine</i></p> <p>(a) Power (b) Acceleration (c) Flexibility (d) Maximum road speed</p>	Check on level ground and gradient
11	<p><i>Brakes</i></p> <p>(a) Efficiency (b) Smoothness (c) No air in system (d) Handbrake</p>	(d) Ability to hold on gradient
12	<p><i>Speedometer</i></p> <p>(a) Operation (b) Accuracy</p>	
13	<p><i>Suspension</i></p> <p>Operation</p>	Test on rough ground
After performance test:-		
14	<p><i>Engine</i></p> <p>Not overheating</p>	
15	<p><i>Brakes</i></p> <p>Not overheating</p>	
16	<p><i>Lubrication, cooling and fuel systems</i></p> <p>Leaks</p>	

RESTRICTED

The information given in this document is not to be communicated either directly or indirectly to the Press or to any person not authorized to receive it.

W O
CODE No,
12174

USER HANDBOOK

FOR

SCOUT CAR, LIAISON, FERRET, MK, 1
SCOUT CAR, RECCE, FERRET, MK, 2

1957

(Supersedes W O Code No, 17766 and 17830)

This Publication has been produced to the requirements of
THE DIRECTOR OF WEAPONS AND DEVELOPMENT,
THE WAR OFFICE,
to whom all communications should be addressed.

FIRST EDITION

REPRINTED MAY 1962 EMBODYING AMENDMENTS 1-3