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REGULATIONS FOR ARMY ORDNANCE SERVICES, PART II

PAMPHLET No. 27

Instructions for the Examination, Care and Preservation of Artillery Equipments on R.A.O.C. Charge.

TRIENNIAL EXAMINATION

1. All guns, howitzers, mortars, carriages and artillery trailers on R.A.O.C. charge, including such equipment on deposit from units (except tank and fixed armaments), will be examined every three years and the results reported on A.F. G 834, G 875 and G 875A, or, where the ordnance has not been fired since the previous examination, on A.F. G 818.

2. To allow of a spread-over of the work involved, one-third of the equipment will be examined each year and the army forms, completed in all respects, rendered to the Chief Inspector of Armaments at any time up to 1st July. These returns will show the state of the equipment after any necessary repairs have been carried out.

3. For *home* depots, the triennial examination of ordnance, when it does not coincide with a biennial inspection (*see* para. 9) will be carried out as far as possible without unblocking the bore, the condition of the bore being reported as that noted at the previous biennial inspection.

4. The following special instructions for the examination, care and preservation of this equipment will be observed.

SECTION I

ORDNANCE AND BREECH FITTINGS

(NOTE.—*In this section the term "gun" is used in a general sense to include guns, howitzers and the jackets of loose liner or loose barrel guns.*)

5. Guns will have the bore coated with a mixture of mineral jelly and beeswax, in the proportion by weight of 95 parts to 5 parts respectively. The mixture may be warmed, if necessary, to bring it to a consistency convenient for application.

6. Guns under 6-inch calibre will, after treatment as in para. 5, be blocked at the breech and muzzle ends with painted dry wood blocks, the joints being made up with putty this operation should be carried out in dry weather if possible. The exterior of the piece, including the clinometer plane and all bright parts, will be painted.

7. Guns of 6-inch calibre and upwards will have the muzzle opening closed by a wood block, as described above, but the breech opening will be closed by a breech packing cover of steel plate clamped to the breech face by means of a bolt and clamping bar, the joint at the breech face being sealed by means of putty. The external holes and recesses in the gun bodies, such as holes for the carrier hinge bolt and the recess of the hinge of the carrier, will be protected by painting.

8. When stored dismantled, those natures with bearing strips or side cover plates will, where practicable, have these fittings placed inside the bore.

9.—(a) In the case of guns on R.A.O.C. charge in depots at home the following procedure will be carried out :—

(i) Guns will be unblocked every two years and the preserving mixture removed. After ascertaining that the bores are free from rust, they will be re-coated and the blocks replaced.

(ii) In addition, guns will be inspected externally every twelve months and should the sealing of the ends of the bore appear in any way defective the blocks will be removed at once and the preserving mixture cleaned off. After ensuring that the bores are free from rust, they will be re-coated with the preserving mixture and the blocks replaced.

In all cases the greatest care should be taken to see that the blocks seal correctly.

(b) In the case of guns on R.A.O.C. charge in depots abroad, the procedure given at sub-para. (i) above will apply, except that the interval will be twelve months.

10. All breech fittings and other metal fittings removed from guns in R.A.O.C. charge will be coated with mineral jelly before being placed in store. Steel parts must be examined frequently to ascertain that they are free from rust.

11. Breech rings and/or breech bushes of loose liner and loose barrel guns will be kept in their respective jackets, but must be removed every three months, except in the case of A.A. equipments in which the period will be six months. After ascertaining that the threads and plain portions are free from rust the threads will be coated with graphite grease before reassembly.

12. Obturators will be placed in the boxes provided, care being taken that the pads and discs are properly assembled and maintained under pressure at all times. The Registered No. of the gun with which the pad is to be used will be stencilled on both the pad and the box.

LOOSE LINERS, LOOSE BARRELS, AND MONOBLOC BARRELS

13. Loose liners and loose barrels will be stored horizontally in their packing cases. A visual examination will be made on receipt and thereafter half-yearly. When necessary, they will be treated as indicated in para. 15, until the metal is thoroughly heated.

The liners and barrels will be cleaned, inspected and re-treated annually.

AIMING RIFLES AND MORTARS

14. Aiming rifles and mortars will have the bores and attendant fittings dealt with as described in paras. 5 to 10.

SECTION II

BUFFERS AND RECUPERATORS

General Instructions

15. Buffers and recuperators of 8-inch howitzer and below on R.A.O.C. charge will (except as provided for in para. 16) be preserved by being immersed in a bath of acid-free mixture consisting of 95 parts mineral jelly and 5 parts beeswax by weight, at a temperature of 250° F. for the times in the table below.

Carriages—

18-pr., Mks. I* to IIR	..	..	15 mins.
18-pr., Mks. IIIR to VR and VP	..	..	15 mins.
25/18-pr., Mks. IVP and VP	..	..	15 mins.
25-pr., Mk. I	..	..	15 mins.
3.7-in. howitzer, Mks. I to IVP	..	..	15 mins.
60-pr., Mks. IV, IVR and IVP	..	..	20 mins.
6-in. howitzer, Mks. I, IR and IP	..	..	20 mins.
6-in. gun, Mks. VIII and VIIIA	..	..	30 mins.
8-in. howitzer, Mk. VIIA	..	..	30 mins.

Buffers and recuperators of 3.7-in. A.A. and 4.5-in. A.A. equipments and of equipments above 8-inch will be treated as described in their respective paras.

16. Buffers of equipments having spring recuperators will be stored assembled and filled completely with buffer oil, and all recuperator system parts will be thoroughly coated with mineral jelly.

Annually, all buffers will be emptied, the oil being first well stirred up by moving the piston backwards and forwards, and refilled with fresh oil.

These equipments will be inspected as follows :—

- (a) Half-yearly. Visually, to ensure that the preservative coatings are intact; and that there is no leakage from the buffer, which should be full of oil.
- (b) Biennially. By dismantling the cylinders and thoroughly cleaning all parts. On completion, the date of the inspection will be painted on the buffer in a conspicuous place.

17. In carrying out the operation referred to in para. 15, the buffer, recuperator and floating piston must be assembled, less packings, with rods in their correct positions in the cylinders and then immersed at an angle with the liquid surface, alternately tilting each end and moving the piston rods backwards and forwards so as to ensure that all surfaces are in contact with the liquid. Stuffing boxes and other removable parts of the buffer and recuperator must be immersed separately.

18. Before being immersed in the bath the various parts of the buffers and recuperators must be carefully cleaned, and any appearance of slight rust removed. Excessive rust will be reported to an O.M.E.

19. Pitting in buffers, hydraulic cylinders and hydro-pneumatic cylinders will be removed by lapping, which will be done in ordnance factories.

When pitting occurs in a buffer or recuperator on charge of a unit to such an extent that, in the opinion of an O.M.E., it is necessary to remove the pitting by lapping, the cylinder block, complete with fittings, will be returned to ordnance store and a serviceable set demanded in exchange. Cylinder blocks returned to ordnance store will be dealt with as under :—

- (a) Carriages in which the buffer and recuperator system are formed out of the cylinder block (*e.g.* 18-pr. carriages fitted with air recuperators, 3·7-in. howitzer carriages, etc.). The cylinder block, complete with fittings, will be sent to the Chief Ordnance Officer, Royal Arsenal, Woolwich.
- (b) Carriages in which the cylinders belonging to the recuperator system are removable (*e.g.* 6-in. howitzer and 8-in. howitzer Mark VIIA carriages, etc.).
 - (i) If the buffer is affected, procedure will be as in (a).
 - (ii) If only the cylinders of the recuperator system are affected, these will be exchanged locally and the pitted cylinders sent to Chief Ordnance Officer, Royal Arsenal, Woolwich.

20. Subsequent to initial preservative treatment, in all cases where the buffer and recuperator system is immersed in a bath of the mixture, it will be cleaned, inspected and re-treated triennially, but where the system is simply coated with the mixture by means of a cloth or sprayed through the medium of a pump, inspection will take place annually. The month and year of the last overhaul will be stencilled in a conspicuous position on the recuperator body or casing. In all cases dipping is preferable to coating with a cloth or spraying, the latter process being restricted to cases where dipping is quite impracticable.

21. Where isolating valves or gravity tank connections are removed, it is most important that, to prevent ingress of water to the cylinder, the tank inlet in the latter should be closed by the plug provided. Should the plug not be available, some form of plug must be fitted.

22. With mobile equipments a History Sheet (A.F. G 804) is issued with each air recuperator, and must always be

kept with the recuperator and accompany it when issued from store. If at any time the History Sheet should be lost or damaged, a duplicate can be obtained from the Chief Inspector of Armaments.

The forms will show in red ink the dimensions of oversize parts.

The condition of the recuperator will be recorded on the form by the officer concerned at each inspection.

Packings

23. After removal of packings from buffers and recuperators they must be cleaned and dried. Shaped rubber packing rings will be placed in tins, which should be sealed with adhesive tape. French chalk, whiting or china clay may be used for preserving the rings but this is not essential. The rings should be stored in a cool even temperature, in the dark, and must not be deformed.

24. All formed packings, *i.e.* those of asbestos or hemp with or without anti-friction metal, should be wrapped in oiled paper and stored in tins, boxes or other suitable receptacles, so that the shape and finish may be maintained. These tins, etc., need not be sealed, but they must be kept as much as possible at an even temperature. "U" and "L" leathers, if found serviceable, will be treated with dubbing, which will be rubbed in, a thick coating being left on the surface. "U"-shaped leathers of intensified glands should be left on their supporting rings. Should it be necessary to fit a new leather on the supporting ring, the two parts of the spare "U"-leather will be cemented together with shellac and allowed to dry for 12 hours.

All fabric packings, *i.e.*, those formed from laminated fabric proofed with rubber (*e.g.*, S.E.A. packings) or laminated fabric proofed with synthetic rubber, if found serviceable, should be stored in tins, boxes, or other suitable receptacles, preferably sealed with adhesive tape. The packings should be stored in a cool even temperature, in the dark, and not be deformed. The insertion of pieces of rope or tow within the grooved recess of these packings, to maintain the shape during storage, is prohibited. Should any deformation occur, this must be removed before the packing is taken into use, by running the fingers or thumb around the inside of the skirt. The packing must not be stretched by means of a tool or undue force.

Liquid

25. The liquid officially authorised for use in hydraulic buffers and recuperators is "Oil, mineral, hydraulic buffer" and, so long as this liquid is procurable, no other will be used.

Note.—Certain equipments of foreign design and manufacture require a different liquid, particulars of which should be obtained from the relevant publications.

The liquid officially authorised for recuperator gland intensifiers is a mixture of one part potash soft soap and two parts heavy torpoyl. In cold weather a more suitable consistency may be obtained by using a different proportion of these materials or alternatively by using medium torpoyl.

26. The receptacles employed for storing and transporting mineral oil must be proof against the ingress of moisture, and care must be taken to see that the oil is kept thoroughly dry," *i.e.* quite free from any admixture with water. The presence of water in the oil has a serious effect on the buffer and recuperator; every precaution will therefore be taken to avoid trouble arising from this cause.

27. For this reason, receptacles containing mineral oil must be carefully handled, to avoid denting or damaging them in transport, and they will not be opened until actually required. Drums of oil must be stored with proper protection against the weather.

28. Where large quantities of "Oil, mineral, hydraulic buffer" are required, a settling tank will be employed, to allow water or foreign matter to settle to the bottom. The tank must be provided with a dust proof cover, and with a drain cock for drawing off any water.

Tanks must be completely emptied and cleaned periodically, as convenient.

29. Visual examination of a glass of buffer oil will show whether it is free from water. Held to the light, it should appear bright and clear, but a slight difference in colour between two samples is to be expected.

30. *Oil emptied from buffers or recuperators must not, except in a very great emergency, be used again in the cylinders.*

Dry Air

31. Normally, dry air should be used for charging recuperators and this can be obtained from either the three-stage dry air compressor (supplied for R.A.O.C. workshops), or the Pump, air or gas, Mk. I. The latter is a belt-driven four-stage pump, suitable for stationary workshops, and will supply "dry air" for charging up to 2,000 lb. per square inch.

32. Great care must be taken in the use of pumps supplying dry air. The instructions governing the use of the three-stage compressor must be rigidly adhered to, and the necessity of operating the drain cocks must not be overlooked.

33. Dry air has a great affinity for moisture and it will be passed through the connecting pipes and, where circumstances permit, through the recuperator and buffer cylinder bores for a short while, before charging, in order to dry them out.

Cleaning

34. Paraffin must not be used for removing preservative coatings, or cleaning buffer or recuperator systems. Buffer oil, preferably warm, will be applied. Cleaning rags have an appreciable moisture content and must be dried before use.

Operations for dismounting Buffers and Recuperators

35. The following operations must be carried out in a clean building under the supervision of an armament artificer or other responsible person, care being taken to avoid the ingress of grit or foreign matter to the various parts when they are reassembled. Equipments with cut-off gears must have the gear disconnected before commencing operations.

CARRIAGES, 18-PR., MKS. I* TO IIR

36. Lay gun horizontal and secure it to cradle.

Release all air pressure by removing plug "L" and opening stop valve "M."

The buffer and recuperator body must be taken out of the cradle by removing the front nuts on the rods of both buffer and recuperator pistons, nut adapter breech lug, and cap of recuperator case.

The collars on the rods of buffer and recuperator pistons having been removed, the glands, gland rings, stuffing boxes, "L" section packing rings and supporting rings must then be taken out and the gland packing rings removed, together with retarding spring and valve. Drain out all oil.

The buffer and recuperator pistons are then taken out and the "U" section rings of the recuperator piston (where in existence) and packings removed.

Remove plugs "O," "N," "K," and "L," stop valve "M" and the run-out adjusting plug, together with all glands, rings and packings.

Reassemble, less packings, and treat as described in paras. **15, 17 and 18.**

Thoroughly drain and dry. When cool, replace all fittings except packings. Finally, replace in cradle.

CARRIAGES, 18-PR., MKS. IIIIt TO VR AND VP AND 25/18-PR.,
MKS. IVP AND VP

37. Lay gun horizontal and secure it to cradle.

Ensure that valve "M" is closed. Remove plug "L" and open valve "M" about $\frac{1}{8}$ turn, taking care to place a suitable receptacle to catch the oil. This operation releases any oil on the liquid side of the floating piston and allows the latter to move up to the stuffing box.

When oil ceases to flow, remove plug "H" completely and open valve "K." Care must be taken to see that all air pressure has been released, after which valve "K" will be removed completely, *precautions being taken that no person is in line with it during removal.*

Take the buffer and recuperator body from the cradle by removing the front nuts on the rods of both buffer and recuperator pistons, nut securing gun and the cradle cap.

Remove stuffing box complete with gland supporting rings and packing, and also rear plug from buffer cylinder. Drain out all oil. Remove packing from stuffing box. Remove piston rod retaining block and take out the stuffing boxes, complete with glands, packing, etc., from the air reservoir and from the hydraulic cylinder of the recuperator, also seating, spring, and retarding valve from the latter. Withdraw floating piston, also buffer and recuperator pistons, and remove packings.

Remove also the "plug, adapter hole" and "isolating valve" complete with socket, gland, etc. Slack back the "oil-filling valve."

Reassemble, less packings, and treat as described in paras. 15, 17 and 18, after which thoroughly drain and dry.

Carefully clean all the remaining parts, opening the run-out adjusting valve and immerse in the bath, drain, and when cool, reassemble in the recuperator, taking care that all interior surfaces are well coated with the acid-free mixture.

Reassemble in the buffer and recuperator body, less packings, and replace the latter in the cradle.

CARRIAGES, 3.7-IN. HOWITZER, MKS. I TO IVP

38. Lay gun horizontal and secure it to cradle.

Release all air pressure by removing adapter cap and opening valve "C."

Take the buffer and recuperator body from the cradle by removing the front nuts on the piston rods of both buffer and recuperator pistons, nut securing howitzer, and the cradle cap.

Take off the recuperator piston rod collar and remove the

stuffing boxes complete with glands, packings, etc., from both cylinders, together with spring and retarding valve from recuperator cylinder. Drain out all oil and remove packings from stuffing boxes.

Withdraw buffer and recuperator pistons from cylinders, and remove "U" section packings and piston packing. Reassemble recuperator piston, less packings.

Remove plugs "A," "D," "E," stop valve "C" and plug adjusting run-out, together with all glands, rings, and packings, etc.

Reassemble, less packings, and treat as described in paras. 15, 17 and 18, after which thoroughly drain and dry.

When cool replace all fittings, except packings, taking care that all interior surfaces are well coated with the acid-free mixture.

Replace in the cradle.

CARRIAGES, 60-PR., MKS. IV, IVR AND IVP AND 4.5-IN./60-PR., Mk. IVP

39. Lay the gun horizontal, lash it securely to the cradle, and remove elevating handwheel.

Close isolating valve, unscrew elbow joint connection from the cylinder block, and insert tank inlet plug.

Remove nuts securing piston rods, cradle cap, and nut securing cylinder block to lug of gun.

Withdraw the cylinder block to the front, care being taken to avoid damage to the slides, etc., and place it horizontally on suitable supports.

Release all air pressure by removing plug "L" and opening valve "M."

Remove the stuffing boxes complete with glands, packing, etc., from the three cylinders, also the rear plug of the buffer and the dust cap, together with seating, spring and retarding valve from the recuperator.

Drain all oil out of the system, withdraw the floating piston, also buffer and recuperator pistons, remove "U" section packing rings and compressed packing rings, and reassemble piston heads, less packings.

Remove all packings from stuffing boxes.

Remove plugs "A," "B," valve "M" and adapter hole plug, together with non-return valve and spring.

Treat as described in paras. 15, 17 and 18.

Carefully clean all the remaining parts, opening the run-out adjusting valve, and immerse in bath, taking care that all interior surfaces are well coated with the mixture.

Thoroughly drain and dry. When cool, reassemble in the cylinder block, less packings, and replace in the cradle.

CARRIAGES, 6-IN. HOWITZER, MKS. I, IR AND IP

40. Remove depression stop, lay the howitzer horizontal and lash it securely to the cradle.

Close isolating valve, remove plug securing pipe from cylinder block and insert the inlet plug.

Remove nuts securing piston rods, the front cap of cradle and nut securing cylinder block to howitzer lug.

Withdraw the cylinder block to the front, care being taken to avoid damage to the slides, etc., and place it horizontally on suitable supports.

Release all air pressure by removing plug "F" and opening valve "G."

Remove screwed collar from recuperator piston rod, and also stuffing boxes complete with cap, gland, packings, etc., from the buffer and hydraulic cylinders. Withdraw retarding valve, centring collar, and spring. Drain all oil out of the system.

Remove the dust cap from the rear end of the hydraulic cylinder and withdraw piston. Take out the "U" rubbers and packings, and reassemble, less rubbers and packings. Remove control cylinder from buffer cylinder and withdraw piston.

Remove snifting valve, plugs "A," "D," "E," "F" and "H," and remove all packings from stuffing boxes.

Treat as described in paras. 15, 17 and 18. Thoroughly drain and dry. When cool, reassemble in the cylinder block, less packings and replace in the cradle.

CARRIAGES, 6-IN. GUN, MKS. VIII AND VIIIA AND 8-IN. HOWITZER, MK. VIIA

41. Lay the gun or howitzer horizontal and secure it to cradle.

Release all air pressure by removing plug "F" and opening valve "G."

Remove front nuts on the rods of both buffer and recuperator pistons, nut securing gun and the cradle cap. Remove cylinder block from cradle and place it horizontally on suitable supports.

Remove stuffing boxes, complete with cap, gland, packings, etc., from the buffer cylinder and the hydraulic cylinders of the recuperator, taking off the screwed collars on the front end of the rods of the recuperator pistons. Withdraw retarding valves, centring collars, and springs. Drain all oil out of system.

Remove the dust caps from rear ends of the hydraulic cylinders of the recuperator and withdraw pistons. Take out the "U" rubbers and packings.

Remove the control cylinder from the buffer cylinder and withdraw piston complete. Reassemble, less packings.

Remove plugs "A," "B," "C," "D," "E," "F" and "H," and also packing from stuffing boxes. Slack back air valve and running-out adjusting valve.

Treat as described in paras. 15, 17 and 18. Thoroughly drain and dry. When cool, reassemble in the cylinder block, less packings, and replace in the cradle.

CARRIAGES, 9.2-IN. HOWITZER, MKS. I AND II

42. Lay cradle horizontal, release all air pressure by removing the closing plug of the recuperator rear plug and opening air valve.

Remove air, filling and drain plugs, and run off all liquid from the recuperator system.

Remove recuperator crosshead, together with piston rod cover, ram gland with packings, and stuffing box, and withdraw floating piston with ram. Remove piston rod gland together with packings, floating piston stop plate and withdraw piston. Remove packings from piston and reassemble, less packings.

Buffer system.—Remove front spur wheel, segment, guard, piston rod front nut, piston, bevel wheel segment, and remove buffer system complete. Remove piston rod collar, piston rod glands, together with packings, stuffing box, and withdraw piston rod. Take down tank and fittings, and remove all plugs.

Thoroughly clean all parts, removing any appearance of rust. Excessive rust should be reported to the O.M.E. Carefully and thoroughly coat all such surfaces with acid-free mixture at a temperature of about 250° F. When cool, reassemble, less packings, floating piston, buffer piston, and recuperator ram, care being taken to maintain the coating of mixture intact.

The pistons and recuperator ram must be treated separately, and then labelled distinctly with the number on the buffer and recuperator, service and Mark of carriage to which they belong, after which they must be stored upon racks with V-shaped grooves cut to prevent damage by coming into contact with each other.

CARRIAGES, 12-IN. HOWITZER, MKS. II AND IIA

43. Lay cradle horizontal, release all air pressure by removing the closing plug of the recuperator rear plug and opening air valve.

Remove drain plug and run off oil from the recuperator

system. Remove recuperator crosshead together with piston rod cover, ram gland with packings and stuffing box, and withdraw floating piston together with ram.

Remove piston rod gland, together with packings, floating piston stop plate, and withdraw floating piston. Remove packings from floating piston and reassemble, less packings.

Buffer system.—Remove front and rear piston nuts, glands, packings, and stuffing box, and withdraw piston.

Remove gland or locking plunger and control cylinder retarding plug, also air and filling plugs.

Thoroughly clean all parts, removing any appearance of rust. Excessive rust must be reported to an O.M.E. Carefully and thoroughly coat all such surfaces with acid-free mixture at a temperature of about 250° F. When cool, reassemble, less packings, floating piston, buffer piston, and recuperator ram, care being taken to maintain the coating of mixture intact.

The pistons and recuperator rams must be treated separately and then labelled distinctly with the number of the buffer and recuperator, service and Mark of carriage to which they belong, after which they must be stored upon racks with V-shaped grooves, cut to prevent damage by coming into contact with each other.

Where hydraulic rammer gear is fitted.—Release all air pressure by removing pressure gauge and opening valve in H.P. cylinder front plug.

Remove gland, packings and valve complete.

Disconnect and strip down all piping in the system; thoroughly drain off all hydraulic liquid, and clean the interiors of the pipes by means of a wire brush of suitable proportions. Thoroughly dry and free from dust and scale. Remove hydraulic cylinder gland locking plate, glands, together with packings, stuffing box, and three-way suction connection, together with suction valve and fittings.

Withdraw hydraulic cylinder piston, strip down, and remove all packings. Thoroughly clean all parts and reassemble, less packings.

Unscrew replenishing tank from hydraulic cylinder, strip down valve for preventing overcharging, non-return valve of the tank, and replenishing tank, ball valve, and seating. Carefully clean, dry, and reassemble.

Remove H.P. cylinder cover, delivery valve, together with cage and fittings, and withdraw floating piston and relief valve rod. Remove all packings, thoroughly clean, dry, and reassemble, less packings. Remove piston rod leakage indicator, clean, dry, thoroughly coat with acid-free mixture, and reassemble.

The H.P. and hydraulic cylinders must be carefully examined, any signs of slight rust cleaned off, and the surfaces carefully coated with acid-free mixture. Excessive rust must be reported to an O.M.E. The accumulator will then be reassembled, less packings. The hydraulic cylinder stuffing box must be packed with ordinary soft tallow packing.

Strip down the hydraulic ram and remove all packings. Thoroughly clean, dry and reassemble, less packings, all steel parts being carefully coated with acid-free mixture.

Strip down the hydraulic valve, clean, and reassemble.

The whole of the system must be reassembled, less packings, jointing discs being used for the connections of the pipes to hydraulic rammer, and then completely fill with acid-free mineral oil.

MOUNTINGS, 3·7-IN. A.A., MKS. I AND IA.

44. Buffer system.—Empty the buffer by depressing the gun and removing the air plug "C" in the cradle, situated below the intensifier and the air plug "D" in the rear of the piston rod. Remove the filling plug on the gravity tank.

Place a receptacle in position and remove the drain plug "L" from the underside of the front end of the buffer cylinder.

When empty, replace the plugs and bring the gun horizontal.

To remove the piston rod and control rod. Remove the buffer keep pin and piston rod nut.

Remove the locking plate and slacken the nuts on the front end of the air cylinder tension rods until the sliding crosshead engages the ram safety stop, then disconnect the gun from the rear ends of the rods by removing the split pins and nuts.

If possible the gun should now be dismantled. If not possible, place preventer skidding under the breech ring and fix check and hauling ropes, and haul the gun to the rear clear of the piston rod.

Remove the piston rod collar.

Unscrew the gland from the rear end of the buffer cylinder and remove the packings.

Remove the locking plates at the front end of the buffer and remove the control rod securing nut.

Withdraw the control rod about 32 inches and remove the leather washer.

Now withdraw the buffer piston and control rod, completely assembled, to the front.

Remove the gland and packings.

Remove the locking plate from the throttling bush in the piston head, and unscrew and remove the throttling bush.

Withdraw the control rod from the piston.

Air cylinder.—Depress the gun and secure the elevating gear by lashing.

See that air charging valve "J" is closed and remove cap "H."

Release all air pressure by gently opening charging valve "J." When empty, and the gauge reads ZERO, remove the charging valve "J" completely, *taking great care that no person is in line during its removal.*

Remove the nuts from the front end of the tension rods and push the recuperator ram in about 6 inches.

Remove the screw securing the crosshead stop and take out the stops.

Withdraw the recuperator ram to the front and remove gland and packing.

Intensifier.—After air is released from the air cylinder, remove the locking wire, securing screw, locking piece of air valve "E" of the liquid gland and slacken air valve "E." Remove the securing screws and cap from front of the intensifier and the split pin, nut and indicator from front end of piston rod. Place a receptacle in position to receive the liquid. Remove the gland, supporting collars and packing from the stuffing box. Unscrew the stuffing box and remove the piston. When empty, replace parts.

Thoroughly clean all parts, remove all appearance of rust; dry out the air cylinder and treat all steel parts with acid-free mixture. The interior of the buffer and recuperator cylinders should be sprayed with the mixture at 250° F. and parts which can be immersed should be so dealt with.

Note.—The recuperator rams are of stainless steel and need only be cleaned and wiped with an oily rag.

MOUNTING, 4.5-IN. A.A., Mk. I

45. Buffer system.—Empty the buffer by laying the gun horizontal and removing air valve "E" on the right front end of the buffer cylinder, the air plug "D" in the rear end of the piston rod and air or filling plug "A" or "B," on the tank.

Place a receptacle in position and remove the drain plug "C" from the underside of the rear end of the buffer cylinder.

When empty replace the plugs.

To release air pressure, lay the gun horizontal and secure the elevating gear by lashing. See that charging valve "N" is closed and remove cap "M." Gently open charging valve "N" thus permitting the air to escape. When empty close valve "N" and replace cap "M."

Note.—Before dismantling the recuperator and/or intensifier, after ensuring that all air has escaped, remove air charging valve "N" completely, taking care that no person is in line with it during removal.

To remove the piston rod and control rod.—Remove the keep pin and piston rod nut from the rear of the piston rod. Remove locking plates from the front end of the buffer cylinder and remove the securing nut. Withdraw the control rod about 18 inches and remove the leather washer. Now withdraw the buffer piston and control rod, completely assembled, to the front. Remove the locking plate from the throttling bush in the piston head and unscrew and remove the throttling bush.

Withdraw the control rod from the piston. Remove gland and packings.

Note.—To remove the buffer glands and packings and to replace the packings it is better to have the gun dismounted. If this is not possible the gun must be pulled back sufficiently clear and supported by preventer skidding under the breech.

Air cylinder.—Release the air as shown above. Remove the recuperator ram nut and force the ram into the cylinder. Remove the oil pipes from the intensifier and the three adapters. Remove the six housing bolts from the securing cap and remove the cap and recuperator cylinder and ram. Remove gland and packings.

Intensifier.—After the air is released from the air cylinder slacken air valve "G." Remove securing screws and cap from front of intensifier. Remove split pin, nut and indicator from front end of piston rod. Place a receptacle in position to receive the liquid. Remove the gland, supporting collars and packing from the stuffing box. Unscrew the stuffing box and remove piston. When empty, replace parts.

Thoroughly clean all parts, remove all appearances of rust; dry out the air cylinder and treat all steel parts with acid-free mixture. The interior of the buffer and recuperator cylinders must be sprayed with the mixture at 250° F. and parts which can be immersed should be so dealt with.

Note.—The recuperator rams are of stainless steel and need only be cleaned and wiped with an oily rag.

MOUNTING, RAILWAY TRUCK, 12-IN. HOWITZER, Mk. II

46. Lay howitzer horizontal, release all air pressure by removing cap "B" and opening valve "C." When all air has escaped remove valve "C."

Recuperator.—Remove the gland nuts of the hydraulic cylinders, together with packings and caps, withdraw rams. Strip down the latter, remove packings, and reassemble, less packings and rams. Remove all plugs in the system and thoroughly drain free of oil.

Spray in through air-filling valve hole acid-free mixture at a temperature of about 250° F. by means of a No. 1 portable liquid pump, or similar apparatus.

Buffer.—Remove stuffing box glands together with packings, stuffing box, and control rod securing nut, and withdraw control rod and piston rods.

Remove throttling bush securing screw, throttling bush, and withdraw control rod. Remove all plugs.

Thoroughly clean all parts, removing any appearance of rust. Excessive rust must be reported to an O.M.E. Carefully and thoroughly coat all such surfaces with acid-free mixture. When cool, reassemble, less packings and piston, leaving the throttling bush in the piston slack so as to be easily removed again for inspection purposes.

The buffer piston and recuperator rams must be immersed separately and then labelled distinctly with the number of the buffer and recuperator, service, and Mark of the mounting to which they belong, after which they must be stored upon racks with V-shaped grooves, cut to prevent damage by coming in contact with each other.

MOUNTING, RAILWAY TRUCK, 12-IN. HOWITZER, Mk. III

47. Lay howitzer horizontal, release all air pressure by removing plug "B" and opening valve "C." When all air has escaped remove valve "C."

Remove the cradle cap, first unscrewing the securing nuts, locking plate, and piston nut, then the locking bar and nuts securing the recuperator rams, also stop cylinder head. Lastly, remove the attachment adjusting and locking recuperator gland nuts, also brackets rail loading bogie, and withdraw the buffer system complete. Remove glands and packing from the cylinder.

Recuperator.—Remove safety collars, hydraulic cylinder gland nut, packings, hydraulic cylinders end cap, and withdraw rams. Strip down and remove packings from rods.

Remove plug "A" air-filling valve, and, after carefully drying the air reservoirs, spray in through air-filling valve hole acid-free mixture at a temperature of about 250° F. by means of a No. 1 portable liquid pump or similar apparatus.

Thoroughly clean all parts, removing any appearance of rust. Excessive rust must be reported to an O.M.E. Carefully and thoroughly coat all such surfaces with acid-free mixture. When cool, reassemble, less packings, recuperator rams, and buffer piston, leaving throttling bush in piston slack so as to be easily removed again for inspection purposes.

The buffer piston rod and recuperator rams must be immersed separately and then labelled distinctly with the number of the buffer and recuperator, service, and Mark of mounting to which they belong, after which they must be stored upon racks with V-shaped grooves, cut to prevent damage by coming in contact with each other.

Issue of Carriages having Buffers and Air Recuperators.

48. When an issue is made to other ordnance depots, the process as outlined in paras. 15 to 47 will be completed, except that recuperator and buffer pistons and rods will not be reassembled but will be packed separately, firmly supported between wood "V" blocks suitably secured in the packing case and labelled with the number of buffer and recuperator to which they belong.

49. When an issue is made to a unit, all parts will be cleaned and reassembled complete and the system charged by the issuing depot.

The issue voucher will be enfaced to show whether the recuperator is "charged" or "empty."

The recuperator and package will be clearly stencilled with at least one-inch letters either—

"EMPTY, PACKINGS REMOVED."

or

"CHARGED DATE / / . LIQUID AND AIR
PRESSURE .. LB. SQUARE INCH."

(NOTE.—For all other stripping and operational instructions, etc., reference must be made to the handbook of the equipment concerned.)

SECTION III

MISCELLANEOUS STORES

COMPRESSOR, AIR, TRAVELLING

50. *Air reservoirs.*—Open valve of each air cylinder separately and discharge separately until atmospheric pressure is reached in all cylinders, allow all valves to remain open for twelve hours, and then close valves completely down. It is essential that these valves should be kept closed.

51. *Petrol engines.*—Remove balata belt and high-tension cable (between magneto and sparking plug), remove fan belt, and rub well with dubbing, then store in a dry, temperate place.

52. The engine cylinder, exhaust pipes, and exhaust box must be thoroughly cleaned and painted, care being taken not to paint any part of the sparking plug or magneto. The sparking plug, valves, and springs must be coated with mineral jelly, *in situ*, and the jockey pulley and belt pulley painted.

53. Every six months both magneto and fan bearings must be lubricated with three or four drops of lubricating oil and a small quantity of air-cooled engine oil run through the compression tap, the engine being rotated at a fast speed for two minutes by means of the starting handle.

54. *Petrol tanks.*—Remove the tank filling cap and paint interior walls of tank with air-cooled engine oil. The interior of the tank must be inspected every twelve months and, if necessary, painted with oil at each inspection.

55. *Pumps, air, two-stage, horizontal, Nos. 1 and 4.*—Remove caps of L.P. delivery and suction valves, and H.P. delivery and suction valves; take out the valves and thoroughly cover both valves and seating with acid-free mixture. Reassemble all parts as dismantled. Tie a rag over the cap of the L.P. suction valve to exclude dust from the pump cylinder. Open drain cock and drain off all water. Allow to stand until dry. Pour in paint through the filling hole until the water jacket is completely filled, then remove drain cock and allow the paint to run out into a suitable receptacle until completely drained. The walls will then be covered with a coat of paint. Paint pulley all over. Allow between 60 and 70 drops of oil to drip from the sight feed lubricator, afterwards rotating the pump by pulling round the belt pulley for twelve or more revolutions. Every six months about 20 drops of oil must be allowed to drip from the sight-feed lubricator and the pulley rotated several revolutions.

56. Trailers.—Remove wheels from axle and suspend in a dry, dark, cool place where the rubber tyres are not subject to any great variation in temperature. After five years the rubber tyres must be examined annually. Great care must be taken that no oil or grease comes in contact with the rubber tyres. All straps must be treated with dubbing. Every five years the whole of the paintwork must be examined and, if necessary, repainted.

COMPRESSOR, AIR, 12-IN. HOWITZER

57. The instructions contained in paras. **51** to **55** inclusive apply equally to the pump and petrol engine comprising the compressor, air, 12-in. howitzer.

PUMPS

58. Pumps must be stripped down, thoroughly cleaned, and, where applicable, the water in the jacket drained off. All bright parts must be coated with acid-free mixture, both internally and externally, before being re-assembled. Where packings are fitted they must be treated as described in paras. **23** and **24**. Pumps must be stored in their boxes, where provided.

RESERVOIRS, COMPRESSED AIR

General Instructions

59. A history sheet (C.I.A. Form 269A) is issued with each reservoir and is intended to record a complete history of the reservoir from the date of issue to its final return to store. The result of all tests will be recorded, also anything calling for special remarks. It will always be kept with the reservoir. Reports of the entries made in the history sheet will be forwarded to the C.I.A. on A.F. G 881B, through the G.O.C.-in-C., on the completion of the biennial test.

60. Reservoirs will be returned by units biennially for testing in R.A.O.C. workshops, in accordance with the instructions contained in paras. **83** and **84** to ascertain whether they are in a serviceable condition. Oil, mineral, hydraulic buffer, used for these tests must not previously have been used for any other purpose.

61. Any reservoir failing to pass the test, or showing any leakage or permanent set above the limit laid down, must be returned to the C.O.O., Woolwich.

62. Reservoirs will be stamped with a registered number,

the manufacturer's name or recognised trade mark, the Mark, the year of manufacture and the date of test, *i.e.*—

Number 56

J.B. & Co.

I

1937

T 1-4-39

The stamping of the date of test will be carried out locally and must on no account be done unless the reservoir is empty.

63. Before being received from units, reservoirs must have been emptied and stencilled "EMPTY" by the returning unit. When issued filled, reservoirs will be stencilled "FILLED," together with the amount of pressure in them.

64. Air reservoirs will be used solely for containing compressed air and will be marked by painting along the reservoir, in letters of suitable size, "COMPRESSED AIR ONLY."

65. Care must be taken, in moving reservoirs, that they are not thrown down or roughly handled and that the rope grummets, where provided, are in position to protect them from jar. Reservoirs must not be allowed to rust under the grummets.

66. Wadmitilts, or other suitable covering as may be available, will be placed over the reservoirs, when required, to protect them from the direct rays of the sun.

Special Instructions

RESERVOIRS, AIR—TRAVELLING AIR COMPRESSOR

67. After three years in store, the reservoirs must be removed from the trailer and tested before issue, in accordance with paras. 83 and 84. If remaining in store, they need only be examined for external rust biennially, and, if any sign of rust is discovered, the surface must be thoroughly cleaned and repainted.

68. The maximum working pressure, which must not be exceeded, is 1000 lb. a square inch, and the hydraulic test pressure 2000 lb. a square inch.

69. General treatment will be as laid down in paras. 59 to 66, where applicable.

RESERVOIRS, COMPRESSED AIR, 9-IN. DIAMETER, MKS. II AND III, AND 5½-IN. DIAMETER, MK. I

70. After three years in store, reservoirs must be tested before issue in accordance with paras. 83 and 84. If remaining in store, they need only be examined for external rust biennially, and, if any sign of rust is discovered, the surface must be thoroughly cleaned and repainted.

71. Three rope grummets (of 4-in. tarred rope) will be placed on 9-in. diameter reservoirs and two rope grummets (of 3-in. tarred rope) on 5½-in. diameter reservoirs, to protect them from jar when being moved.

72. The maximum working pressures, which must not be exceeded, and the hydraulic test pressures are as follows :—

	Hydraulic test pressure, lb. a sq. in.	Working pressure, lb. a sq. in.
9-in. diameter, Mks. II and III	3000	2000
5½-in. diameter, Mk. I	3000	1800

73. General treatment will be as laid down in paras. 59 to 66, where applicable.

RESERVOIRS, COMPRESSED AIR—RAILWAY TRUCK MOUNTINGS

74. After three years in store, reservoirs must be removed and tested before issue, in accordance with paras. 83 and 84. If remaining in store, they need only be examined for external rust biennially, and, if any sign of rust is discovered, the surface must be thoroughly cleaned and repainted.

75. The maximum working pressures, which must not be exceeded, and the hydraulic test pressures are as follows :—

	Hydraulic test pressure, lb. a sq. in.	Working pressure, lb. a sq. in.
B.L. 14-in. guns and 18-in. howrs.	4000	2500
B.L. 12-in. howrs., Mks. II and III	2250	1250

76. General treatment will be as laid down in paras. 59 to 66, where applicable.

RESERVOIRS, COMPRESSED AIR—9·2-IN. MK. VII MOUNTING

77. After three years in store, reservoirs must be tested before issue, in accordance with paras. 83 and 84. If remaining in store or in a state of preservation on the mounting, they need only be examined for external rust biennially, and, if any sign of rust is discovered, the surface must be thoroughly cleaned and repainted.

78. The maximum working pressure, which must not be exceeded, is 3500 lb. a square inch and the hydraulic test pressure 5600 lb. a square inch.

79. General treatment will be as laid down in paras. 59 to 66, where applicable.

CYLINDERS, AIR—STROMBOS HORN, Mk. II

80. After three years in store, the cylinders must be tested before issue, in accordance with paras. 83 and 84. If remaining in store, they need only be examined for external rust biennially, and, if any sign of rust is discovered, the surface must be thoroughly cleaned and repainted.

81. The maximum working pressure, which must not be exceeded, is 1700 lb. a square inch and the hydraulic test pressure 3400 lb. a square inch.

82. General treatment will be as laid down in paras. 59 to 66, where applicable.

**Instructions for Testing Air Reservoirs in Cylinders,
Testing, No. 1, Mk. I and No. 2, Mk. I**

83. Only the oil referred to in para. 60 must be used for these tests, which will be carried out as follows :—

Ensure that the reservoir to be tested is completely emptied of air pressure and remove the fittings necessary to enable the correct adapter to be assembled.

Fill the air reservoir, in a vertical position, with buffer oil.

Screw in the adapter, making a joint on the soft copper washer.

Attach the cover plate of the testing cylinder, making a joint on the underside with a leather washer.

Screw on the lifting eye.

Remove the thumb screw from the filling plug in the cover plate.

Partly fill the testing cylinder with water.

Lower the reservoir into the testing cylinder by means of the lifting eye, ensuring that the cover plate beds down correctly on the leather joint ring on top of testing cylinder.

Secure the cover plate in position by the screwed clamps.

Remove the filling plug from the cover plate, complete the filling of the testing cylinder and replace the plug, allowing surplus water to escape through the thumb screw hole.

Replace the thumb screw.

Remove the lifting eye.

Connect the reservoir by copper tubing to the pump, testing, compressed air reservoirs.

Ensure that all air is excluded by slackening the union at the reservoir and taking a few strokes of the pump. Note that the zero level of water in the gauge registers correctly.

Proceed gently by pumping up to the test pressures as shown under the appropriate reservoir, paras. 67 to 81.

Note the level B in the gauge tube.

Record the level A-B in the space provided on the test sheet.

Release the test pressure slowly, taking care to provide a suitable receptacle for the escaping oil.

Note the final level C in the gauge tube.

Record A-C and the percentage value in the appropriate columns on the test sheet.

If the residual expansion A-C is more than 10 per cent. of the expansion A-B, or the reservoir fails to pass the test in other respects, it will be disposed of as detailed in para. 61.

No further tests will be applied to a reservoir which fails to pass the water jacket test at the first trial.

Precautions, when testing

84. Great care must be exercised to ensure oil-tight joints.

Pressure must be applied and released slowly and steadily, or dangerous oscillation may be set up inside the reservoir.

If sudden or abnormal rises in the gauge tube level occur, suspect oil leakage into the water jacket.

GAUGES, PRESSURE

85. All pressure gauges must be overhauled and tested annually (or more often if necessary) by means of the "Gauge, pressure, dead weight, testing" to ensure that they record correct pressures.

86. Special care must be exercised when handling pressure gauges, so as to avoid damaging the threads. When not in use they must be kept in the boxes provided for them and not exposed to the sun.

JACKS, LIFTING, HYDRAULIC

87. Jacks, when once filled, will be kept constantly so, whether in use or in store except as provided for in para. 88. They will, however, be emptied and washed out once every twelve months and refilled. The liquid taken out can be filtered and used again if not too thick.

A moderate pressure must be constantly maintained on the leather packings to preserve them in good condition and prevent leakage. With this object in view, jacks must be pumped up daily in the "Frame, store, hydraulic jack," and then lashed to prevent their falling in the event of the pressure going off.

By standing unused a long time the ram is liable, from rusting, to set fast in the cylinder. To prevent this and other defects, the thickness of the pad must be varied during the daily pumping operation, and the jack examined at regular intervals.

For transport, hydraulic jacks must be lowered to their fullest extent so as to collect the fluid in the reservoir, the air-screw plug tightly screwed down, and the claw lashed to the foot.

88. Where jacks are not in general use and are not likely to be employed for a lengthy period, they may, at the discretion of an ordnance officer be stripped down and greased, the leathers being treated with dubbing and stored, with the jacks, in a suitable packing case. The jacks must be examined periodically and regreased at intervals not greater than twelve months.

RECEIVERS, AIR, MOUNTED ON AIR COMPRESSORS, No. 2

89. To test, dismount the Receivers, Air (two), by breaking the necessary pipe joints and lifting the cover clear. Inspect the interior of each receiver for rust or other foreign matter through the opening which takes the flanged compressor charging pipe, and clear as necessary. Provide locally a flange joint for the opening, fitted with an adapter to connect with a "Pump, testing, compressed air reservoirs," through pipe connections, and a "Gauge, pressure, No. 1, Mk. I." Before attachment, fill each receiver in turn with "Oil, mineral" (about 10 gallons required), fix the flange joint, connect to the pump, and test each receiver until the gauge registers 150 lb. per sq. inch. If this pressure is maintained for 2 minutes, break the connections, and run off the oil. After each biennial test, each receiver must be stencilled with the words "TESTED —/—/— (date)."

Notified in A.C.Is. 30th July, 1941

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26
Regulations
2106

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

PAMPHLET No. 27, 1940

AMENDMENTS (No. 1A)

1. Page 6. *Delete* para. 13 and *substitute* :—

²⁷⁰
Guns
65 13. Loose liners, loose barrels and monobloc barrels will ^{Amdt. 1A} be visually examined on receipt, treated as follows and stored ^{July, 1941} horizontally in racks :—

(a) Bore.—As detailed in paras. 5 to 9.

(b) Exterior—

- (i) Loose liners will be coated with a mixture of mineral jelly and beeswax as in para. 5, care being taken to “touch up” the “slinging positions” after disposal in the racks.
- (ii) Loose barrels will be painted at the forward end, *i.e.* part protruding from jacket, and the remainder treated as at (i) above.
- (iii) Monobloc barrels will be painted, except for working and fitting surfaces, which will be treated as at (i) above.
- (iv) Loose liners and barrels will be visually examined quarterly, monobloc barrels half yearly and, if necessary, the unpainted portions treated as indicated in para. 15, until the metal is thoroughly heated, or, where applicable, as in last sentence of para. 20.

Notified in A.C.Is. 24th December, 1941.

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26
Regulations
2106

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

PAMPHLET No. 27, 1940

AMENDMENTS (No. 2A)

Amdt. 2A
Dec., 1941

Page 23, para. 60. Last line.—*After* “purpose” insert—26
“and must be clean and free from any foreign matter.” Regulations
2106

Page 27, para. 84. *Add* at end :—

Amdt. 2A
Dec., 1941

Note.—It is essential that after the test has been carried 26
out, all traces of oil must be removed from the reservoirs by Regulations
filling with air under pressure and then blowing off through 2106
the emptying valve. This procedure must be repeated until
oil mist ceases to emerge.

By Command of the Army Council,



THE WAR OFFICE,
24th December, 1941.

2. Page 23.

Delete para. 59.*Insert* new para. :—Amdt. 1A
July, 1941**60A.** The test pressure and date of last biennial test will be found painted on each reservoir thus—

TESTED LB. ON.

The results of the biennial test will be notified by units, through the G.O.C.-in-C., to the C.I.A. on A.F. G 881B for recording on history sheet (C.I.A. Form 269A) which is held for each reservoir to record a complete history from the date of issue to its final return to store.

By Command of the Army Council,



THE WAR OFFICE,
30th July, 1941.

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