

INSTRUCTION MANUAL FOR
SOUTHERN CROSS.

FIG. 3222 1 K.W. 32 VOLT BATTERY CHARGING GENERATING
SET WITH LOCAL ELECTRIC STARTING.

Comprising:-

- Mark EF-D 3½ H.P. Diesel Engine
- G.M.F. - 1 K.W. 32 Volt Generator
- Mark KS-B Flexible Coupling
- Mark KN-D Welded Steel Base
- Mark KO-G Switchboard.

FIG. 3224 1 K.W. 32 VOLT BATTERY CHARGING GENERATOR
AND SWITCHBOARD

Comprising:-
G.M.F. - 1 K.W. 32 Volt Generator
Mark KO-G Switchboard.

-----oO-----

FIG. 3222 1 K.W. 32 VOLT BATTERY CHARGING GENERATING SET.

INSTALLATION.

FOUNDATION FOR SET.

To obtain the best results from this set, install it on a firm foundation. A block of concrete with the foundation bolts set into it makes a suitable foundation.

TO MAKE CONCRETE BLOCK.

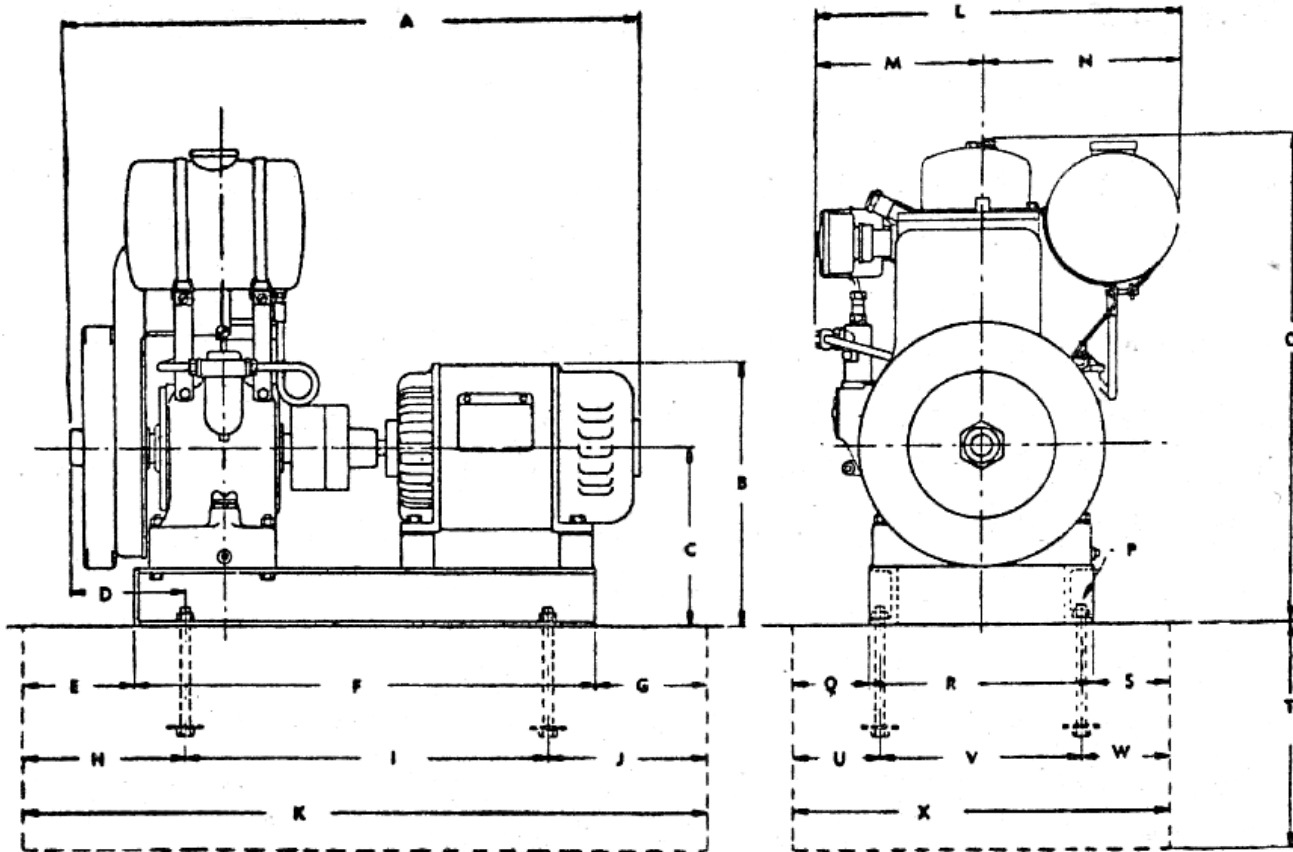
- (1) After deciding where the set is to be installed, sink a hole in the ground 1 ft. to 1 ft. 6 ins. deep and to the sizes on the General Arrangement Illustration. Light soil requires a larger base than heavy, well packed soil, but always make the block larger for preference.
- (2) Make a wooden template to hold the foundation bolts in the correct positions while the concrete is being poured. Slide the base on to the template and mark the positions of the holes. Bore ½ inch holes at the marked positions.
- (3) Place template in position over the hole in the ground. Take the foundation bolts from the engine case, put large washers on them and then hang them from the template so the tops will project 1 inch above the concrete when the template is removed.
- (4) Drive in some small pegs around the ends of the crossboards to hold the template in position. Check that the template is level with a spirit level and pack under the ends, if necessary.

TO MAKE CONCRETE BLOCK. (Cont'd).

- (5) Mix a batch of concrete using 4 parts sharp stone or rubble, 2 parts sand and one part cement. See that the stone and sand are clean and do not contain any clay or dirt. If they do, wash carefully, before mixing.
- (6) Fill the hole with concrete and at the same time, place some old bars and bolts in for reinforcements.
- (7) Allow the concrete to set for two or three hours and then carefully lift off the template, taking care not to disturb the bolts. If necessary, smooth off the top of the block, using a mixture of 2 parts sand and one part cement. Allow the concrete to set for a day.

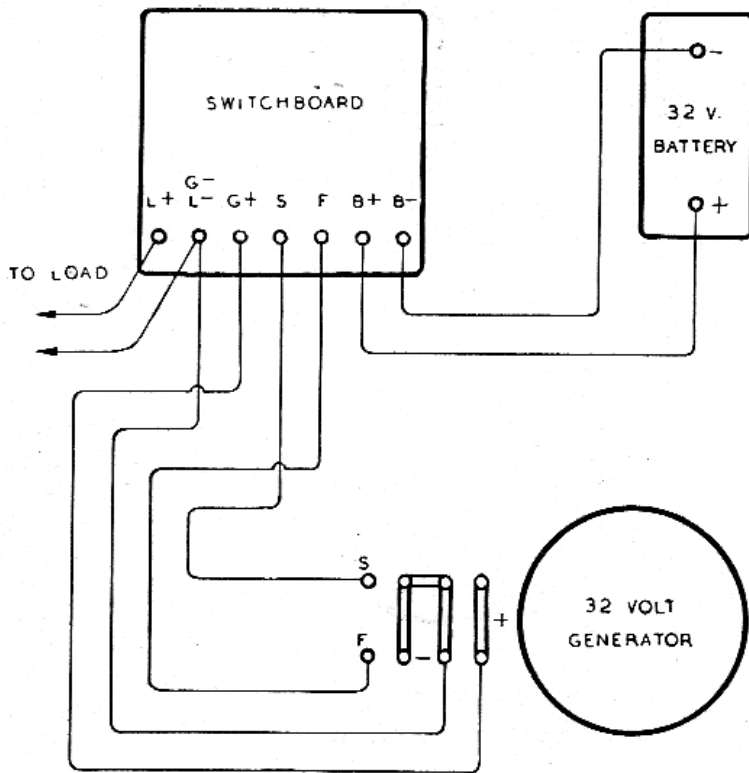
LINING UP THE SET.

- (1) Lift the base into position on the concrete block, and with a spirit level, check that the base is level. Where necessary, place thin pieces of tin under the edge of the base to level it and then tighten the nuts on the foundation bolts, fitting spring washers under the nuts.
- (2) Sit the engine on the base and loosely bolt it down with the 3" x $\frac{3}{8}$ " bolts and spring washers supplied.
- (3) Clean the bore of the driving half of the flexible coupling, shaft and keyway.
- (4) Fit the key in place in the crankshaft and slide on the driving half of the coupling until the face of the coupling half is about 1/16 in. out from the end of the shaft. Tighten the locking screw.
- (5) See that the key is in position in the generator shaft and then slide the driven half of the coupling on.
- (6) Lift the generator on to the base and loosely bolt it down with the $\frac{1}{4}$ " x $\frac{1}{2}$ " bolts and spring washers supplied.
- (7) The two halves of the Coupling are the same diameter. Using a metal straight edge across the coupling halves, check if the diameters coincide on top, underneath, and on either side. Shift the generator and recheck with the straight edge at these four points until correct.
- (8) Then, using a set of feeler gauges, check the gap between the coupling halves at the top, underneath and on either side. Shift the generator until the gap is the same all round the coupling, and at the same time check that the diameters coincide, using the straight edge as in (7) above. The generator must be adjusted until the maximum misalignment on the outside of the coupling is less than .005 in. and the maximum variation in the gap between the coupling halves is less than .010 in.
- (9) When the alignment is correct, bolt the engine and generator down and recheck the alignment as in (7) and (8) above.

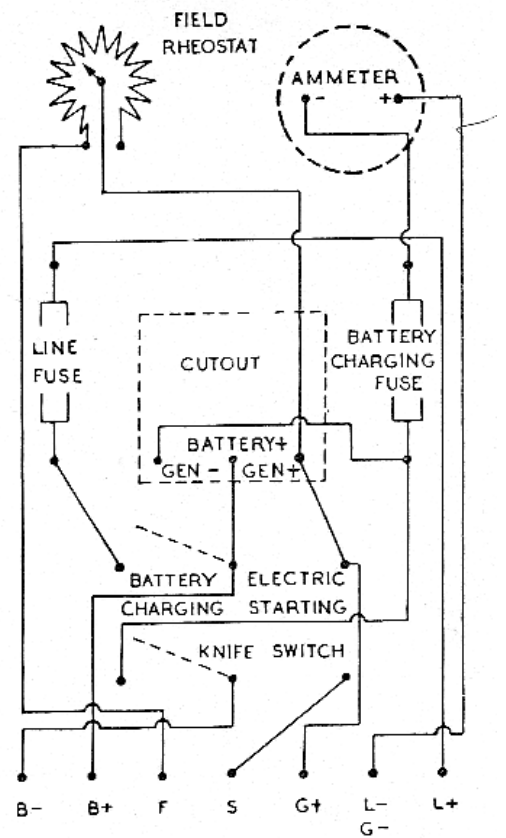


A	.....	.....	3ft. 1 27/32in.	O	.....	.....	2ft. 3 1/2in.
B	.....	.....	1ft. 1 7/8in.	P	.....	.....	1/2in.
C	.....	.....	9 1/2in.	bolts to project 1in. from concrete.			
D	.....	.....	11in.	Q	.....	.....	4in.
E	.....	.....	6in.	R	.....	.....	11 7/8in.
F	.....	.....	1ft. 10 3/8in.	S	.....	.....	4in.
G	.....	.....	6in.	T	.....	.....	1ft. 0in.
H	.....	.....	8 1/2in.	to	.....	.....	1ft. 6in.
I	.....	.....	1ft. 5in.	U	.....	.....	4 5/8in.
J	.....	.....	8 1/2in.	V	.....	.....	10 5/8in.
K	.....	.....	2ft. 10in.	W	.....	.....	4 5/8in.
L	.....	.....	1ft. 8in.	X	.....	.....	1ft. 7 7/8in.
M	.....	.....	9 5/16in.				
N	.....	.....	10 5/16in.				

General Arrangement of Fig. 3222, 1 K.W., 32 Volt Battery Charging Generating Set.

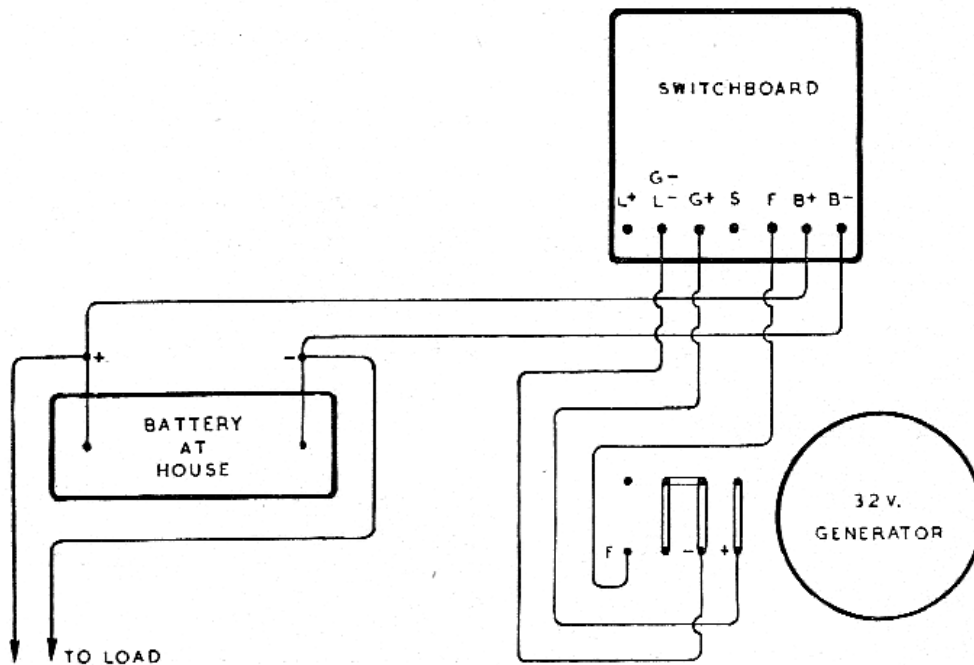


"Wiring of Set where Battery is in Engine Room."



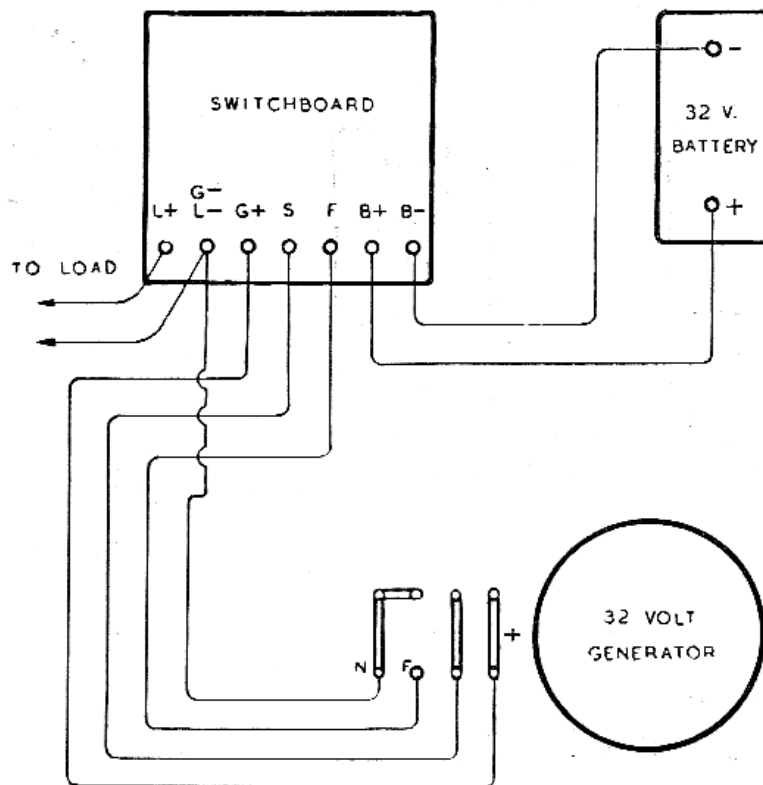
VIEW FROM BACK OF SWITCHBOARD.

"Switchboard Wiring Diagram."

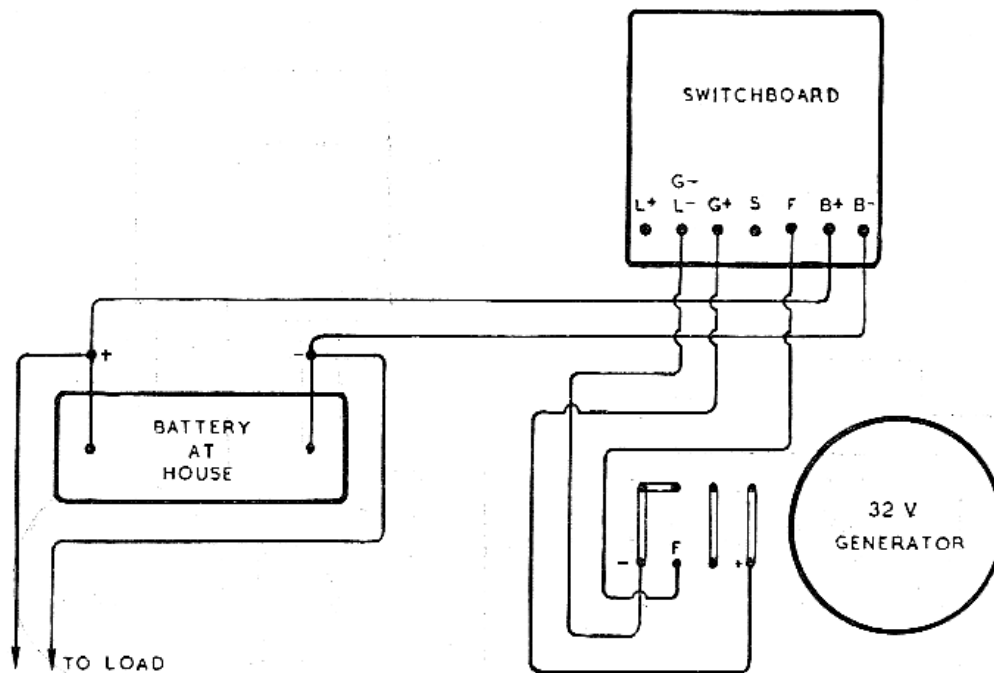


"Wiring of Set where Battery is at House."

Wiring Diagrams for Fig. 3222 Generating Set



"Wiring Connections where Battery is in Engine Room and Generator Rotation is anti-clockwise from Drive End."



"Wiring Connections where Battery is at House and Generator Rotation is anti-clockwise from Drive End."

Wiring Diagrams for Fig. 3224 Generator and Switchboard (anti-clockwise)
 (Use Fig. 3222 Set Diagrams for clockwise rotation)

LINING UP THE SET (Cont'd)

- (10) Slide the driven half of the coupling along the shaft to leave 1/32in. gap between the halves and lock it in position. Fit the rubbers and pins in the coupling, fit locking nuts with spring washers under them and tighten.

MOUNTING SWITCHBOARD ON WALL.

The switchboard must be mounted within easy reach of the engine so that the operator can reach the valve lift plunger on the engine while operating the starter switch.

IMPORTANT - Do not mount the switchboard over the battery as the acid fumes may affect it.

SETTING UP THE BATTERY.

The generating set has been designed for use with the battery in the engine room, but it may be placed at the house, if the operator is prepared to do without electric starting of the engine.

Although the installation of the battery at the house prevents the use of electric starting, it enables the set to be installed much further from the house without an increase in the size of the overhead lines between the house and the set. Refer to next section "Wiring Up Set" which shows maximum permissible distance between the set and the house for different size overhead lines.

Connect the cells together, making sure they are connected correctly, that is, positive terminal of one cell to the negative of the next cell. Use the flexible connection between the end cells of the two rows.

WIRING UP SET

1. Remove the cover from the generator terminal box.
2. Refer to the top wiring diagram for Fig. 3222 Generating Set, which shows the necessary connections where the battery is installed in the engine room. For installations with the battery at the house, the connections are shown in the bottom wiring diagram.

Use 7/.064 wire for leads "+" to "G+", and "S" to "S" and from battery to switchboard. For leads "-" to "G-L-", use 7/.036 minimum and for lead "F" to "F", use 3/.029 minimum.

Tough Rubber Sheathed Cable (TRS) may be used between the generator and the switchboard, and the switchboard and the battery.

Hard Drawn Bare Copper Cable may be used for the overhead lines, but where there is any likelihood of personal contact, covered or insulated cable should be used. For instance, where the lines are well above normal reach, covered or insulated cable would only have to be used between the set and the first pole, and between the last pole and the house.

SOUTHERN CROSS GENERATING SET.

SP/300/279/63.

WIRING UP SET (CONT'D)

The size of the overhead lines to the house will vary according to the distance the set is installed from the house. The table below shows the maximum distances the generating set, with the battery in the engine room, can be from the house to ensure good lights.

<u>Wire Sizes.</u>			
<u>7/.064</u>	<u>7/.080</u>	<u>7/.092</u>	<u>7/.104</u>
200 ft.	310 ft.	410 ft.	525 ft.

Maximum Distances between Set and House for
Different Wire Sizes.

(Battery in Engine Room)

The battery may be installed at the house, if desired, but if it is, the engine cannot be electrically started. With the battery at the house, the maximum distances the generating set can be placed from the house are as follows:

<u>Wire Sizes</u>				
<u>7/.052</u>	<u>7/.064</u>	<u>7/.080</u>	<u>7/.092</u>	<u>7/.104</u>
325 ft.	475 ft.	750 ft.	1,000 ft.	1,250 ft.

Maximum Distances between Set and House for Different Wire Sizes.
(Battery at House.)

Separate small loads such as lights in outbuildings may be wired up, using separate small overhead lines. Consult the installing electrician about the size of these overhead lines.

EARTHING.

Connect a wire from one of the generator holding bolts to a long piece of iron or copper bar driven into the ground outside the building.

RUNNING INSTRUCTIONS.OPERATING SWITCHBOARD.

KNIFE SWITCH: - There are two positions for the knife switch. They are (1) "Battery Charging" and (2) "Electric Starting".

The switch is shifted to the "Electric Starting" position when electrically starting the unit but otherwise it may be left in the "Battery Charging" position. The battery cannot be charged and load cannot be taken from the battery in the engine room unless the switch is in the "Battery Charging" position.

SOUTHERN CROSS GENERATING SET.

SP/300/280/63.

OPERATING SWITCHBOARD (Cont'd)

FIELD RHEOSTAT:- The field rheo stat is used to vary the charging rate to the battery. To increase the charge to the battery, turn the rheostat knob in a clockwise direction and vice versa.

IMPORTANT:- The Maximum Charging Rate shown on the Battery Instruction Chart must not be exceeded.

AMMETER:- The ammeter indicates the charge to or discharge from the battery. The readings will vary and depend on:-

- (a) Whether or not the set is charging.
- (b) The amount of load at the house.
- (c) The setting of the field rheostat (when the set is charging)

The ammeter will not indicate the discharge from the battery if it is at the house.

FUSES

The "line fuse" is on the right hand side and the "battery charging fuse" is on the left hand side, when the switchboard is viewed from the front.

When the "battery charging fuse" is blown, the battery cannot be charged.

If either fuse is blown, no load can be taken from the battery in the engine room. Where the battery is at the house, load can be taken whether the fuses are blown or not.

The electric starting is not affected by blown fuses.

SPEED OF SET.

The Southern Cross Diesel Engine, Mark EF-D, as supplied from the factory, is set to run at 2,100 R.P.M.

The correct speed for the set is 1,850 R.P.M. so it will be necessary to reset the speed of the engine using a tachometer.

TO START SET.

The following procedure applies to sets which can be electrically started from the battery.

- (1) Prepare engine for its first run as detailed in the Engine Instruction Manual.
- (2) See that the fuel pump control rod is in the running position.
- (3) Pour sufficient oil into the starter plug to fill it, and put into cylinder head plate. Four fillings may be necessary in cold weather but never use more than four fillings of oil or pour oil in while the engine is running, otherwise it may be damaged.

TO START SET. (Cont'd)

- (4) Depress valve lift plunger with one hand to release the compression and at the same time, shift the knife switch to the "electric starting" position. After the engine has made several revolutions, release the valve lift plunger and as soon as the engine commences to fire, shift the knife switch to the "battery charging" position.

If the engine does not commence firing, then the instructions for preparing the engine for its first run in the Engine Instruction Manual have not been followed.

NOTE:-

- (a) Do not hold the knife switch closed in the "electric starting" position for more than about 30 seconds at a time.
- (b) After each attempt to start, allow the battery to stand idle for at least one minute while the engine is checked over to see why it did not start.

If the battery is installed at the house, the engine must be cranked by hand as detailed in the Engine Instruction Manual.

TO STOP SET.

Stop Engine as detailed in the Engine Instruction Manual.

CARE OF THE GENERATOR

In order to ensure trouble-free operation of the Generator it is necessary to observe a certain maintenance routine.

CLEANING.

Keep all parts of the generator clean. It is most important that the commutator be kept free from dust and dirt. The commutator, brushes, brush holders and spindles, windings and terminals should be periodically wiped down with a clean dry rag.

BEARINGS.

When the generator leaves the works the bearings are packed with grease and do not require further attention before the plant is put into operation.

However, it is advisable to examine them about once a year and regrease them, if necessary. The balls and races should be clean and show no signs of rusting. There need only be a smear of grease on the bearing. If necessary more grease should be smeared around the balls. Don't add a lot of grease or the bearing may overheat, causing grease to be forced out over the windings of the generator. The drive end bearing is sealed on the generator side but can be greased on the other side.

Under no condition must oil or grease containing graphite be used.

Recommended grease is "Southern Cross Grease" or if this is not available, any ball bearing grease as recommended by a reputable oil company.

SOUTHERN CROSS GENERATING SET

SP/300/282/63.

CARE OF THE GENERATOR. (Cont'd)BRUSHES.

Keep the brushes free in their holders and even in pressure. When worn down to less than $\frac{5}{8}$ inch long they should be replaced with new brushes of the size and grade stamped on the nameplate.

TO FIT NEW BRUSHES.

1. Remove the commutator end shield cover, remove the brushes from the holders and disconnect brush leads.
2. Try new brushes of the size and grade shown on the nameplate in the brush holders.
3. They should slide freely without sticking. If they are tight, ease them down carefully by rubbing the tight side lightly on a flat sheet of fine sand paper until they will just slide in the holder.
4. Put the brushes in the holders and attach brush leads.
5. Place a piece of sand paper, sand side out, around the commutator and allow the brushes to seat on the sand paper.
6. Carefully draw the paper backwards and forwards until the brushes assume the correct curvature, taking care to keep it round the commutator so that a flat is not formed in the brush. When the process is nearly completed, fine glass paper should be used to obtain a very smooth finish.
7. After bedding carefully, clean away every trace of dust from the Commutator, Brushes and Holders. Make sure no specks of abrasive material are embedded in the face of the brush.
8. Replace the end shield cover and the generator may be started. It is advisable to run it on light load for a few hours before putting it on full load to enable the brushes to settle down properly.

DISMANTLING GENERATOR.

When it becomes necessary to dismantle the generator, proceed as follows:-

1. Remove commutator end shield cover and commutator end bearing cap.
2. Take the two long screws which held the bearing cap, insert them through the holes in the end shield and screw them into the brush holder support.
3. Remove the setscrews from the drive end shield.
4. Remove the circlip from the end of the armature shaft and using a piece of brass bar as a drift, tap out the armature.
5. Remove the commutator end shield and the rest of the parts can be dismantled.

FIG. 3224 1 K.W. 32 VOLT BATTERY CHARGING GENERATOR.
AND SWITCHBOARD.

FOUNDATION FOR GENERATOR.

To obtain the best results from the generator it should be set up on a firm foundation, preferably a block of concrete.

SPEED OF GENERATOR.

The correct speed for the generator is 1,850 R.P.M.

MOUNTING SWITCHBOARD ON WALL.

The switchboard should be mounted on the wall in a convenient position close to the generator.

IMPORTANT:- Do not mount the switchboard over the battery as the acid fumes may affect it.

ELECTRIC STARTING.

Although the generator and switchboard are wired for electric starting, this is only intended for use on the Fig. 3222 Generating Set. Whether or not the electric starting can be used on other installations, depends on the starting load imposed on the generator.

To try the electric starting, the starting load should be reduced to a minimum. This may be done by disengaging drives to equipment such as skim milk pump and separator; removing air line plug from milking machine and using the decompression device on a diesel engine. For convenience, the decompression device should be within easy reach of the switchboard.

WARNING:- (a) If the engine does not turn over when the knife switch is put in the "Electric Starting" position, it should be opened immediately.

(b) If the engine turns over but does not start, do not keep the knife switch closed for more than about 30 seconds at a time.

(c) After making an attempt to start, do not make another attempt for at least one minute.

SETTING UP THE BATTERY

As shown for Fig. 3222 Set on Page Three.

WIRING UP SET.

As shown for Fig. 3222 Set on Page Three. The connections shown on Wiring Diagram for the Fig. 3222 Set apply to generators driven in a clockwise direction from drive end. Separate wiring diagrams are shown for anti-clockwise direction of rotation.

RUNNING INSTRUCTIONS.

OPERATING SWITCHBOARD.

KNIFE SWITCH:- There are two positions for the knife switch. They are (1) "Battery Charging" and (2) "Electric Starting".

Electric Starting can only be used where the battery is in the engine room and where the starting load is within the capacity of the generator.

The battery cannot be charged and load cannot be taken from the battery in the engine room unless the switch is in the "Battery Charging" position.

FIELD RHEOSTAT)

AMMETER) As shown for Fig. 3222 Set on Page Five.

FUSES.)

PARTS LIST.

1 K.W. 32 VOLT BATTERY CHARGING SWITCHBOARD, MARK KO-G.

NO. OFF	SYMBOL NO.	NAME OF PART.
1	KO-G1	Front Panel
2	KO-G2	Switchboard Mounting Bracket
1	KO-G4	Cutout
1	KO-G10	Terminal Connection Marking Strip
1	KO-G11	Changeover Switch Nameplate for Battery Charging
1	KO-G12	Changeover Switch Nameplate for Electric Starting
2	KO-G 20	Fuse Assembly
4	DA-G 22	Fuse Connection
1	DA-G 37	Knife Switch
1	DA-G 41	Rheostat Indicator Plate
1	DA-G 68	Rheostat Internal Connection
1	DB-C 72B	Ammeter
1	DA-G 90	Rheostat Knob
1		Field Rheostat (25 ohm 50 watt)
		Fuse Wire (4 $\frac{3}{4}$ " x 22 Gauge S.W.G. Bare Copper Wire)