

C. Normal Re-charging of Battery

It is absolutely necessary to re-charge a battery if the acid density has fallen below $1.14 = 18^\circ \text{ Bé}$ (in the tropics, $1.09 = 12^\circ \text{ Bé}$) or if the voltage of the individual cells has fallen to 1.8 Volts.

1. Unscrew the filler caps of the individual cells.
2. Check the acid level and if necessary, top up with distilled water.
The acid should be 10 mm above the edge of the separators and 15 mm above the top edge of the plates.
3. Connect the battery to a charger. The positive cable of the charger is connected to the positive terminal of the battery and the ground cable of the charger to the negative terminal of the battery.
4. Charge the battery at a rate of amperes not exceeding $\frac{1}{10}$ of the rated capacity, that is to say, at a maximum of 5.6 Amps.
- c) The charge can be considered at an end when the cells have "gassed" for a period of half-an-hour. Three readings should be taken at intervals of 1 hour to ensure that the charging voltage and the acid density show no further increase during that time. If the battery is fully charged, the cell voltage should be 2.6 to 2.7 Volts. **The voltage must be measured with the charger switched on.** When the charger is switched off, the battery voltage then drops to the normal cell voltage of 2 — 2.2 Volts.
The acid density in a fully-charged battery should be $1.285 = 32^\circ \text{ Bé}$ (in the tropics, $1.23 = 27^\circ$). The acid density should be measured with the acid at the specified level (see Section A).

Note:

- a) While the battery is being charged, the acid temperature must not rise above 40° C. (in the tropics, 45° C.). If the acid temperature is higher, the rate of charging must be decreased and the period of charging increased.
- b) If the plates of a battery are already sulphated this can be seen from the white deposit on the plates), it should first be charged at $\frac{1}{4}$ of the specified charging rate, that is to say at 1.4 Amps., for at least forty hours and only at the end of this period should the full charging current of 5.6 Amps. be applied. The charging process can then continue at this amperage until the battery is fully charged.
- d) **During the charge, the charging room should be well ventilated. No naked lights must be used, owing to the danger of explosion occasioned by the release of oxyhydrogen gas.**
5. Disconnect the charger and once more check the acid level.
6. Do not put on the filler caps until at least two hours after the charge.

Note: Any acid which has splashed or spilt over should be washed off with water or rendered innocuous by means of a soda solution or ammonium chloride. The battery should then be dried.

D. Re-charging of Battery with Quick-charging Apparatus

If a quick charge is needed, discharged batteries can be charged at a rate which is considerably higher than the normal charging current rate. A considerable amount of time is saved in this process since a quick charge takes only approx. half-an-hour. Quick-charging, however, should not be made the rule and in any case should only **be undertaken in the case of sound batteries which have already been in use and should never be undertaken at the first charge.** Before beginning a quick charge, it is absolutely necessary to check the battery and make sure that it is in good condition. It is useless to charge defective batteries in this way since this will only increase the damage to the battery. Before charging, therefore, the battery should be repaired or alternatively, replaced by a battery which is in good order.

The modern, commercially available quick-charging plants are fully automatic. The rate and duration of charge are so arranged that it is impossible for overcharging and thus overheating to take place at all. The operating instructions for the charger which is being used should in all cases be strictly adhered to.

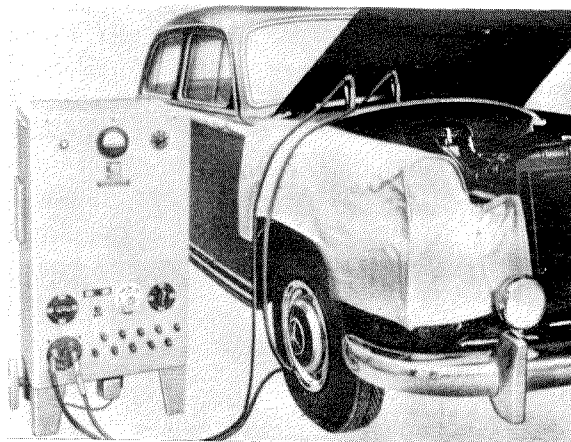


Fig. 54 — 10/4

E. Preparation of New Batteries

New batteries are generally delivered empty. Initial charging should be carried out according to the instructions issued with the battery. The following is the general procedure adopted:

1. Unscrew the filler caps and fill the cells with chemically pure accumulator acid of a specific gravity of $1.285 = 32^{\circ} \text{ Bé}$. The acid should be 10 mm over the top edge of the separators and 15 mm over the edge of the plates.
2. It is absolutely essential that the battery should then be allowed to stand for 5–6 hours so that the plates can become completely soaked in the electrolyte.

Note: The acid level decreases somewhat during this period and in consequence the battery should be slightly agitated afterwards so that any air bubbles can escape from the cells. Then top up the cells again so that the battery acid reaches the specified level.

3. Charge the battery at a rate of 3.5 Amps. or less until the voltage of each cell has risen

to 2.5–2.7 Volts on charge and until all cells are actively gassing.

4. Measure the temperature of the battery acid from time to time. If the temperature rises above 40° C. , reduce the charging rate.
5. After the charge is completed, check the acid density once more (specific gravity $1.285 = 32^{\circ} \text{ Bé}$) and if necessary, correct. If it is necessary to top up the battery with acid or distilled water, charge the battery for a short time afterwards in order to ensure that the battery acid is well mixed and distributed.
6. The filler holes should be left open for a period of at least 2 hours – preferably even more – after the charge has been completed. Then the filler caps should be put on. Any acid which has splashed over should be washed off with water or rendered innocuous by means of a soda solution or ammonium chloride. The battery should then be dried.