# REPLACEMENT PARTS AND PROCEDURES

# FOR

# STORAGE BATTERIES, OPEN TYPE

## 1. GENERAL

1.01 This section covers the information necessary for ordering parts to be used in the maintenance of the BT, CT, PT, ET, D, E, F, G and H open type storage batteries per KS-5804 and KS-5804-01. This section also covers approved procedures for replacing these parts.

1.02 Part 2 of this section is called Replacement Parts and covers the various parts which may be replaced in the field in the maintenance of this equipment. This part also contains explanatory figures showing the different parts.

1.03 Part 3 of this section is called Replacement Procedures and covers the approved procedures for the replacement of the parts listed under Part 2.

1.04 Repairing the storage battery cell is a matter of expediency, balancing the total cost of repairing the cell, against the cost of replacing the damaged cell with a new cell, taking into consideration the age and condition of the damaged cell. When doubt exists as to which course should be followed, refer the matter to the supervisor.

1.05 Where new battery plates of the BT, CT, PT, ET, D, E, F, G and H types of batteries are installed, the batteries shall be given an initial charge as described in the General Engineering Requirements Specification for the Initial Charge of Storage Batteries of the Open Cell Types.

1.06 + 1.07 added (see add.)

## 2. REPLACEMENT PARTS

2.01 The figures included in this part show the various replacement parts in their proper relation to other parts of the apparatus together with their corresponding names.

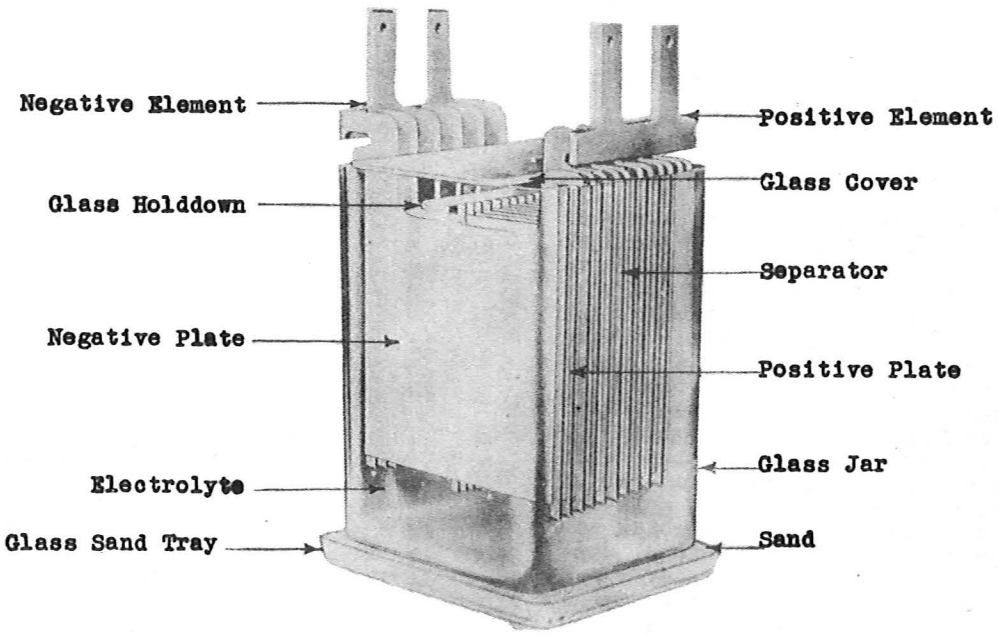


FIG. 1 - CELL ASSEMBLY

2.02 When ordering parts for replacement purposes all parts shall be ordered by giving the name, describing the part fully and giving the storage battery cell rating and type. For example: Multiple Plate Elements, Type E-11 per KS-5804.

## 3. REPLACEMENT PROCEDURES

### 3.001 List of Tools and Materials

Tools

Jack, automobile type, Commercial
Knife, putty, R-1060
Scraper, triangular, R-1417
Sediment scoops for F, G or H tanks right or left hand Electric Storage Battery Company
Tool, wood placing for type B water filler, Electric Storage Battery Company
Wrenches, socket, for D and E types of bolt connectors, R-2369 and R-2424

Materials

Apron, rubber, full length, RM-657709
Cheesecloth, KS-6350 or equivalent
Container, glass, glazed porcelain or earthenware, or lead for handling electrolyte, Commercial
Electrolyte, specific gravity 1.215 ± 0.005 at 60° F
Funnel, glass, Commercial
Gloves, rubber, Anode, RM-669166
Grease, No-Oxide or vaseline, unmedicated
Oil for electrolyte, Electric Storage Battery Company
Paper, roofing or equivalent, Commercial
Soda cleaner, Bell System or bicarbonate of soda
Spacing sticks, Electric Storage Battery Company
Water, distilled or approved for battery use
Webbing, Electric Storage Battery Company

3.002 Precautions as the use of rubber gloves, rubber apron, Bell System soda cleaner, glass or glazed earthenware battery utensils shall be employed in the handling of electrolyte if necessary. All floors, walls, concrete or other places should be protected with wrapping paper covered with roofing paper. A solution of Bell System soda cleaner in water (1.16 pound to 1.0 gallon) is a useful remedy to neutralize acid accidentally spilled upon the body, the floor or equipment, or soaked into the hands during the handling of hydrometers, covers or other apparatus which has electrolyte upon its surface. It is a much more effective wash than plain water, and has the advantage that gas bubbles appear as long as any unneutralized acid is present. Bicarbonate of soda (baking soda) is less effective but may be used. For neutralizing acid on clothing ammonia water is generally preferable unless the clothing can conveniently be washed to remove the soda. Large quantities of spilled electrolyte may be mopped up with cheesecloth or equivalent and the remaining solution then neutralized. Plain water may be used to wash the eyes if electrolyte should enter. About 3.5 pints of saturated soda cleaner solution or 11 pints of bicarbonate soda solution will neutralize 1.0 pint of 1.215 electrolyte.

3.003 Cell covers, water fillers, hydrometers, thermometers and electrolyte height indicators should be removed, washed in clean water and safely stored during the time the cell is being repaired. The electrolyte height indicators should be marked to indicate from which cells they were removed.

3.004 After making any replacement of parts, the apparatus shall be checked and where necessary readjusted to meet the requirements specified in the section covering the Apparatus Requirements and Adjusting Procedures for this equipment.

3.005 No replacement procedures are specified for parts in which the procedure consists of a simple single operation.

### 3.01 Electrolyte

(1) The following table indicates the amount of electrolyte required for the various sizes and types of open type storage battery cells.

POUNDS OF ELECTROLYTE PER CELL
Types of Batteries

| No. of Plates Per Cell | Cells Using Glass Jars BT | CT | PT | ET |
|---|---|---|---|---|
| 2 | 3/4 | 3 | 4 3/4 | 7 |
| | D | | E | F |
| 3 | 8 1/4 | | - | - |
| 5 | 11 1/2 | | 17 | - |
| 7 | 14 1/2 | | 21 | - |
| 9 | 17 | | 26 | 46 |
| 11 | 20 | | 30 | 52 |
| 13 | 23 1/4 | | 34 | 58 |
| 15 | - | | 38 | 65 |

| | Cells Using Lead-Lined Wood Tanks Style A F | Style A G | Style A H | Style C H |
|---|---|---|---|---|
| 11 | 100 | 179 | - | - |
| 13 | 111 | 198 | - | - |
| 15 | 122 | 218 | - | - |
| 17 | 133 | 238 | - | - |
| 19 | 144 | 258 | - | - |
| 21 | 155 | 277 | 555 | 354 |
| 23 | 165 | 297 | 594 | 384 |
| 25 | 176 | 317 | 634 | 414 |

3.01 (Continued)

| No. of Plates Per Cell | Cells Using Lead-Lined Wood Tanks Style A F | Style A G | Style A H | Style C H |
|---|---|---|---|---|
| 27 | 187 | 336 | 673 | 443 |
| 29 | - | 356 | 713 | 473 |
| 31 | - | 376 | 753 | 503 |
| 33 | - | 396 | 792 | 553 |
| 35 | - | 415 | 832 | 562 |
| 37 | - | 435 | 871 | 592 |
| 39 | - | 455 | 911 | 622 |
| 41 | - | 475 | 950 | 652 |
| 43 | - | 494 | 990 | 681 |
| 45 | - | 514 | 1029 | 711 |
| 47 | - | 534 | 1069 | 741 |
| 49 | - | 554 | 1109 | 771 |
| 51 | - | 573 | 1148 | 800 |
| 53 | - | 593 | 1188 | 830 |
| 55 | - | 613 | 1227 | 860 |
| 57 | - | 633 | 1193 | 890 |
| 59 | - | 652 | 1230 | 919 |
| 61 | - | 672 | 1267 | 949 |
| 63 | - | 692 | 1304 | 979 |
| 65 | - | 712 | 1341 | 1009 |
| 67 | - | 731 | 1378 | 1038 |
| 69 | - | 751 | 1415 | 1068 |
| 71 | - | 771 | 1453 | 1098 |
| 73 | - | 791 | 1490 | 1128 |
| 75 | - | 810 | 1527 | 1157 |
| 77 | - | 830 | 1564 | 1187 |
| 79 | - | 850 | 1601 | 1217 |
| 81 | - | 870 | 1638 | 1247 |
| 83 | - | 889 | 1676 | 1276 |
| 85 | - | 909 | 1713 | 1306 |
| 87 | - | - | - | 1336 |
| 89 | - | - | - | 1366 |
| 91 | - | - | - | 1395 |
| 93 | - | - | - | 1425 |
| 95 | - | - | - | 1455 |

(2) Only electrolyte nominally of 1.215 ± .005 specific gravity at 60° F. shall be used for replacement purposes. Make certain of the specific gravity of the electrolyte by using a hydrometer. The electrolyte shall be cool when it is poured into the cell.

(3) Open type cells may be filled in either of two ways. In filling glass container types of cells, the electrolyte shall be poured from the carboy into an approved electrolyte container (used for pouring electrolyte into storage battery cells) and then poured into the individual cells. For lead-lined wood tank type of cells, the electrolyte may be either poured directly from the carboys into the cells, or pumped into the cells from the carboys, a pouring tank or a tank wagon.

(4) The old electrolyte may be used for replacement purposes provided it is of the correct specific gravity, is free from dirt or sediment and contains no substantial amount of impurities collected during previous use. In event of doubt about the latter a sample (one quart) should be submitted to the manufacturer for analysis and report. This sample should be a composite sample obtained by taking a small amount from each cell. New electrolyte of the correct specific gravity shall be used when required for additions.

3.02 Battery Plates Separators

(1) Caution If the battery must be kept in service, one or more additional cells of suitable size should be temporarily connected in multiple with the cells to be worked upon so service will not be interrupted.

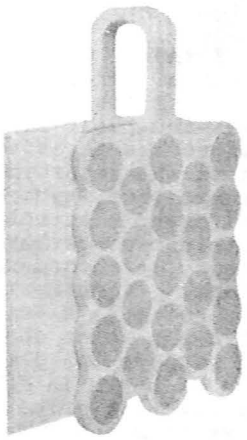

FIG. 2 - CELL COUPLE

Note Separators which are shipped wet should be kept wet until installed.

(2) In BT, CT, PT and ET type cells, remove the cell couples and separators if provided, and pour all of the clear electrolyte into a clean glass container or carboy and dispose of any sediment. Rinse the jar with clean water, check for any defects and return to its former location. Replace the old couples with new couples making sure each jar contains a positive plate of one couple and a negative plate of the next. Replace the old electrolyte and add sufficient new electrolyte to bring the electrolyte up to the correct maximum level.

3.02 (Continued)

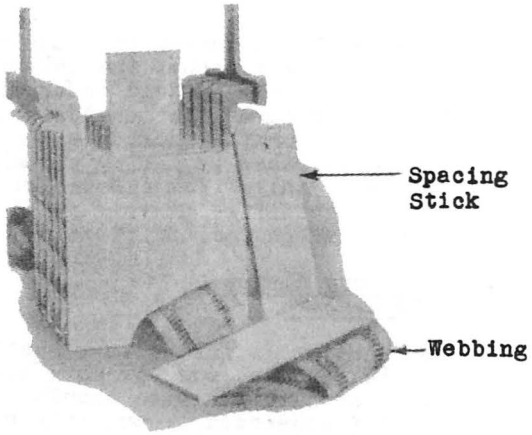


FIG. 3 - INSERTING SPACING STICKS

(3) In D, E and F type cells provided with glass jars disconnect one cell at a time using the proper socket wrench to unloosen the bolt connectors of the cell. Remove the positive and negative plate groups and separators, using care not to damage them, syphon off or pour all of the clear electrolyte into a clean glass container or carboy and dispose of any sediment in accordance with local instructions. (Sediment should not be allowed to get into a drain). Rinse the jars with clean water, check for any defects and replace the plate groups and separators as shown in Figs. 3, 4 and 5. Place the negative group crosswise on a piece of webbing and slip the plates of the positive group between those of the negative group, so that the vertical edges of all the plates will be flush. Insert the spacing sticks to keep the plates apart. Lift the groups by the webbing and lower them into place in the middle of the jar. After making sure that the hanging lugs of the plates rest evenly on the sides of the jar, withdraw the webbing and spacing sticks. Install the separators, one between each positive and negative plate, guiding it into place by the stakes when provided and pushing it down until the hard rubber pin rests lightly on the tops of the plates. The long ends of the outside stakes should be at the top. Place the separators symmetrically with respect to the plates, so that both edges of all plates are protected and the tops of the separators are horizontal. Damaged separators must not be used. (Cracks not exceeding 1 1/2 inches in length from the edge of the sheet and which do not form a shelf are permissible.) Replace the old electrolyte and add sufficient new electrolyte to bring

FIG. 4 - LOWERING CELL ELEMENT

the electrolyte up to the correct maximum level. If oil is used on the electrolyte, add such quantity as is required to give the depth specified in the Section on Apparatus Requirements and Adjusting Procedures. Reconnect the cell into the circuit first scraping the contact surfaces to a bright finish with a triangular scraper, then bolting tightly and finally shaping the strap lugs as necessary. Cover bolted connections with No-Oxide grease or vaseline and charge as required.

(4) In the F, G and H type cells provided with the lead-lined wood tanks, all repair work should be done by a person trained to service such storage batteries. The general methods outlined for cells using glass jars are followed, with certain changes and additions as described in the General Engineering Requirements Specification for the Initial Charge of Storage Batteries of the Open Cell Types.

3.03 Glass Cell Container
Lead-Lined Wood Tanks

(1) To replace a damaged glass jar observe the Caution under procedure 3.02 in order that service may be maintained. Disconnect the cell from the circuit and remove the plate groups, separators and electrolyte as described in procedure 3.02. The entire battery ele-

3.03 (Continued)

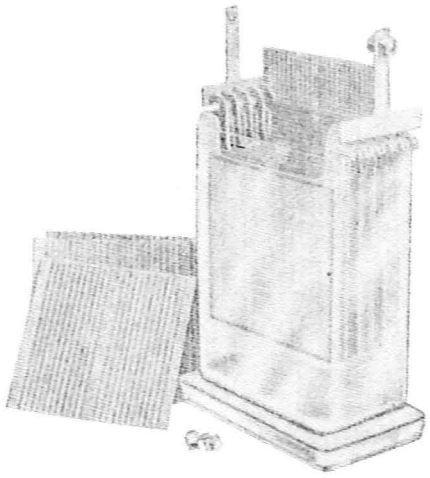

FIG. 5 - INSERTING SEPARATORS

ment or cell including the plates and separators should be kept assembled under water in a non-metallic vessel filled with clean water until required for reinstallation, but for periods greater than one week the positive plates should be withdrawn and allowed to dry, keeping the negative plates and separators under water until reassembled. Replace the damaged glass jar with a new jar and reassemble the cell as described in procedure 3.02. Check the condition of the plates, separators and electrolyte and replace any damaged part of the cell. Give the cell or the complete battery a charge as required.

(2) In the F, G and H type cells provided with the lead-lined wood tanks, all repair work should be done by a person trained to service such storage batteries. Special procedures as described in the General Engineering Requirements Specification for the Initial Charge of Storage Batteries of the Open Cell Types are necessary.

3.04 Glass Insulators
Porcelain Insulators

(1) To replace a damaged insulator, lift the battery cell immediately over the insulator to be removed just sufficiently to release the insulator, using lifting jacks if necessary. Remove the damaged insulator and replace with a new insulator. Make sure that the new insulator is provided with insulator oil approximately one inch in depth. When assembled with the alloy cap and pad, or alloy cap, porcelain pedestal and tile, and aligned under the cell using the original spacing washers if provided, the assembly should be of the correct height. Lower the battery cell into position. All repair work should be done by a person trained to service such storage batteries.

see add

3.05 Water Fillers

(1) Replace the damaged part or parts of the water filler with new parts. If a complete new water filler is installed make sure that the new filler is assembled and adjusted to maintain the same water level as the old filler.

APPROVED:

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