SECTION G—3
ISSUE 1, JULY 1962

LUCAS

Quality

EQUIPMENT

WORKSHOP INSTRUCTIONS

BATTERIES (12-VOLT)

MODELS BT, BV, BLT, S, SF, SL and SFL

JOSEPH LUCAS LTD · BIRMINGHAM 19 · ENGLAND

Printed in England

BATTERIES (12-VOLT)

MODELS BT, BV, BLT, S, SF, SL AND SFL

The information regarding filling, charging, storage, testing and maintenance given in Lucas Publication No. 732H is applicable to these batteries, and has not been repeated in this Workshop Instruction

1. GENERAL

Lucas B and S batteries have a one-piece moulded lid instead of the six separate cell lids used in GT and other 12-volt batteries. Only the positive and negative terminal posts and filler arrangements are visible above the lid, giving a neat appearance to the battery top, which can be easily cleaned to prevent leakage. The intercell connectors are of the loop-over partition type below the cell lid.

BT, BV and BLT batteries have six separate screw-in type vent plugs as illustrated in Fig. 1 ; S, SF, SL and SFL batteries have a manifold venting system consisting of a plastic moulding incorporating push-in rubber vent plugs as shown in Figs. 2 and 3. Internally, the batteries have plate packs assembled with KG and glass wool separators, and a separator guard made from a hard rubber material. This separator guard, which protects the top edges of the separators and also acts as a splash guard, is perforated to show the acid level and to allow specific gravity readings to be taken.

Containers for BT, BV, BLT, S and SL batteries are moulded in Milam ; those for SF and SFL models are in hard rubber. All are intended for waist fixing, and will interchange with the GT and FRT ranges of batteries.

Each model is available in a "dry-charged" condition, the suffix Z being used following the basic type letters (e.g. BTZ, SFZ, etc.) to denote this. Information on "dry-charged" batteries is given in Publication No. 732H.

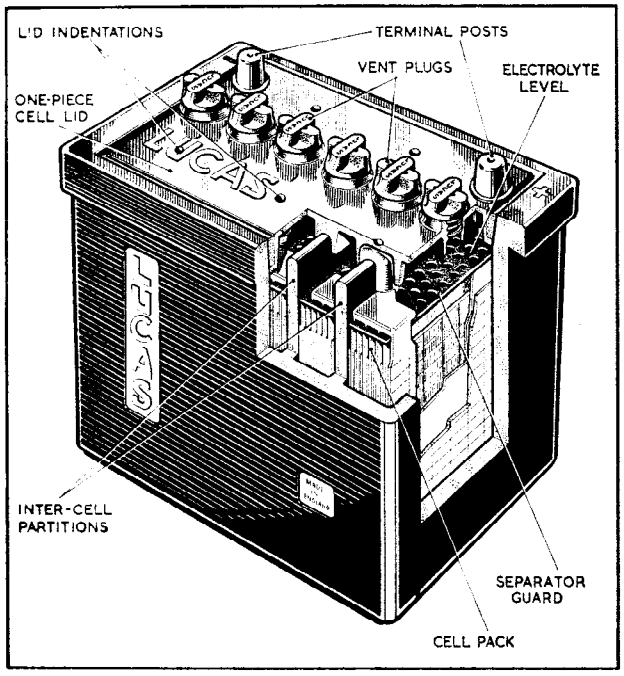

Fig. 1. BT and BV Batteries

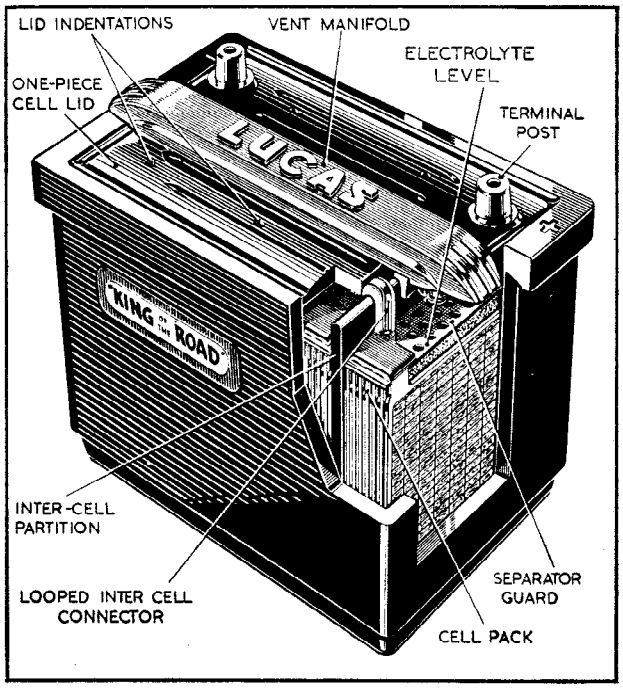

Fig. 2. S and SF Batteries

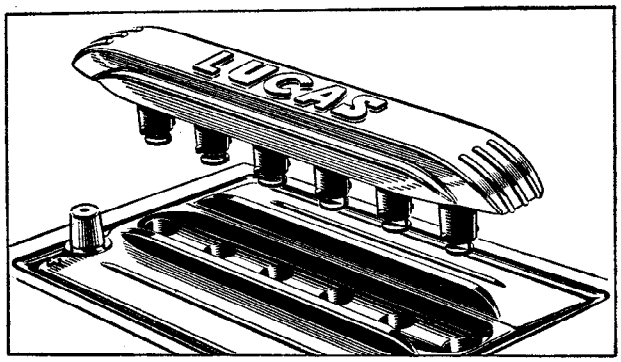

Fig. 3. The manifold venting system on S Batteries

2. CAPACITIES AND CHARGING RATES

Battery	*Plates in each Cell*	*Capacity (Ampere-Hours)*		*Volume of Electrolyte required to fill one Cell*		*Initial Charging Current (Amps.)*	*Normal Recharge Current (Amps.)*
		10-hr. rate	*20-hr. rate*	*Pint*	c.c.		
BT 7A SF 7A S 7A	7	38	43	¾	430	2.5	4.0
BLT 7A SL 7A	7	30	34	½	290	2.0	3.0
BT 9A SF 9A S 9A	9	51	58	1	570	3.5	5.0
BV 9A	9	44	50	1	570	3.0	4.5
SFL 9A	9	40	45	¾	430	3.0	4.0
BT 11A	11	64	72	1	570	4.5	6.5
BV 11A S 11/9	11	60	67	1¼	710	4.0	6.0

3. SERVICING

(a) BATTERY PERSISTS IN LOW STATE OF CHARGE

First consider the conditions under which the battery is used. If the battery is subjected to continuous discharge (e.g., long periods of night parking with lights on) without suitable opportunities for recharging, a low state of charge must be expected.

A fault in the dynamo or regulator, or neglect during a period out of commission, may also be responsible for the trouble.

Vent Plugs

See that the ventilating holes in each vent plug are clear.

Level of Electrolyte

The surface of the electrolyte should just cover the separator guards. If necessary, top up with distilled water. Any loss of acid from spilling or spraying (as opposed to the normal loss of **water** by evaporation) should be made good by dilute acid of the same specific gravity as that already in the cell.

Cleanliness

See that the top of the battery is free from dirt or moisture which might provide a discharge path. Ensure that the battery connections are clean, tight and coated with petroleum jelly.

Hydrometer Tests

Measure the specific gravity of the acid in each cell in turn with a hydrometer (see Fig. 4). To facilitate this measurement being taken, insert a short glass tube into the hydrometer rubber tubing, of a diameter that will pass through one of the apertures in the separator guard. To avoid misleading results, do not take readings immediately after topping up; at least thirty minutes' charging at the normal re-charge rate is required after topping-up to ensure true readings. The readings given by each of the cells should be approximately the same; if one cell differs appreciably from the others, an internal fault in that cell is indicated. This will probably be confirmed by the high-rate discharge test.

High Rate Discharge Test

It will be seen that there are five small indentations on the battery lid; these coincide with the concealed inter-cell connectors underneath. Two are between and in line with the terminals, and three in line and on the opposite side to the terminals. These indentations must be pierced with a pointed tool to expose the inter-cell connectors and allow the battery to be tested with the high rate discharge tester.

Press the pointed prongs firmly against the exposed negative and positive connectors of each cell, and note the readings on the meter. A good cell will maintain a reading of 1.2—1.5 volts for 10 seconds. If the reading rapidly falls off, the cell is probably faulty, in which event a new plate assembly may have to be fitted.

Re-seal the holes with sealing compound after testing.

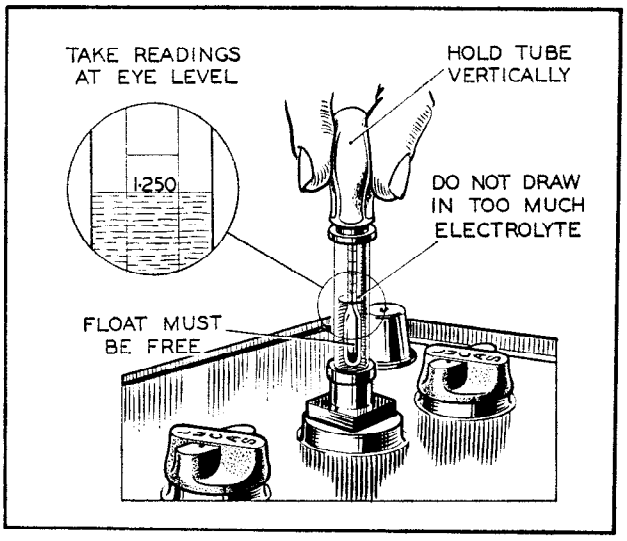

Fig. 4. Taking hydrometer readings

(b) RE-CHARGING FROM AN EXTERNAL SUPPLY

If the above tests indicate that the battery is merely discharged, and is otherwise in a good condition, it should be re-charged, either on the vehicle by a period of daytime running or on the bench from an external d.c. supply. If the latter, the battery should be charged at the recommended re-charge current given in Para. 2 until voltage and specific gravity show no increase over three successive hourly readings. The electrolyte must be kept level with the tops of the separator guards during the charging period by the addition of distilled water.

" Cycling "

A battery which may have become partially sulphated due to neglect during a period out of commission, or similar causes, will often respond to the process known as "cycling". This consists of fully charging the battery at the 10-hour rate given in Para. 2 and then discharging it by connecting to a lamp board, at the same rate. The battery should be capable of providing this current for at least 7 hours before it is fully discharged, as indicated by the voltage of each cell falling to 1.8. If the battery discharges in a shorter time, repeat the cycle of charge and discharge.

(c) DISMANTLING

If the tests show that a cell is faulty, adopt the following procedure to dismantle, inspect and if necessary refit a new plate assembly. Special tools are available to facilitate the dismantling of the battery. These can be obtained through the normal supply source.

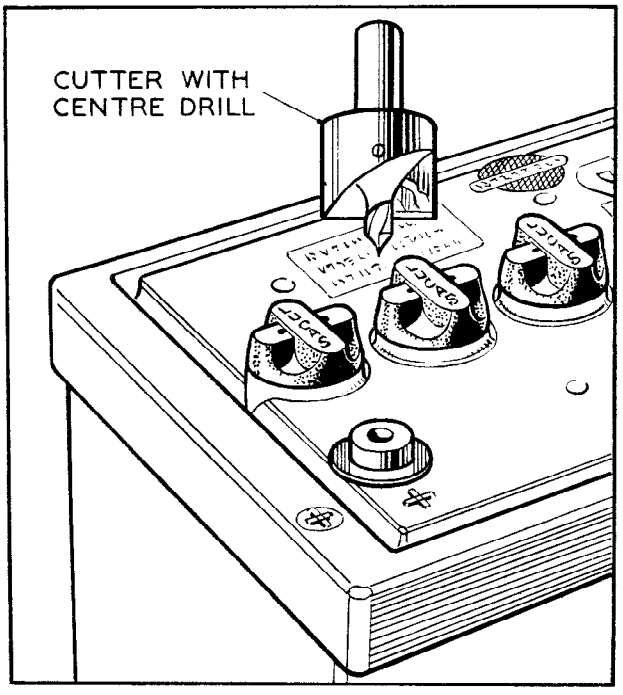

Fig. 5. Milled terminal post

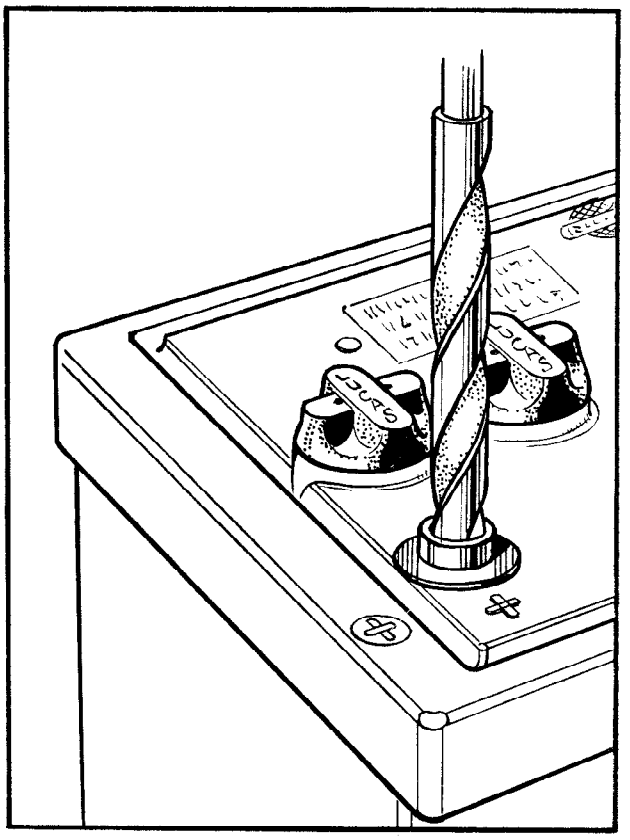

Fig. 6. Drilling the terminal post

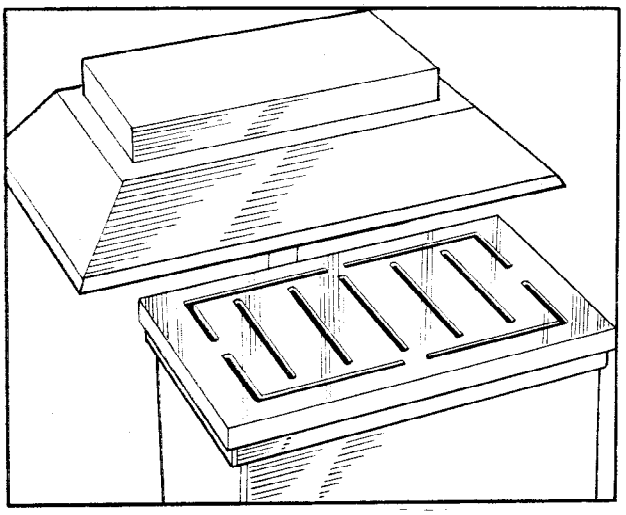

Fig. 7. Metal mask in position

(i) Ensure that the vent plugs are in place.

(ii) The positive and negative terminal posts must be sawn off or milled down to within $\frac{3}{16}$" of the bottom of the post (Fig. 5).
Drill centrally the remaining portion of the posts with a $\frac{5}{64}$" diameter drill until a clear break is made between the terminal post and the lead bush insert of the battery lid. This leaves the cell lid with two lead collars $\frac{3}{16}$" high, these being necessary for the re-burning of the terminal posts if the old lid is to be used again (Fig. 6).

(iii) Remove the vent plugs.

(iv) The sealing compound around and beneath the lid must now be thoroughly softened by means of infra-red lamps or elements, or by steam. If infra-red lamps or elements are used, the lid and battery case should be protected by fitting the metal mask illustrated in Fig. 7, which is slotted

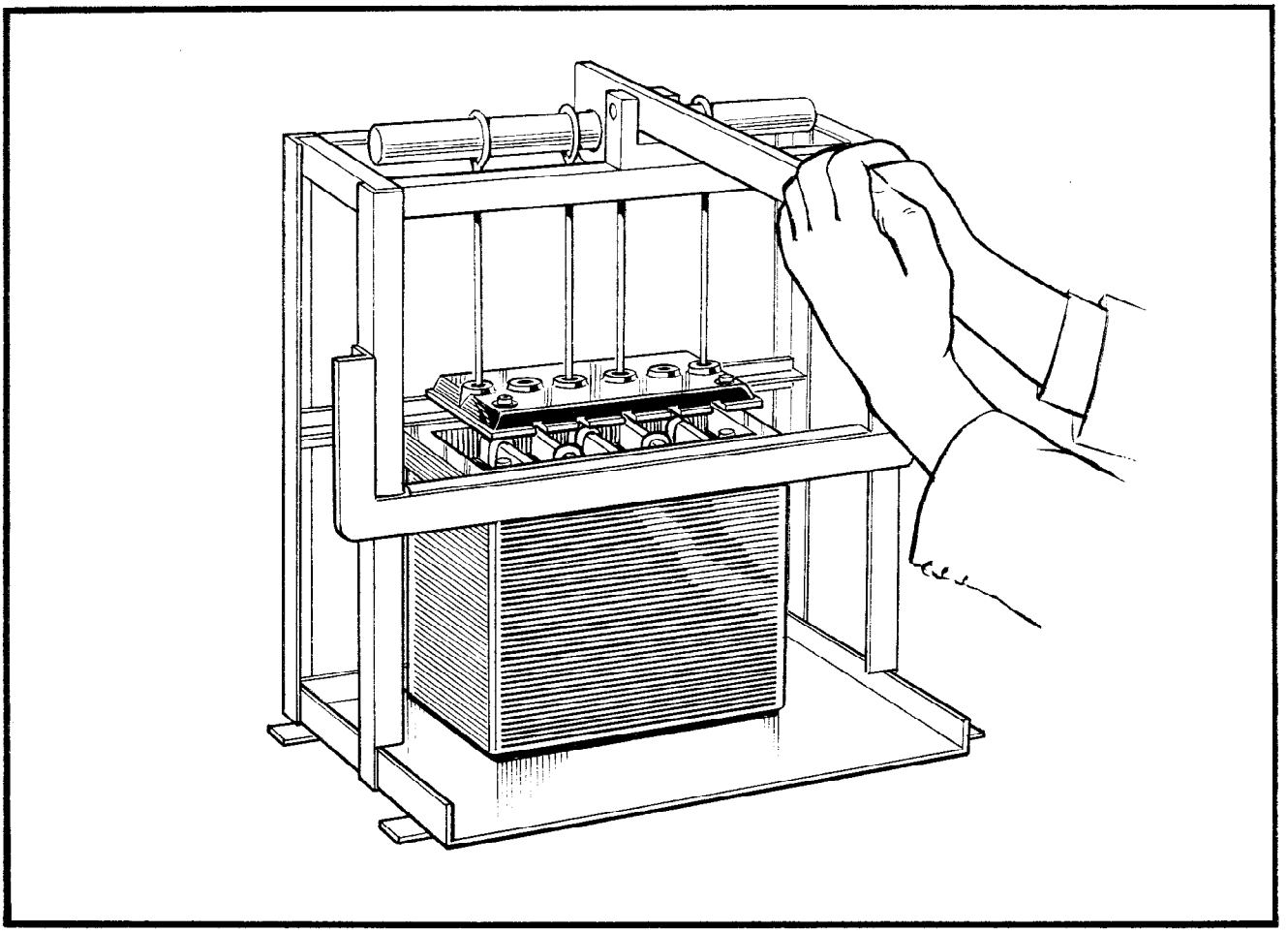

Fig. 8. Removing battery lid

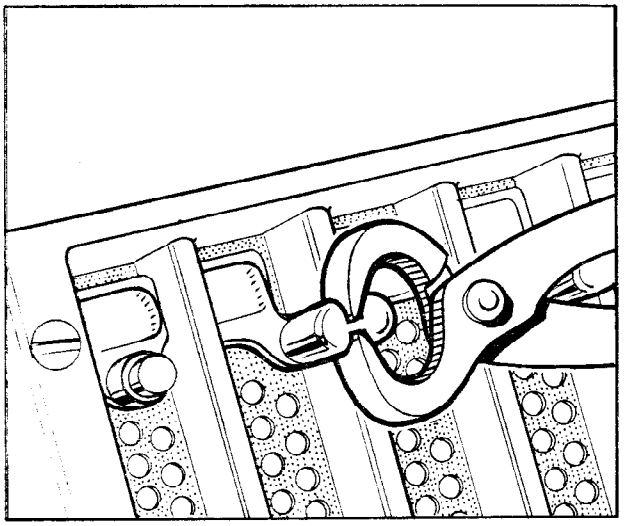

Fig. 9. Cutting inter-cell connector links

so that only the sealing areas are exposed to the heat rays. Make sure that the remains of the terminal posts do not short circuit through the metal mask.

Note : When infra-red lamps or elements are used, the battery must not be totally enclosed in the battery heating apparatus. The compound will become sufficiently soft in about 15—20 minutes. If infra-red equipment is not available, the sealing compound can be softened in a steam bath or by using a steam cover which is placed on top of the battery. Normally the compound will be softened in about 10 minutes using steam. **The sealing compound should be sufficiently warm to allow the lid to be lifted easily by the extracting jig.**

(v) To remove the lid, use the extracting jig illustrated in Fig. 8 and proceed as follows:

Raise the hinged front bar of the jig and slide the battery into position in the jig with the terminal posts towards the front. Lower the bar across the front edge of the battery. For BT7, 9 and 11 and S7 and 9 batteries, the jig is used as shown, but with batteries BLT7, SL7 and SFL9 packing must be placed below the battery in order to bring the top edge of the container up to the retaining bars of the jig.

Hook the right-angled lifting rods through the vent plug apertures so that they engage with the underside of the battery lid. Apply downward pressure on the lever. The lid will lift away from the battery, provided that the sealing compound is softened sufficiently.

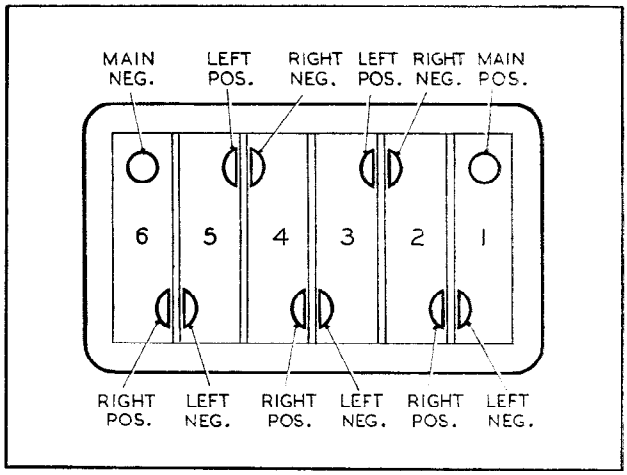

Fig. 10. Cell pack layout

Withdraw the battery from the jig and remove the compound from all surfaces while it is still warm ; the underside of the lid and tops of the partitions must be cleaned and dried. The original lid may be used again during reassembly unless it is distorted or broken, in which event a replacement must be fitted.

(vi) Cut the connector links of any section to be removed, with the cutter illustrated in Fig. 9, and lift out the section. Siphon out the electrolyte from the cell(s) concerned, and clean out all flaked material from the bottom of the case.

(vii) Examine the plates for flaking or sulphation of the active material, and signs of buckling or distortion of the grids. If the plates are in bad condition they should be changed. For convenience, cell packs are available and comprise plate sets assembled complete with separators and guards. Note

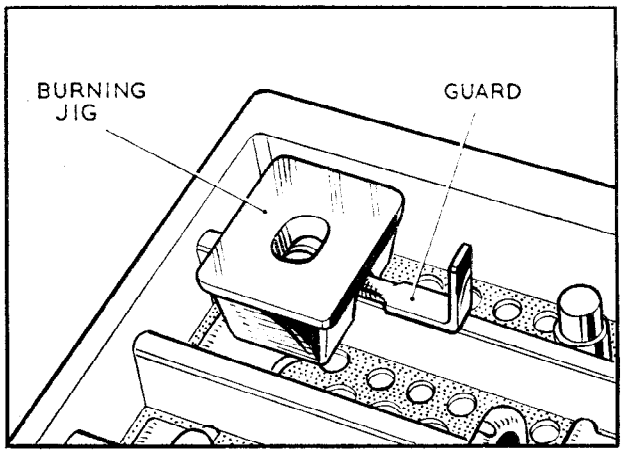

Fig. 11. Burning jig and guard in position

that cell packs are not interchangeable; four different types of cell pack are used in the battery and comprise an outer set with main Positive terminal, an outer set with main Negative terminal, and two types of replacement inner sets.

The inner sets are supplied with half-loop posts to enable them to be burned together in the battery.

The cell packs are arranged in the container in the following order (see also Fig. 10):

No. 1 Cell : Main Positive, Left Negative
No. 2 Cell : Right Positive, Right Negative
No. 3 Cell : Left Positive, Left Negative
No. 4 Cell : Right Positive, Right Negative
No. 5 Cell : Left Positive, Left Negative
No. 6 Cell : Right Positive, Main Negative.

("Positive" and "negative" refer to the polarity of the connector; "right" and "left" to the position of the connector viewed from the end of the cell pack to which it is nearest).

(d) RE-ASSEMBLY

(i) Ensure that all exposed areas of the inside of the battery container are clean and dry. If the container shows any cracks or faults, either in the outer casing or in the moulded partitions between the cells, it must be discarded.

(ii) Any cell pack that has been removed and is to be re-used must have its half-loops filed and cleaned-up before the pack is assembled into the battery for re-burning; if the pack incorporates a main terminal post, this must be built-up before assembling into the battery.

Any cell pack which has not been removed, but has been adjacent to a cell pack which is now removed, should have the severed face of its half-loop(s) filed and cleaned-up, or built-up if a main terminal post, before re-burning; it is extremely important to ensure that no lead filings, splashes or other foreign matter enter the battery case during this operation.

(iii) Place the partition guard on top of the cell partition, and the burning jig in position over the half-loops to be joined, as illustrated in Fig. 11, and burn-up the connection to a shape similar to the original connector. (The aperture in the burning jig is chamfered. The level of the lead used to burn-up the half-loops should be taken to the bottom of the chamfer, in order to ensure a satisfactory connection).

(iv) Add electrolyte of the correct specific gravity according to climatic conditions and carry out the initial charging procedure for the new cell(s). 'Bulldog' clips can be used to make connections to the half-loop posts.

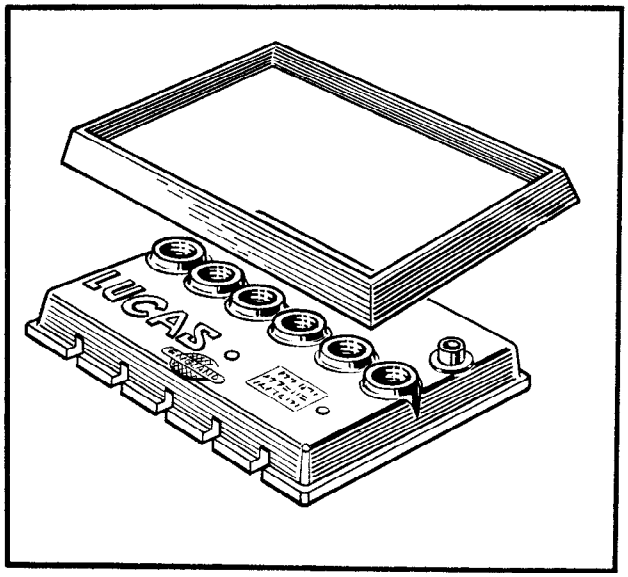

Fig. 12. Battery lid and frame

(v) Place the battery lid upside down in the metal frame (illustrated in Fig. 12) and pour a thin layer of about $\frac{3}{16}$" of heated sealing compound in the five grooves and recesses for the connector loops. In cold weather, warm the lid slightly to prevent the sealing compound from setting too quickly.

(vi) With the lid still retained in the frame, reverse the lid and place it in position over the posts and inter-cell connections. Remove the frame and press the lid down by hand. Place the battery at the front of the extracting jig and, using the adaptor plate and rod under the front of the jig (Fig. 13), apply downward pressure on the lid.

With S batteries, which are fitted with a curved lid having ribs, it is recommended that two strips of wood are placed below the adaptor plate and on the outer edges of the lid.

Pressing down the adaptor plate will cause the sealing compound to be squeezed out, and seal over the partitions and around the connectors. Remove any excess sealing compound from the end of the grooves before completing the top sealing of the battery.

(vii) Reseal around the outer groove of the lid in the usual manner.

(viii) Reform the main negative and main positive posts. (Where Lucas die-cast lead cable connectors are to be used with the battery, each post must be drilled to a depth of $\frac{1}{2}$" with a $\frac{5}{32}$" diameter drill to take the self-tapping screw).

(ix) The battery should be branded in accordance with recognised procedure, to indicate that it has been repaired.

4. STORAGE OF BATTERIES

(a) UNFILLED BATTERIES

As Lucas Publication No. 732H, Page 4, noting also the following:

(i) S batteries must **not** be stacked on top of one another, or damage will be caused to the moulded venting device.

(ii) Although unfilled batteries are suitable for indefinite storage, from a practical point of view it is desirable to use such batteries within 12 months of delivery. Correct storage during this time is most important.

(iii) On certain "dry-charged" batteries no vent plug seals or tapes are fitted ; it is important that they are stored correctly.

(b) FILLED BATTERIES

As Lucas Publication No. 732H, Page 4, noting also the following:

(i) Under no circumstances must filled batteries be stored on top of each other.

(ii) If the battery has not received a charge during the two weeks prior to being put into service, it should have a further freshening charge to ensure it is delivered to the customer in a fully charged state.

(iii) If the battery is to be stored on the vehicle for a long period, it is preferable to disconnect the cables from the battery terminals.

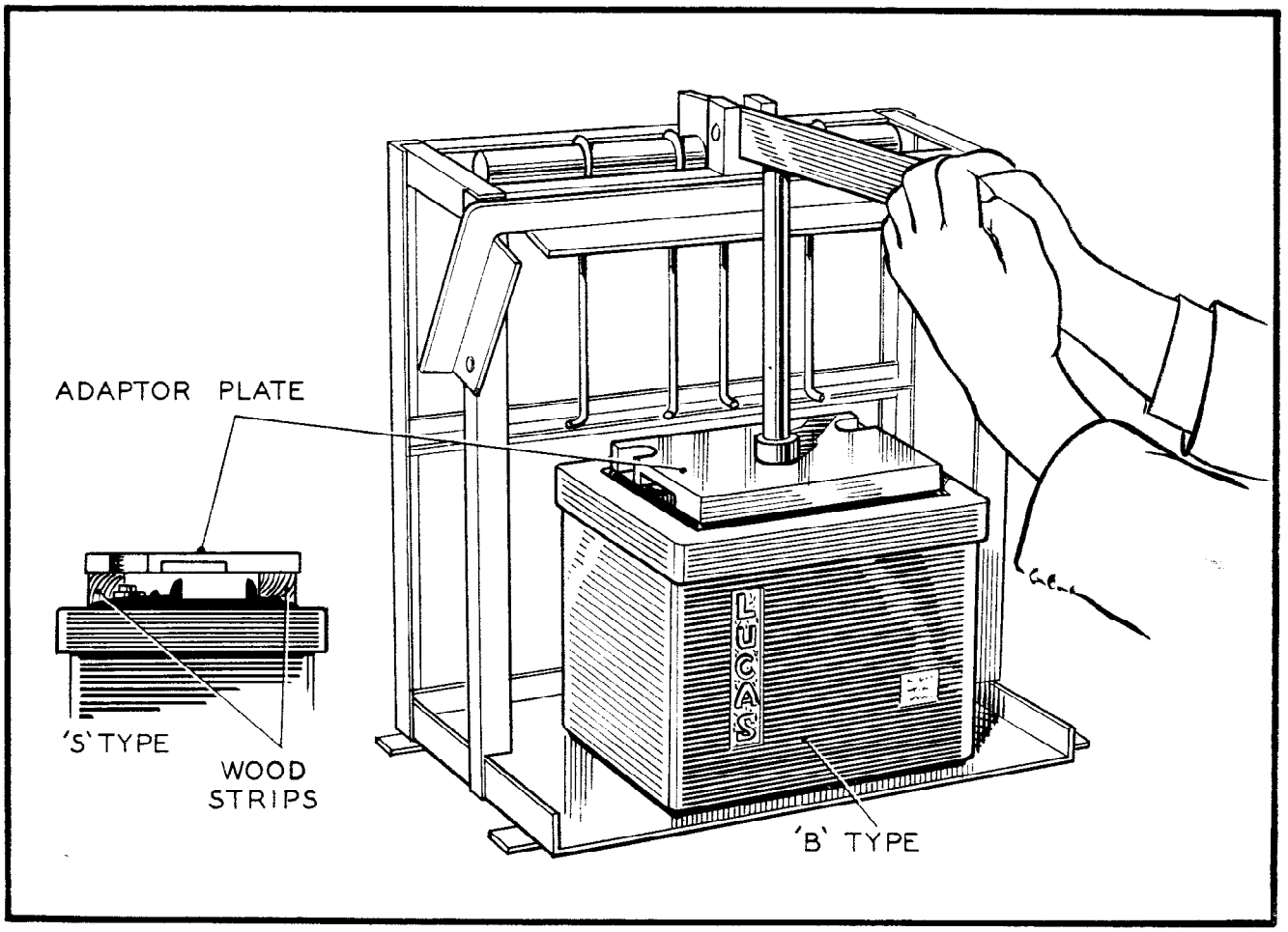

Fig. 13. Fitting the lid

5. BATTERY CABLE CONNECTORS

When fitting diecast cable connectors, smear the inside of the tapered hole with petroleum jelly and push on the connector by hand. Insert the No. 10, Type Z, $\frac{5}{8}$" long (B 4.9 x 16) self-tapping screw and tighten with medium pressure only : fill in the recess around the screw with more petroleum jelly. If the connectors are fitted dry and driven home on the tapered battery posts too tightly, difficulty may be experienced when it is required to remove them subsequently.

If, after the self-tapping screw has been removed several times, the hole in the terminal post becomes enlarged so that unsatisfactory tightening results, it is permissible to change to a larger self-tapping screw, namely No. 12, Type Z, $\frac{5}{8}$" long (B 5.5 x 16).

CONVERSION OF MEASUREMENTS OCCURRING IN FOREGOING TEXT

$\frac{5}{32}$" = 4.0 mm.

$\frac{3}{16}$" = 4.8 mm.

$\frac{1}{2}$" = 12.7 mm.

$\frac{35}{64}$" = 13.9 mm.