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REGULATIONS
FOR
ARMY ORDNANCE SERVICES
PART II

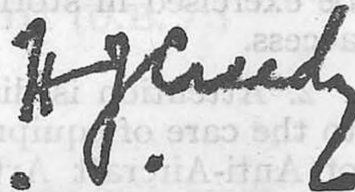
PAMPHLET No. 22

1939

Care and Preservation of Anti-Aircraft Equipments, A.A. Divisions (T.A.), relative to Mobilization Store-houses, War Sites and Drill Halls

- I. Anti-Aircraft Instruments, Searchlight Equipments, and Sound Locators.
- II. Anti-Aircraft Artillery Equipments.
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- IV. Mechanical Transport Vehicles (including Searchlight Lorries and Trailers, Generating Sets).
- V. Outline Programme of Maintenance of Mechanical Transport Vehicles (including Searchlight Lorries and Trailer, Generating Sets).

By Command of the Army Council,



THE WAR OFFICE,
18th October, 1939.

REGULATIONS FOR ARMY ORDNANCE SERVICES

PART II

PAMPHLET No. 22

CARE AND PRESERVATION OF ANTI-AIRCRAFT EQUIPMENTS, A.A. DIVISIONS (T.A.), RELATIVE TO MOBILIZATION STORE-HOUSES, WAR SITES AND DRILL HALLS

GENERAL INSTRUCTIONS

1. The care and preservation of all such anti-aircraft equipment needs special consideration in view of the necessity of its being held ready for use at very short notice, although it may necessarily have been stored for a prolonged period.

For this reason, certain of the methods normally used for the care and preservation of equipment in store are unsuitable, although it will be noted that authorized inspections still obtain.

2. The following notes form a summary of the points which must receive particular attention, and a general programme of the routine maintenance which must be carried out.

I. ANTI-AIRCRAFT INSTRUMENTS, SEARCHLIGHT EQUIPMENTS AND SOUND LOCATORS

1. Predictors, height-finders, telescopes and all other instruments, provided with cases as part of their equipment will, when held in mobilization stores and at war sites, be kept in such cases ready for immediate issue. Maintenance will involve removal of instruments from their cases for visual examination and report of any defects. Special care must be exercised in storing to avoid damage, and to provide easy access.

2. Attention is directed to the special instructions relating to the care of equipment published in "Directions for the use of Anti-Aircraft Artillery Instruments", Pamphlets Nos. 1, 2, 3, etc., and other relevant publications.

3. Silica Gel. containers will be inspected and treated monthly.

4. PREDICTORS

(a) Immediately on receipt normal tests will be carried out by an O.M.E.

(b) Test sheets will be filled in and attached to the predictor history sheet which will be kept by the O.O.

(c) All modifications and inspections carried out must be entered in the respective history sheet.

(d) **Quarterly**

Remove predictor from case and place on stand.

Clean exterior with dry soft linen.

Open and close levelling bubble case covers.

Connect battery and rotary convertor.

Connect predictor to guns and switch on.

Fully wind clock motor and start.

Run both deflections between stops either way finishing between 5° and 10° .

Run T.E. from minimum to maximum and back to minimum.

Run Q.E. from minimum to maximum and back to 45° .

Run time to zero and back to maximum.

Set maximum wind speed and height and rotate wind direction dial through 360° .

Traverse predictor through 360° .

Return wind speed and height to zero.

Run for approximately five minutes and check dials.

Disconnect and replace instruments in case, leaving in condition for transport, *see* Directions for use of A.A.

Instruments, Pamphlet No. 1.

Important.—The rotary convertor *must* be switched off before disconnecting gun cables.

The annual superficial internal cleaning and lubrication will be carried out at O.M.E.'s annual inspection.

Panels will on no account be removed, except by an O.M.E. or armament artificer (instruments). Before replacement bearing surface of panels will be coated with a mixture of beeswax and mineral jelly.

Telescopes will be inspected annually by an O.M.E.

5. HEIGHT AND RANGE-FINDERS (No. 2, Mk. II (U.B. 2); No. 2, Mk. III (U.B. 2A) ; No. 3, Mk. III (U.B. 7))

(a) **Quarterly**

Remove from case and place on stand.

Clean externally with clean soft linen.

Elevate through minimum to maximum using both gears.

Traverse 360° using both gears.

Operate elevating and traversing slip clutches.

1*—(1730)

Move working head through limit of travel.

Lightly oil leather work (sweet oil).

Return instrument to case.

(b) The annual tests and optical cleaning as necessary will be carried out during O.M.E.'s annual inspection. Lubrication will also be carried out at this time.

(c) Optical cleaning as necessary will be carried out in R.A.O.C. workshops following the O.M.E.'s annual inspection.

6. TELESCOPES, IDENTIFICATION

(a) Quarterly

Remove from case and place on stand.

Clean externally with clean soft linen. Do not touch lenses with the hand.

Elevate minimum to maximum.

Traverse through 360°.

(b) Optical cleaning as necessary will be carried out in R.A.O.C. workshops following the O.M.E.'s annual inspection.

7. BINOCULARS

(a) Keep in their cases, leather, within the cases, wood, packing supplied and keep in a separate lock-up store. They are not to be removed, except for stocktaking and O.M.E.'s annual inspection.

8. DIRECTORS, NO. 5 (C)

(a) Six-monthly

Remove from case and place on stand.

Clean externally with soft dry linen. Do not touch lenses with the hand.

Elevate and depress through limits.

Traverse both bases through 360°.

(b) Internal cleaning, as necessary, and lubrication will be carried out following O.M.E.'s annual inspection.

9. HEIGHT-FINDERS, NO. 5

(a) Annually

Remove from case and place on stand.

Clean externally with soft dry linen.

This is in preparation for O.M.E.'s annual inspection.

10. A.A. RING SIGHT TELESCOPE (ALDIS) (Silica Gel. container in telescope case)

(a) Six-monthly

Half-yearly inspection by Armament artificers (instruments) is necessary with these. One of the half-yearly inspections will also be the O.M.E.'s annual inspection.

11. TELESCOPES, SIGHTING NO. 9, MK. II

(a) Annual inspection by O.M.E.

12. WATCHES

(a) Store in safe.

Wind periodically, say every three months.

Annual inspection by O.M.E.

13. PROJECTORS, A.A. 90-CM., MK. VI OR VI*

(Complete with Lamps H.C.D., Mk. I* or Mk. V)

(a) **Six-monthly.**—(Once in preparation for O.M.E.'s annual inspection which will follow sector training.)

(b) Lamp

Clean positive carbon carrier rings (Mk. I* only).

Check bedding of carbon holders (Mk. V only).

Lubricate *as laid down* in Handbooks of Lamps.

Touch up paint as necessary (*see* Handbooks of Lamps).

(c) Projector

Remove reflector.

Dust out interior of barrel.

Clean exterior.

Clean reflector in accordance with instructions for care and use of glass reflectors for searchlights.

Touch up paint as necessary (*see* Handbooks of Projectors).

Lubricate *as laid down* in Handbooks of Projectors.

Clean glass sectors.

Replace reflector.

(d) Projector and lamp together

Set carbons correctly in gauge.

Fit fan (and switch on before striking arc).

Connect to power supply.

Strike arc and run for a few minutes.

Douse and repeat at different angles of elevation.

Check operation of trip switch.

Check operation of warning bell (Mk. V, lamp only).

Check bedding of brushes on slip rings.

Elevate and depress through limits.

Traverse through 360°.

Annual inspection and test by O.M.E.

14. PROJECTORS, A.A. 90-CM., MK. V, FITTED WITH LAMPS, MK. I* OR MK. V

(a) **Six-monthly.**—(Once in preparation for O.M.E.'s annual inspection which will follow sector training.)

(b) **Lamp.**—As for lamp under Projectors, A.A., Mk. VI and VI*.

(c) **Projector.**—As for Projectors, Mk. VI and VI* (Handbook in this case is Number 1 of Handbook of Searchlight Equipment, 1938), and in addition :—

Check oil level in motor unit gearboxes.

(d) **Projector and lamp together**

Set carbons to gauge.

Fit fan (and switch on before striking arc).

Connect to power supply and to locators, sound, Mk. VIII or IX, or to appropriate testing panel unit.

Roughly co-ordinate projector and locator or panel.

Strike arc and run for a few minutes.

Douse and repeat at different angles of elevation.

Check operation of trip switch.

Check operation of warning bell (Mk. V, lamp only).

Check operation of low voltage cut-out.

Run projector by locator or panel for 15 minutes, while lamp is burning, through 360° in azimuth and between 0° and 90° in elevation at different speeds. Repeat in opposite direction. (See paragraph on locators, Mk. VIII or IX.)

Check operation of elevation worm drive. Throw out gear at 0° and 90° elevation.

(e) Annual inspection and test by O.M.E.

15. PROJECTORS, A.A. 120 CM.

(a) **Six-monthly.**—(Once in preparation for O.M.E.'s annual inspection which will follow sector training.)

(b) As these projectors are kept dismantled in mobilization stores, the following procedure will be adopted :—

Erect one projector, less control arm, reflector and front door.

Connect to power supply.

Using erected projector, test all H.C.D. lamps by setting carbons to gauge, striking arc and running for a few minutes.

Douse and repeat striking tests at two or three angles of elevation.

Disconnect cable from erected projector and connect to individual switchboard. Sub-circuits of each projector can then be tested.

(c) **Each projector**

Clean reflector in accordance with instructions for care and use of glass reflectors for searchlights.

Dust interior of barrel.

Clean exterior.

Touch up paint as necessary (see Handbook).

Lubricate as laid down in Handbook.

Clean glass strips.

16. LOCATORS, SOUND, MKS. VIII AND IX. (To be supported with tyres just clear of floor.)

(a) Monthly

Check tyre pressures.

Spin wheels.

Grease chassis.

Adjust brakes.

(b) Six-monthly

Clean exterior.

Lubricate as laid down in Part II, para. 5 (2) and (3) (ii) in Handbook of Searchlight Equipment, 1938, Number II, and corresponding paragraphs which will be incorporated in Handbook of Mk. IX locator.

Touch up paint as necessary.

Connect to projector, Mk. V, or to appropriate testing panel unit.

Connect projector or panel unit to power supply.

Roughly co-ordinate with projector or panel unit.

Run for 15 minutes as follows :—

Move paraboloid arms through 360° in azimuth and from 0° to 90° in elevation simultaneously (if using projector), and follow up on the course gear. Speeds will be varied and test repeated in opposite direction (*see* paragraph on projectors, Mk. V).

Check operation of course-finding sight as under :—

For Mk. VIII as in (d) below.

For Mk IX as in (f) below.

(c) Annually

Remove tyres.

Treat rims as necessary.

Fit new tyres (under turnover scheme).

Annual inspection and test by O.M.E.

(d) Tests for course finding sight of locators, sound, Mk. VIII

(i) The limits of accuracy for the course finding mechanism of this sight shall be within $\pm \frac{1}{2}$ in. from true course, determined from an average of eight readings, taken alternately for both directions of the course plate, measured on the periphery of the bowl.

(e) Method of testing

(i) Lock the sound locator in azimuth.

(ii) Depress the sound collectors to approximately 30°.

(iii) Set the air speed pointer accurately to zero on scale.

(iv) Align the follower pin (on the bow) with the line of sight member. Keeping the arch fixed in azimuth, lower the

bow (with the follower pin) until it is in line with the edge of the bowl. Mark the edge of the bowl on the inside with a pencil.

(v) Throw the course-setting motor out of gear and rotate the course plate in a clockwise direction until the centre line of the course spindle is approximately 90° right of the mark made on the bowl. Re-engage course setting motor.

(vi) Lock the solenoid by means of the switch ring and elevate the sound collectors to approximately 65° . The course setting motor will rotate the course plate and come to rest.

(vii) Measure the peripheral distance between the mark on the bowl and the centre line of the course spindle. Record the measurement and unlock the solenoid by switching off the switch ring.

(viii) Depress the sound collectors to approximately 30° .

(ix) Throw the course-setting motor out of gear and rotate the course plate in an anti-clockwise direction, until the centre line of the course spindle is approximately 90° left of the mark on the bowl. Re-engage the course setting motor.

(x) Follow the procedure as in sub-paras. (vi), (vii) and (viii) above.

(xi) Repeat the procedure as in sub-paras. (v), (vi), (vii), (viii), (ix) and (x) four times.

(xii) *The average of the readings measured as in sub-para. (vii) shall not exceed $\frac{1}{2}$ in.*

(f) Test for course finding sight of locators sound, Mk. IX

(i) the limits of accuracy for the course-finding components of this sight shall be within $\pm \frac{3}{8}$ -in. from true course determined from an average of eight readings taken alternately for both directions of the course bowl, measured on the surface of the turntable (external line of sound member).

(g) Method of testing

(i) Lock the sound locator, in azimuth.

(ii) Depress the paraboloids to approximately 15° .

(iii) Set the air speed pointer accurately to zero on the scale.

(iv) Align the follower-pin (on the follower bow) with the external line of sound member. Keeping the telescope arch fixed in azimuth, lower the follower bow to the horizontal and project a pencil mark from the centre of the follower pin on to the turntable (external line of sound). Carry this mark approximately radially across the face of the turntable and the rim of the bow (course finding unit).

(v) Throw the course setting motor out of gear and rotate the bowl (course finding unit) in a clockwise direction until the mark on the bowl is approximately 90° right of the mark on the turntable. Re-engage course setting motor.

(vi) Lock the solenoids by means of the locking switch on the right-hand member of the telescope arch and elevate the paraboloids to approximately 65°. The course setting motor will then rotate the course bowl and come to rest.

(vii) Measure the chordal distance between the marks on the turntable and bowl and record the measurement. Unlock the solenoid by breaking the locking switch.

(viii) Depress the paraboloids to approximately 30°.

(ix) Throw the course setting motor out of gear and rotate the course bowl in an anti-clockwise direction until the mark on the course bowl is approximately 90° left of the mark on the turntable and re-engage the course setting motor.

(x) Repeat the procedure outlined in sub-paras. (vi) and (vii) above.

(xi) Repeat the procedure as in sub-paras. (v), (vi), (vii), (viii), (ix) and (x) four times.

(xii) The average of the readings measured as in sub-para. (vii) shall not exceed $\frac{3}{8}$ -in.

17. TRAILERS, GENERATING SETS

(a) Routine maintenance as for the engine and dynamo of lorries, searchlight, will be carried out where applicable; reference should be made to instruction book as regards correct fuel to be used, lubrication required and general operation of plant.

(b) For the six-weekly test, the engine will be run for ten minutes with no load at its normal speed with the change-over valve screwed into the "IN" position to give high compression.

(c) No road test will be given.

(d) The following will also be carried out :—

(i) *Once a month.*—Turn the engine over by hand. In the case of the 22 KW. and 15 K.V.A. sets the governor bell crank lever will be operated to and fro for a few times.

(ii) *Every three months.*—Engines to be run for ten minutes without load.

(iii) *Every twelve months.*—Engines will be run on full load for one hour under the supervision of qualified technical staff. If it is impracticable to carry this out in the open, or to convey the exhaust fumes outside the building, C.I. generating sets can be run indoors without risk to the operating staff, as the exhaust from this type of engine does not contain carbon monoxide.

(e) A special annual test will be carried out on the fuel pumps and injectors.

(f) There is no necessity to change the oil in the sump every twelve months. It should remain in perfectly good condition for years.

II. ANTI-AIRCRAFT ARTILLERY EQUIPMENTS

1. Suitable lubricants as follows, will be used for the various parts of the equipments and instruments.

The use of abrasive or burnishers for polishing is forbidden.

Lubricant	Use
Grease, G.S.	Axletree arms and pipe boxes of wheels.
Oildag	Slides, guideways, bearing strips of guns cradles and slippers.
Oil, mineral, hydraulic buffer . .	Hinge bolts, breech mechanisms, plain bearings and working parts generally.
Mineral jelly, red	Roller bearings.
Mineral jelly, red (thinned with oil, mineral, hydraulic buffer).	Enclosed gears and for teeth of exposed gear wheels, worms, or racks.
Graphite, grease (<i>M.T. Section 1</i>) . .	For guns fitted with loose liners, loose barrel or barrels as follows:— Threads on breech end of jacket and threads inside breech ring. Muzzle face. Front end of breech ring.
Oils, for instruments (as laid down)	Range-finding and other instruments.
"Oily rag"	Wiping over exterior of loose liner, loose barrel or barrel of gun.

Cleaning and preservation of ordnance

2. The bores of all guns will be kept clean and free from rust. They will be cleaned and oiled weekly.

3. Guns fitted with loose liners, loose barrels, or barrels, will have the breech rings and liners removed every six months. After removal the bores, surfaces and threads will be cleaned,

particular attention being paid to the removal of rust or grit in keyways, round keys and faces of shoulders. The clearance between the liner and the jacket must on no account be filled with oil or grease.

The threads on both the breech end of the jacket and the inside of the breech ring will be coated with graphite grease. Before assembly the exterior of the liner will be cleaned with an oily rag, and it will be ascertained that the seating of the liner is clean. After re-assembly a coating of graphite grease will be applied to the muzzle face and to the front end of the breech ring to assist in excluding moisture.

4. Clinometer planes will not be cleaned with abrasive material such as emery cloth, scratch card or bath brick. Rust, which after being soaked with paraffin oil, cannot be removed easily, will be dealt with by the armament artificer. Care will be taken to prevent the plane being damaged or burred. If a gun is not likely to be used for a considerable period, the plane will be coated with mineral jelly, otherwise it will be kept oiled.

5. All working surfaces must be well lubricated. When necessary, fittings will be dismantled for this purpose. Abrasive substances or burnishing are forbidden.

6. Guns will be placed with the piece horizontal when not actually manned, to prevent moisture lodging inside the bore and to prevent the oil used for preservation rapidly draining off from the bore. Breech and muzzle or other covers supplied will be kept in position.

Cleaning and care of breech fittings

7. Guns in position exposed to the weather may have any such minor fittings as can readily be refitted, removed and kept in store. Other fittings will not be removed. All holes in which water is likely to accumulate will, when practicable, be filled with greased tow. Fittings will be re-assembled on the guns and mountings and tested quarterly.

Any components or fittings removed for (a) retention in store or (b) cleaning purposes, will be marked or labelled with the registered number of the equipment to which they belong.

8. The steel portion of all fittings will be cleaned and oiled.

9. Fixing and preserving screws will be removed occasionally and lubricating holes and channels cleaned with a wire, and filled with oil.

10. All spare parts will be tested for interchangeability as soon as possible after receipt, and adjusted as may be required or replaced if necessary.

Carriages or mountings

General

11. Thorough and frequent lubrication of all working parts is essential. Whenever and wherever fresh lubricant is applied, the old must first be wiped or scraped off, and the parts well worked to distribute the fresh lubricant before they are left.

12. Lubricators and lubricating holes will be kept free from dirt to allow a fresh passage to the working parts: holes and channels, where possible, will be cleaned out with a wire. Lost or damaged lubricators and lubricating hole screws will be renewed. Lubricators and lubricating hole screws will be kept bright so as to be readily seen.

13. A lubrication chart showing the positions of the lubricating holes will be found in the handbook of each equipment. A large scale lubrication diagram will be hung in each gun park.

14. Special care must be taken to ensure that the guideways on the cradle in which the gun and cylinder block slide are kept clean, well lubricated and free from burrs.

15. Carriages much exposed and liable to accumulate dust or sand will not be left with much oil or grease on them, but only sufficient to prevent rust, for which a very slight film will suffice.

16. To prevent rusting, the teeth of all pinions and wheels will be well smeared with mineral jelly which has been thinned with lubricating oil.

17. Wire ropes must be kept well lubricated, treated with consideration and care, and not neglected. They will be examined periodically for undue wear, or fraying.

18. Wooden wheels require careful inspection and maintenance. They will be examined periodically to see that the woodwork is sound and that the felloes and spokes are tight. Pipe boxes will be tightened periodically as required. Wheels will be removed quarterly and all lubrication channels and surfaces thoroughly cleaned from old grease. They will then be re-assembled and fresh lubricant applied.

19. Steel rubber-tyred wheels with their brakes will be dealt with as follows:—

The mounting will be raised and supported on wooden blocks to ensure that rubber tyres are just clear of the floor, and end movement prevented by chocks. Normal tyre upkeep will be rigidly followed.

20. Leathers for glands, pistons or other joints when kept in store will be kept free from dust and periodically smeared with dubbin to keep them soft and flexible.

21. All formed packings, *i.e.* those of asbestos or hemp, with or without anti-friction metal, if not actually fitted, will be wrapped in oiled paper and stored in tins, boxes or other suitable receptacles, so that the shape and finish may be maintained.

22. In cleaning bright parts, under no circumstances must any course or abrasive material such as sand, bath brick, etc., be used.

23. All nuts and screws must be properly tightened and the various gears adjusted correctly.

24. Batteries, secondary, where fitted will be removed from their mountings and stored separately, and labelled distinctly to show the individual mountings to which they belong.

Recoil and balancing systems

25. Air pressure will be tested weekly. Buffers and recuperators will be completely dismantled half-yearly and the packings, rods and cylinder walls, examined carefully to see if there are any signs of deterioration or pitting, and springs will be examined for permanent set, distortion or rust.

The oil used for charging must be clear, bright and free from water.

26. The month and year of the last overhaul will be painted or stencilled in a conspicuous position on the recuperator body or cradle.

27. All guns fitted with hydro-pneumatic recuperators will be pulled back, without being disconnected, once a month, in order to stir up the liquid and permit re-lubrication of positions where packings rest.

III. OUTLINE PROGRAMME OF MAINTENANCE OF ANTI-AIRCRAFT EQUIPMENTS, INSTRUMENTS, SEARCHLIGHT EQUIPMENTS AND SOUND-LOCATORS

A. MOBILIZATION STOREHOUSES

Weekly

1. Clean and oil bores of all guns and wipe over breech fittings with an oily rag. Work breech mechanisms once.

2. Clean and oil all exposed bright metal surfaces.

3. Test and adjust air pressures.
4. Work elevation and traversing gears as far as storage space safely permits.
5. Check tyre pressures.

Monthly

1. Pull back all guns which are fitted with hydro-pneumatic recuperators.

Quarterly

1. Carry out complete lubrication of equipment.
2. Re-assemble and test any fittings which have been removed or stored separately from guns.
3. Clean, inspect and adjust all wheels of equipments.

Six-Monthly

1. Strip, inspect, give attention as necessary, refit and refill buffers and recuperators of all equipments. This work will be carried out under the instructions and supervision of qualified artificers.

2. Remove, inspect and give attention as necessary to the replacement of loose liners and barrels. In the cases of the heavier natures of ordnance this removal will necessitate the use of a gantry or other suitable lifting appliance as may be authorized for supply in due course.

3. Remove, examine and adjust wood wheels where fitted to equipments. Clean off all old grease and renew.

Annually

1. Necessary stripping and re-assembling in connexion with annual inspections.

2. Pneumatic tyres will be removed and wheels and tyres dealt with as for those of mechanical transport vehicles.

B. WAR SITES AND DRILL HALLS

1. Artillery equipments will be maintained in a similar manner to approved armament in fixed defences and "Regulations for the Care and Preservation of Artillery Equipments" will be followed. The provisions of para. 155 of those regulations, designed for coast defence mountings not in frequent use, will not apply to anti-aircraft equipments, which will be left complete.

IV. MECHANICAL TRANSPORT VEHICLES (INCLUDING SEARCHLIGHT LORRIES AND TRAILER GENERATING SETS)

General

1. Vehicles will be placed so that they can be moved easily to the entrance of the store, and will be complete with all their equipment.

2. Suitable lubricants, as follows, will be used for the various parts of the vehicles :—

Lubricant	Use
Blacklead, dry	Wheel rims taking pneumatic tyres.
Mixture of oil M.600, tallow and powdered graphite.	External driving chains.
Chalk, French	Inner tubes of pneumatic tyres.
Grease, G.S.	Interiors of outer covers (during assembly).
Oil, castor	Inter-leaving of springs. Screw down lubricators. Winding gear. Anti-rust purposes.
Oil, C.70	For leather lined clutches.
Oil, M.160	Magnetos, dynamos, electric starters and similar mechanisms (unless the lubrication chart specifies a different class of oil).
Oil, M.220 ordinary, or special.	Engines and some gearboxes of motor vehicles (as laid down in War Office instructions from time to time).
Oil, C.600	Gearboxes (where gear oil is specified), back axles, transmission universal joints, chassis lubrication by pressure gun.
Oil, M.100	Cotal gearboxes, T.S.M. lorries.

3. Wheeled vehicles which are stored loaded, will be jacked up until springs are only slightly deflected and will be supported on wooden blocks. These blocks will be placed under the side member of the chassis frames, care being taken to avoid damage to steering and brake gears, lubricating pipes or any other parts of the vehicles.

4. Petrol systems (tanks, autovacs, carburettors and piping) will be kept full and vehicles will be run for 15 to 20 miles on the road once a month.

5. Grease or oil must not be allowed to remain on rubber tyres, but will be cleaned off with a little petrol.

6. Accumulators, which normally will be kept in place on the vehicle, will be charged at intervals of six weeks. Each

charge will be given at the normal rate until the accumulators are gassing freely. When this point is reached, the charge rates will be reduced to half the normal and the charge continued for about an hour until the specific gravity of the liquid has ceased to rise. Distilled water will be added as necessary.

7. Once every three months within twenty-four hours of the completion of the most recent charge, accumulators will be discharged at an 8 to 10 ampere rate until the average of each cell has fallen to 1.8 volts and then recharged and replaced on the vehicle.

8. The blocks will be designed for easy and rapid removal; springs will be cleaned and greased annually. Motor-cycles will be stored with front and rear stands down so that the tyres are clear of the floor.

9. Rubber tyres will be protected from light by blackleading. Pneumatic tyres will be kept inflated and pressure will be tested and if necessary adjusted weekly. In the case of unloaded vehicles not supported on blocks, the vehicles will be moved slightly each week so that tyres are not unduly stressed in the same place continuously during the period the vehicles are standing in store. Pneumatic tyres will be removed annually from vehicles in storage and replaced from new stock, the removed tyres being placed in general stock for issue at the first opportunity. At the same time wheel rims will be examined and dents removed.

10. In the case of wire wheels, defective spokes will be replaced, wheels trued and projecting spoke heads removed, as necessary.

11. Wheel rims found to be corroded, or in need of repainting, will be dealt with as follows :—

(a) All rust will be scraped off and the rim polished with emery cloth.

(b) The inside of the rim will be painted with the following paint :—

1 part powdered graphite	} Compounded by weight.
$\frac{1}{2}$ part shellac	
$3\frac{1}{2}$ parts methylated spirits	

NOTE.—The paint dries in about ten minutes after application.

In fitting straight-sided covers, other than those for well-base rims, the wheel rim and locking rim will be smeared with graphite grease or grease G.S.

12. Driver's hood and aprons will be kept opened but not stretched too tightly.

Additional for P.E. Vehicles

13. All dust will be blown out of the windings, commutators and brush gear of the electric generators and motors by means of compressed air, where this is available ; otherwise by means of a pair of bellows. The commutators will then be wiped clean with soft cotton sheeting. Cotton waste must not be used for this purpose. Brushes will be lifted from contact with the commutators.

14. All electrical connections will be examined and any loose ones tightened.

15. Drums and contact fingers of electrical controls will be wiped clean with a piece of soft cotton sheeting, and coated lightly with pure vaseline after which covers will be replaced and secured.

16. All screwdown lubricators will be filled with grease and screwed down several turns. (Lubricators on generator and motor armature bearings one turn only. Over lubrication is very undesirable.)

17. The insulation resistance of the generator, motor and controller will be measured every six weeks by connecting the line terminal of a megger to a brush lead and the earth terminal to the metal of the chassis, the brushes being temporarily replaced in contact with the commutators for this test.

18. Any vehicle in which the insulation resistance has fallen below $\frac{1}{2}$ megohm will be submitted to a "drying out" test as follows :—

The vehicle will be placed on level ground, the brakes applied and the rear wheels locked by suitable means to prevent movement of the vehicle. The engine will then be run slowly with the reversing controller lever to "forward" and the speed controller lever fully retarded as for starting the vehicle. The engine speed will then be increased until a circulating current not exceeding 150 amperes flows between the generator and motor.

The insulation resistance will be taken every hour and the drying out test continued until the insulation resistance has risen to $\frac{1}{2}$ megohm.

Other searchlight lorries

19. Instructions for those searchlight lorries fitted with generators only and no electrical motors (viz. lorries, 3-ton 4 and 6-wheeled, searchlight, Thornycroft, etc.) are similar to the last section with the exception that the drying out test will necessarily be modified in that an external electrical load will be required.

V. OUTLINE PROGRAMME OF MAINTENANCE OF MECHANICAL TRANSPORT VEHICLES (INCLUDING SEARCHLIGHT LORRIES AND TRAILER GENERATING SETS)

General

1. Petrol systems (tanks, autovacs, carburettors and piping) ; will be kept full and vehicles will be run for 15 to 20 miles on the road once a month.
2. Loaded vehicles to be jacked up at chassis frames until springs are only slightly deflected and be supported by wood blocks placed under chassis frames.
3. Tyres to be maintained at standard pressures.
4. Exposed bright metal surfaces to be lightly oiled.
5. Oil level of engine sumps to be maintained at correct level.
6. Gear boxes and back axles to be filled with oil at the correct level.
7. Radiators to be kept filled. Anti-frost precautions must be taken.
8. Batteries to be in position, fully charged and with electrolyte at the correct level.

MAINTENANCE PROCEDURE

Weekly

1. Test and adjust tyre pressures.
2. Test the vehicle lights.
3. Turn over engine by hand. The turning should be assisted by putting the engine into gear and turning on the rear wheels which will also turn over the transmission.
4. Check water level in radiator.
5. Check battery density and voltage with the vehicle lights on and check level of electrolyte.

Six-weekly

1. Carry out weekly test as above.
2. Start up engine by hand and run for ten minutes at a fast " tick-over " (i.e. about 1,500 r.p.m.).
3. Stop engine and then restart on self-starter.
4. See that dynamo is charging satisfactorily.
5. Remove battery for recharging in accordance with the instructions given in the body of the notes above.
6. Refit the battery.

Six-monthly

1. Carry out the weekly test as above.
2. Remove the vehicle supporting blocks.
3. Start up engine by hand and run for ten minutes at a fast "tick-over" (*i.e.* about 1,500 r.p.m.).
4. See that dynamo is charging satisfactorily.
5. Stop engine and then restart on self-starter.
6. Run vehicle on road with lights burning for a distance of about three miles. At the beginning and end of the run test all brakes and adjust if necessary.
7. During run test all gears.

On return of vehicle

8. Check level of radiator water and fill up if necessary.
9. Check battery density and voltage with the vehicle lights burning (to see if battery has held charge satisfactorily during the road run).
10. Remove battery for recharging in accordance with the instructions given above.
11. Carry out all adjustments found necessary during the road test.
12. Attend to all lubrication and grease points.
13. Clean whole vehicle.
14. Replace vehicle on its chocks, if necessary.
15. Check all vehicle equipment and stores.

Annually. (To be carried out in addition to the six-monthly instructions given above).

16. Clean filters (if fitted).
17. Radiator should be drained, flushed and refilled to level with soft water.
18. Tyres should be removed, wheels and rims attended to as necessary, and new tyres fitted.
19. The oil levels in the gear box and back axle should be checked and attended to as necessary.
20. The body and chassis should be thoroughly attended to and cleaned.
21. All vehicle equipment should be removed, checked and replaced.

1. Lorries, searchlight, and T.S.M.

The above procedure should be carried out.

In addition a test of insulation resistance of the motor generator (and dynamo in the case of lorries, searchlight, T.S.M.) must be carried out every six weeks in accordance with the instructions given in the body of the notes above, and the generator (and dynamo if applicable) "dried out" if necessary.

2. Trailers, generating set

(a) Routine maintenance as for the engine and dynamo of lorries, searchlight, should be carried out where applicable.

(b) No road test will be given.

(c) The following will also be carried out :—

(i) *Once a month.*—Turn the engine over by hand. In the case of the 22 KW. and 15 K.V.A. sets the governor bell crank lever will be operated to and fro for a few times.

(ii) *Every three months.*—Engines to be run for ten minutes without load.

(iii) *Every twelve months.*—Engines will be run on full load for one hour under the supervision of qualified technical staff. If it is impracticable to carry this out in the open, or to convey the exhaust fumes outside the building, C.I. generating sets can be run indoors without risk to the operating staff, as the exhaust from this type of engine does not contain carbon monoxide.

3. A special annual test will be carried out on the fuel pumps and injectors.

4. There is no necessity to change the oil in the sump every twelve months. It should remain in perfectly good condition for years.

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Regulations
2106

**REGULATIONS FOR ARMY
ORDNANCE SERVICES, PART II**

PAMPHLET No. 22, 1939

AMENDMENTS (No. 1A)

1. Pages 6 and 7. Paras. 13 (a), 14 (a) and 15 (a).
Delete "which will follow sector training" in each case.
2. Page 7. *Insert* new para. :—

57
General
9916

16A. PROJECTORS, A.A. 150-cm., Mk. I

Amdt. 1A
July, 1941

(Complete with Lamps, Searchlight, 150-cm., Mk. I, and Control Gear, Mk. III.)

(a) **Six-monthly.** (Once in preparation for O.M.E's. annual inspection.)

(b) **Lamp.**

Check bedding of carbon blocks.
Check bedding of motor brushes.
Lubricate as laid down in Handbook.
Touch up paint as necessary.

(c) **Projector.**

Clean reflector using "Reflectors—Cleaning Outfit".

Dust out interior of barrel.

Clean exterior.

Clean glass sectors.

Check bedding of main power brushes and small control gear brushes on slip rings.

Lubricate as laid down in Handbook.

Touch up paint as necessary.

(d) Projector and lamp together.

Focus lamp as laid down in Handbook.

Set carbons correctly in gauge.

Connect to power supply and to Locators, Sound, Mk. VIII or IX or to Apparatus, Testing Control Gear, Panel, Repeater Unit "A".

Co-ordinate projector and locator or panel.

Switch on fan, strike arc and run for a few minutes.

Douse and repeat at different angles of elevation.

Check that positive carbon rotates.

Check operation of trip switch and pilot signalling lamp.

Check operation of low-voltage cut out.

Check operation of depression switch.

Run projector by locator or panel for 15 minutes, while lamp is burning, through 360° in bearing and between 0° and 90° in elevation at different speeds. Repeat in opposite direction (*see* paragraph on Locators, Sound, Mk. VIII or IX).

(e) Annual inspection and test by O.M.E.**PROJECTORS, A.A. 150-cm., Mk. I***

(Complete with Lamps, Searchlight, 150-cm., Mk. I, and Control Gear, Mk. IV.)

(a) Six-monthly. (Once in preparation for O.M.E.'s. annual inspection.)**(b) Lamp** as for detail under Projectors, A.A. 150-cm., Mk. I.**(c) Projector** as for detail under Projectors, A.A. 150-cm., Mk. I.**(d) Projector and lamp together.**

Focus lamp as laid down in Handbook.

Set carbons correctly in gauge.

Connect to power supply and to Locator, Sound, Mk. VIII or IX, or to Apparatus, Testing, Control Gear, Panel, Repeater Unit "A".

Fit Control Arm Mk. V*.

Co-ordinate projector and locator or panel as laid down in Handbook.

Switch on fan, strike arc and run for a few minutes.

Douse and repeat at different angles of elevation.

Check that positive carbon rotates.

Check operation of trip switch and pilot signalling lamp.

Check operation of high and low voltage cut outs.

Check operation of depression switch.

Check remote control operation, *i.e.* that projector remains in co-ordination—judge by using scales—when in "Power Control" in elevation and bearing.

Move projector by hand when in "Power Control" and see that it comes back into co-ordination in elevation and bearing.

Move projector by hand when in "Hand Control" and see that it comes back into co-ordination in elevation and bearing.

Run projector by locator or panel for 15 minutes, while lamp is burning, through 360° in bearing and between 0° and 90° in elevation at different speeds. Repeat in opposite direction. (*See* paragraph on Locators, Sound, Mk. VIII or IX.)

(e) Annual inspection and test by O.M.E.

By Command of the Army Council,



THE WAR OFFICE,
30th July, 1941.