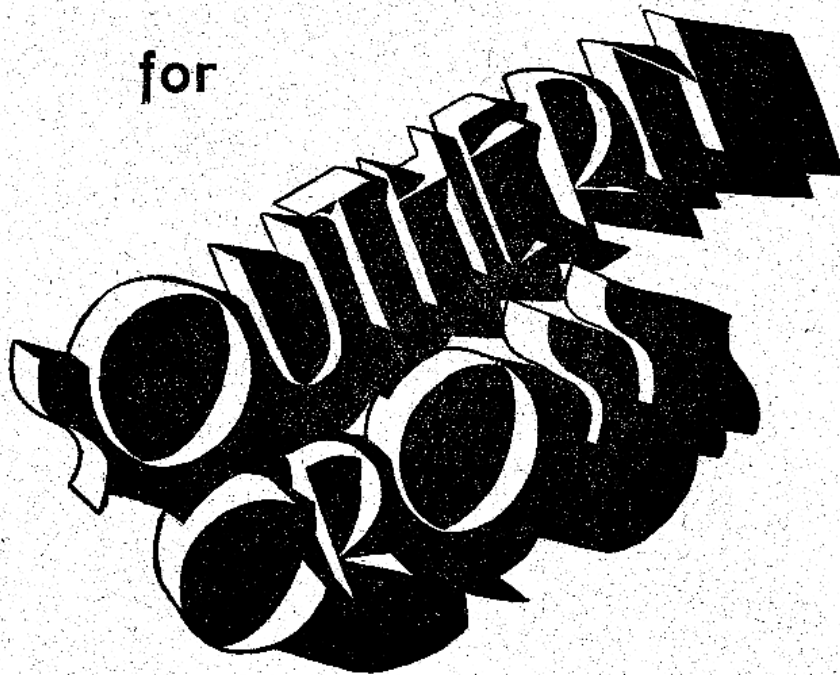


INSTRUCTION BOOK

for



GENERATING

.. SETS

Fig. 2870/2871—4.5 KW. 110 Volt Battery
Charging Generating Set
with Electric Starting.

Fig. 2872/2873—4.5 KW. 110 or 240 Volt
Direct Lighting Generating
Set.

Fig. 2874/2875—4.5 KW. 110 or 240 Volt
Direct Lighting Generating
Set with Electric Starting.



FROM GENERATOR No. 4004.

INSTRUCTION BOOK *for* **SOUTHERN CROSS GENERATING SETS**

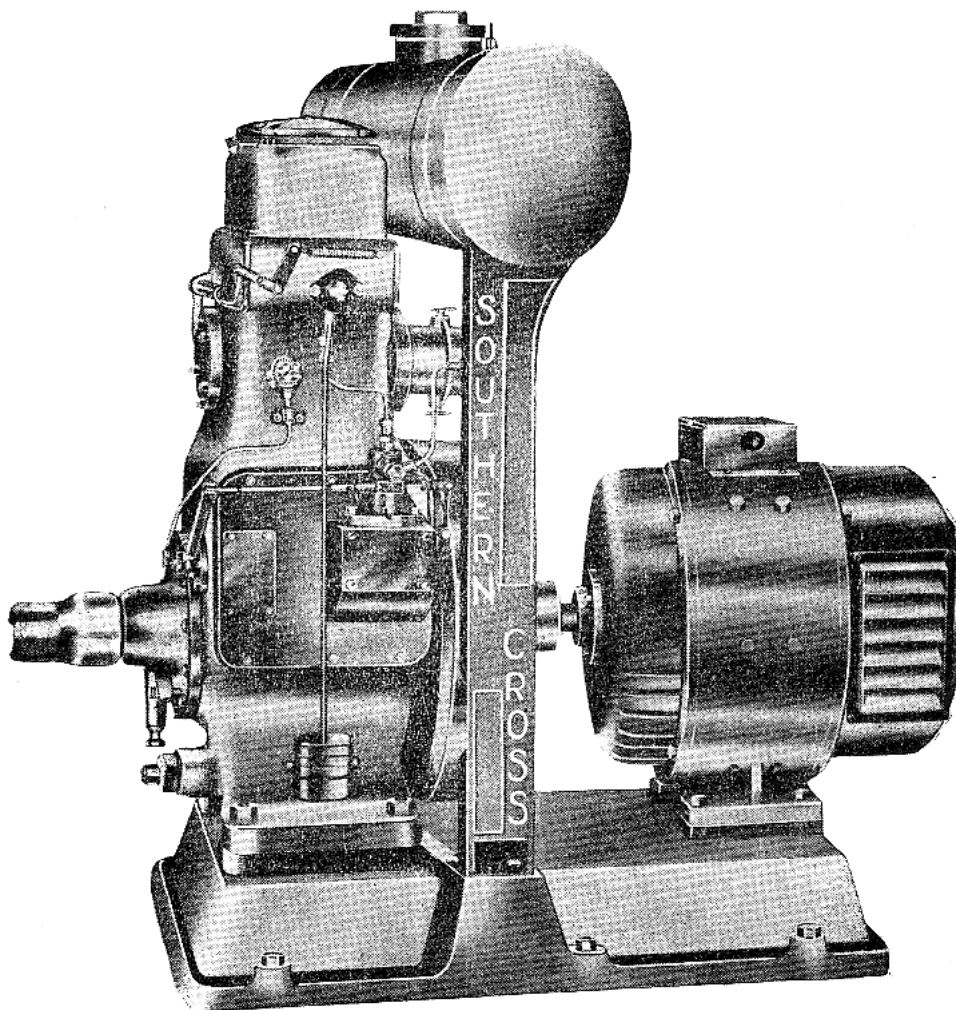


Fig. 2870/2871—4.5 KW. 110 Volt Battery Charging Generating Set with Electric Starting.

Fig. 2872/2873—4.5 KW. 110 or 240 Volt Direct Lighting Generating Set.

Fig. 2874/2875—4.5 KW. 110 or 240 Volt Direct Lighting Generating Set with Electric Starting.

UNPACKING.

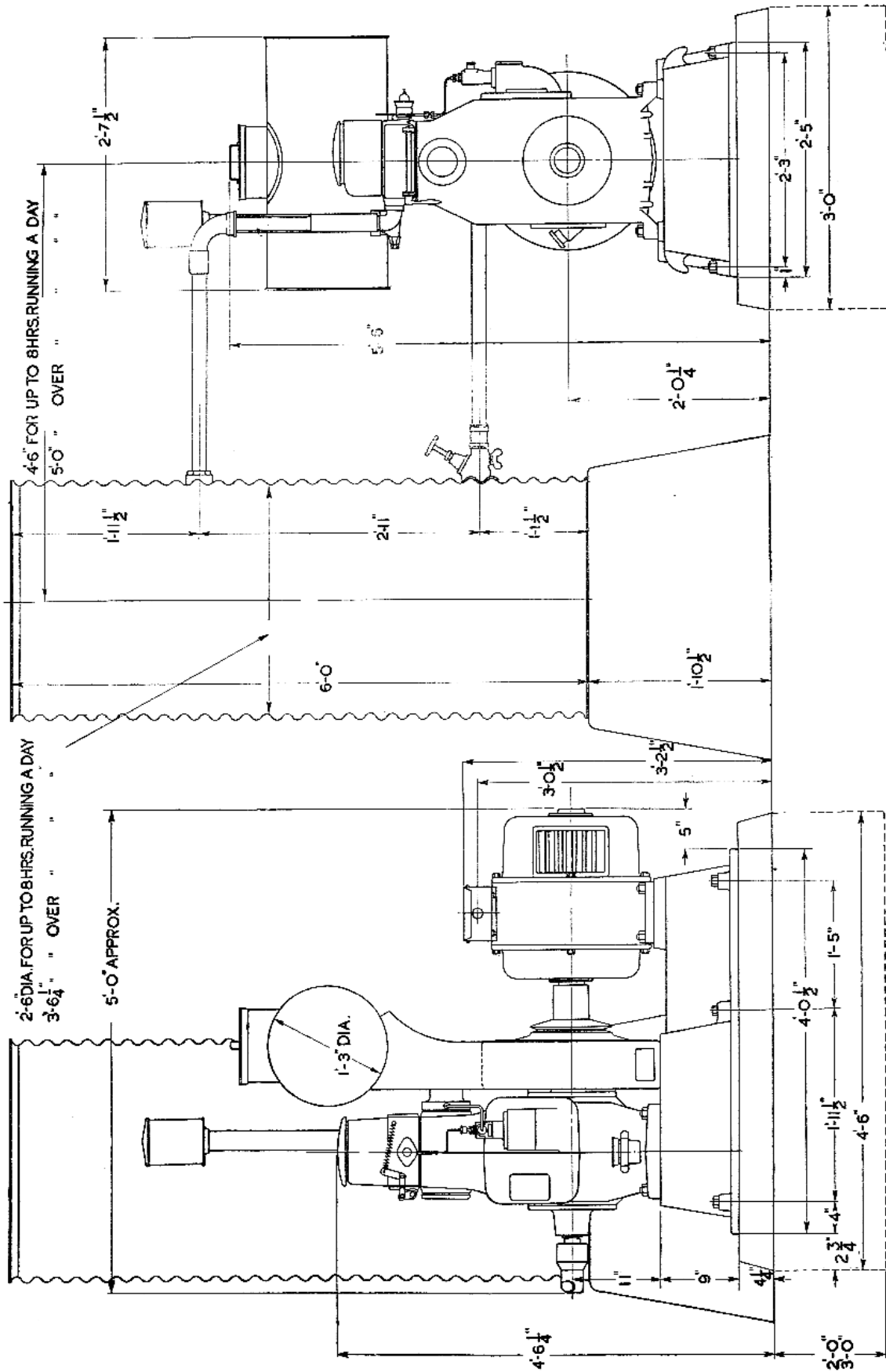
In the envelope with this Instruction Book is a packing list. During unpacking, check all articles with the packing list.

Carefully remove both sides, then both ends from the packing case. Then unscrew the nuts holding the Generating Set to the case.

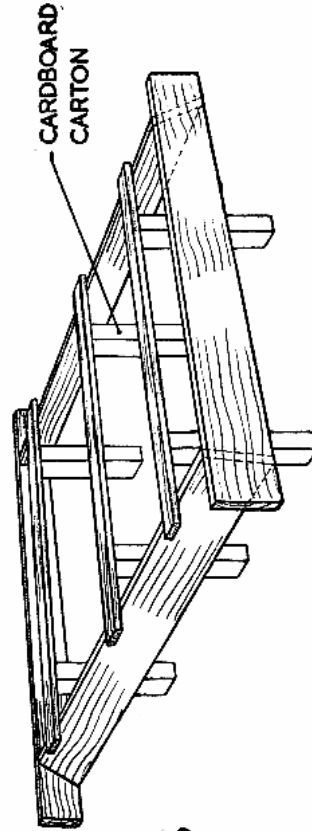
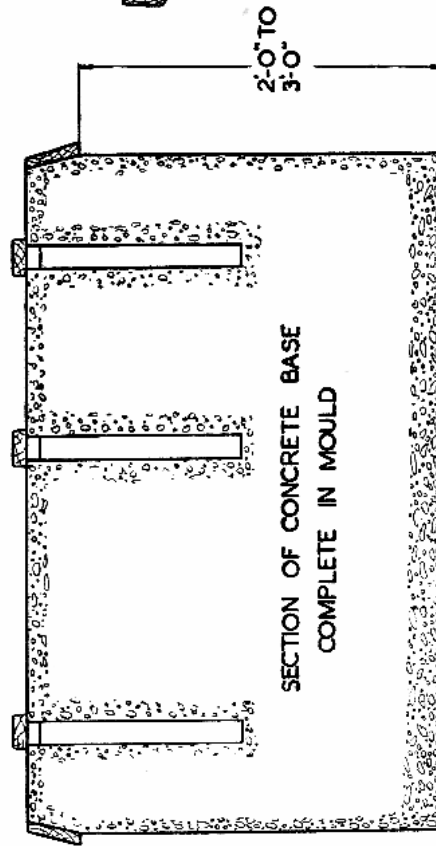
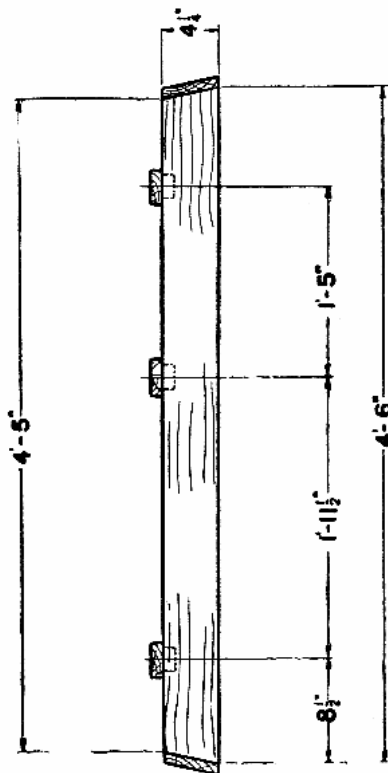
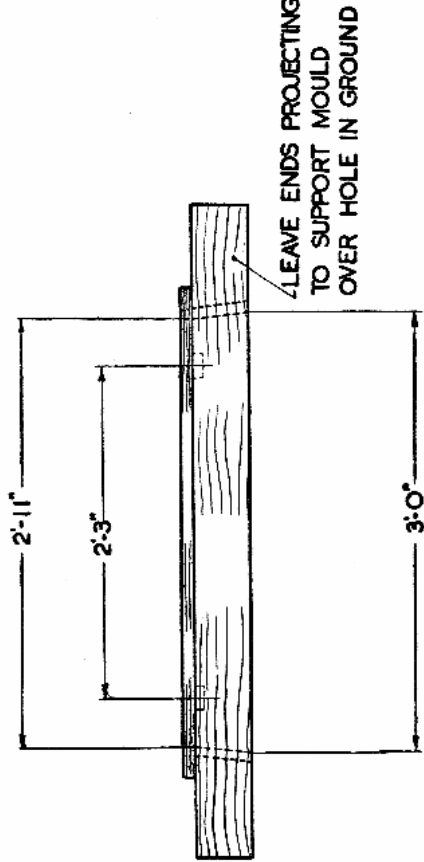
The sides and ends are later used to make a mould for the concrete base so be careful not to break them.

FOUNDATIONS.

In order to obtain the best results from this unit it must be set up on an absolutely firm foundation. The most satisfactory foundation is a good block of concrete. The size of the base and shape of the mould are shown on Page 2.



General Arrangement of Fig. 2870, 2872, 2874, 4.5 KW. 110 or 240 Volt Generating Sets.



Mould for Concrete Base.

INSTALLATION

To Make Concrete Base.

1. From the timber of the case construct a wooden mould for pouring the concrete for the base. The size and shape of the mould is shown on page 3 of the instruction book.

2. Take the special foundation hole cross boards with the square wooden blocks nailed on to them. Open out the cardboard cartons and tack the cartons to the square block. These cartons make square holes in the concrete to permit grouting the foundation bolts.

3. Nail the cross boards to the top of the mould in the position shown in the drawing, and see that the cartons are in line.

4. Now, having decided where the unit is to be installed, sink a hole in the ground 2ft. to 3ft. deep and the same size as the mould.

The depth of the hole depends on the type of soil—light soil requiring a deeper hole than hard, well-packed soil. However, always make the block larger for preference.

5. Place the mould over the hole and level it in both directions.

6. Mix a batch of concrete, using 3 parts sand, 4 parts sharp stone and rubble, and 2 parts cement. See that the stone and sand are sharp and clean and do not contain any clay or dirt. If they do, wash carefully before mixing. A block 3ft. deep will require approximately $\frac{5}{8}$ yards of sand, $\frac{3}{4}$ yards of sharp stone or rubble, and 12 — 84lb. bags of cement.

7. Fill the hole to ground level and also the mould up to the top, and at the same time place some old bolts or iron pipe in to act as reinforcement.

8. Allow the concrete to set for a day. With tank cooled units this time could be spent preparing the base for the cooling tank.

For instructions regarding cooling tanks, refer to the Engine Instruction Book, Page 6.

9. Next day remove the cross boards which hold the cartons in position and dig the cartons out.

10. Place the foundation bolts, with nuts removed and with $\frac{5}{16}$ in. washers on their heads in the holes in the block. The washers are taken from the packing box mounting bolts.

11. Lift the Generating Set on to the block by means of two slings under the lugs on the base. To prevent the paint from being marked, put a bag between the engine and the slings.

12. As the Generating Set is lowered on to the block, guide the foundation bolts into the holes in the base, and, when the unit is resting on the block, screw the nuts on a full nut.

13. The engine and generator have been lined up before the unit left the Factory. However, the base must be set up true or this alignment is destroyed. Therefore, remove the pins and rubber bushes from the flexible coupling. Screw the indicator rod support into the tapped hole in the Flexible Coupling Boss, attach the Indicator Rod to the Support and the Indicator to the Rod.

14. True up the base, using wooden wedges under it. The base must be lined up so that the misalignment as shown on the indicator does not exceed .005in. on the diameter of the flywheel, and .010in. on the face of the flywheel. This alignment is most important, and unless care is taken to get it correct the life of the coupling rubbers will be greatly reduced.

15. After the unit has been correctly aligned, proceed to grout in the bolts with a mixture of two parts clean sand and one of cement. When the holes are filled work the grouting under the edges of the base so it will set on a firm level foundation. This must be carefully done to prevent the unit getting out of alignment.

16. Next day remove the wedges, tighten the foundation bolts, and check alignment, and, with the same mixture, clean up the surface of the block.

17. Mount the fuel tank supports on the base and assemble the fuel tank on the supports. Connect the fuel pipe between the tank and filter.

18. On the following day assemble the pegs and rubbers and tighten them very tightly. The engine may now be started, but not before, as it is essential that the block be allowed to set for at least four days before the engine is run.

Switchboards.

NOTE: Switchboards must be mounted vertically or the contactor on Electric Starting Sets will not operate.

To mount the Switchboard on the wall suitable bearers such as some 3in. x 2in. pine from the packing case must be provided at a convenient height. For size of Switchboard refer to dimensioned drawing under 'Operating' for the particular Generating Set being installed.

When the switchboard bearers have been fixed to the wall, remove the Switchboard Panel, Top, Bottom, Back, and Sides, from the Switchboard Frame. Take the back and place it in position on the wall. Mark the Switchboard mounting holes through the holes in the back.

After drilling the holes, mount the Switchboard Back and Frames, using 4 — 4½in. x ½in. Whitworth Bolts provided.

Replace the bottom of the Switchboard Frame and run 1½in. Conduit between the Generator and the Switchboard. After fitting the conduit, but before joining the pieces together, run through them a piece of fencing wire to pull the main cables through.

The connection to the generator and switchboard are shown in the wiring diagram for the various sets.

Bring the main cables through the bottom of the Switchboard. Support the Switchboard Panel, face down, in front of the frame.

The cables may then be connected to the terminals on the terminal strip. The line leads are taken direct from the Main Circuit Breaker.

Then the Panel may be screwed in place on the frame, and, after it is seen that the wires are not touching anything, the Top and Sides may be replaced in the Switchboard.

Main Circuit Breaker.

These switchboards incorporate a main circuit breaker which serves the purpose of both a Main Switch and Fuses.

When an overload occurs the Circuit Breaker is tripped, automatically opening the circuit. When tripped, the handle of the switch takes up a position midway between "ON" and "OFF." To reset, wait about 5 minutes, then switch "OFF" then "ON." NOTE: After the switch has tripped it cannot be switched on again for about 5 minutes until the trip mechanism has cooled off. The switch cannot be held in against an overload.

This Main Circuit Breaker is also used in the same manner as a normal Main Switch.

Contactor.

Electric Starting is provided on the Fig. No. 2870/2871 4.5 K.W. Battery Charging Generating Set and on the Fig. No. 2874/2875 4.5 K.W. Electric Starting Direct Lighting Set.

This Electric Starting Equipment incorporates a Mark CY-C Contactor mounted in the Switchboard. The Contactor is operated by a Push Button Station on the Generator.

When the Push Button is pressed the main contacts of the Contactor are closed electrically. These main contacts carry current to the Generator, which turns the engine.

When the Push Button is released the Contactor Main Contacts open, forming an Arc which is quickly extinguished by a Blowout Coil on the Contactor. This arc may be seen in the switchboard, and is quite normal.

NOTE: It is most important to the correct operation of the contactor that the Switchboard should be mounted vertically on the wall.

OPERATING

Fig. 2870/2871 4.5 KW. 110 Volt Battery Charging Generating Set. (With Electric Starting).

Connections.

A Mark CZ-D Switchboard is used on this Generating Set. The size of the Switchboard is illustrated on page 8.

This Generating Set is provided with Electric Starting Equipment and care must be taken that it is connected up exactly as shown in the wiring diagram for this set. (Page 7.)

All connections between the switchboards and generator or switchboard and batteries should be made with 7/.064 VIR Cable, which may be run in 1½ in. Conduit.

The neutral should be earthed through the Circuit Breaker. Do not under any conditions earth the system on the generator side of the Circuit Breaker as the Breaker ratings may be exceeded.

Connect the batteries only after all other wiring has been completed. With the generator stopped the Main Circuit Breaker may be switched "ON" and the Batteries will then supply power to the load. NOTE: No reading will be shown on either the Voltmeter or the Ammeter under these conditions.

With the Circuit Breaker "OFF" no power will be supplied to the load, although if the Generating Set is operating, the ammeter will show the charge to the batteries.

With the Circuit Breaker "ON" and the Generating Set operating the Ammeter will show the total output of the Generator.

To Start Generating Set.

1. Prepare engine for first run as detailed on Pages 8 and 9 of the Engine Instruction Book.
2. See that the Fuel Cock is "ON."
3. It is preferable to remove all external load from the batteries while using the Electric Starting Equipment, so as not to put a greater drain than necessary on the batteries. Therefore switch the Main Circuit Breaker "OFF."
4. Lift the Automatic Overload Stop to allow pump control rod to move into the fully open position.
If this is not done the engine will be difficult to start, as it will not receive sufficient fuel.
5. Lift Valve Lift Lever to release compression.
6. Fill Oil Starter Plug with lubricating oil, use two fillings, put into head, and screw up.
7. Push Starter Button and allow the generator to crank the engine. After about five or six revolutions push valve lift lever down, holding push button closed until the engine commences to fire.

If the engine does not commence firing, then the instructions on Page 8 and 9 of the Engine Instruction Book have not been followed.

NOTE.—1. Do not hold the push button closed for more than about thirty seconds at a time.

2. After each attempt to start allow the batteries to stand idle for at least one minute while the engine is checked over to see why it did not start.

3. Always release the valve lift lever before attempting to start the engine.

As the engine gains speed the voltmeter needle should commence rising, and, after about half a minute, the Ammeter should indicate a charge to the batteries.

To Stop Engine.

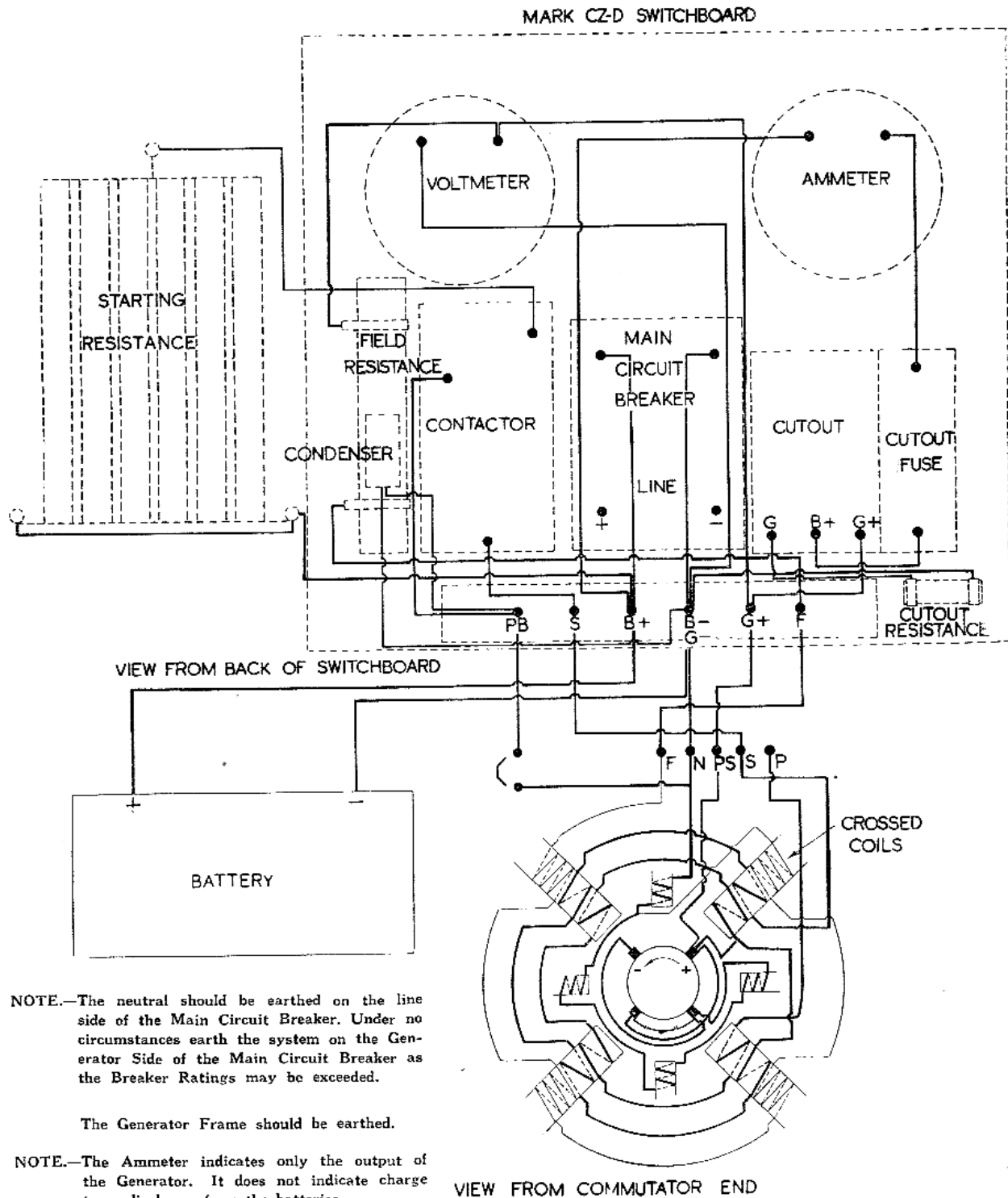
Refer to Page 10 of the Engine Instruction Book.

To Adjust Voltage.

The plant has been tested and adjusted at the Factory to provide the correct charging rate when connected to 55 cells.

If it is necessary to check the adjustment at any time, proceed as follows:—

1. Charge the battery until the specific gravity of the electrolyte and the charging rate have remained constant for two hours.
2. Should the final charging rate be less than that recommended by the battery manufacturer for the particular battery installed, move the clips on the field resistance closer together (about ½ in. at a time), and charge the batteries again, until the charging rate and specific gravity have remained constant for about an hour.
Continue these adjustments until the final charging rate approaches, but does not exceed, that recommended by the battery manufacturer.
3. Should the final charging rate exceed that recommended, the clips should be moved apart, and the plant operated again until the final charging rate approaches, but does not exceed, that recommended by the battery manufacturer.



NOTE.—The neutral should be earthed on the line side of the Main Circuit Breaker. Under no circumstances earth the system on the Generator Side of the Main Circuit Breaker as the Breaker Ratings may be exceeded.

The Generator Frame should be earthed.

NOTE.—The Ammeter indicates only the output of the Generator. It does not indicate charge to or discharge from the batteries.

Wiring Diagram for Fig. 2870/2871 4.5 KW. 110 Volt Battery Charging Generating Set.

Ammeter.

The Ammeter is connected to read only the output of the Generator.

With the Circuit Breaker "OFF" and the Generator running, the Ammeter reads the charge to the batteries.

With the Circuit Breaker "ON" and the Generator running, the Ammeter reads the total output of the Generator, whether used by the load or by the battery. This load must be kept under 47 Amperes, the rated output of the generator.

With the Circuit Breaker "ON" and the Generator stopped, the batteries supply the load by themselves.

Cutout Fuse.

A fuse is connected in series with the cutout and is to protect the plant should the cutout at any time stick closed on shutting down.

To check whether the fuse is blown, start the plant and allow it to rise to its full voltage. Open the Main Circuit Breaker and see if the Ammeter indicates a charge. If there is no charge and the lines to the battery are properly connected, and are not corroded, the fuse is probably blown.

To replace cutout fuse:—

1. With the Generator stopped, disconnect one of the leads from the battery, making sure it cannot short anywhere.
2. Remove the left-hand side of the switchboard to expose the fuse.
3. Undo the two nuts holding the fuse in place and remove it.

4. If the fuse is blown the two cable lugs can be easily pulled from the tube.

5. Replace the wire in the fuse with the spare wire supplied, or with 20 SWG Copper Wire, which is suitable. Bend a loop in the wire mating with the holes in the cable lugs to connect over the screws on the switchboard.

6. Replace the fuse in the switchboard, replace cover, and try plant again.

Cutout.

A Mark AY-D Cutout is incorporated in the Switchboard.

This cutout has been adjusted at the Factory and no further adjustment should be necessary.

The operation of the cutout may be checked as follows:—

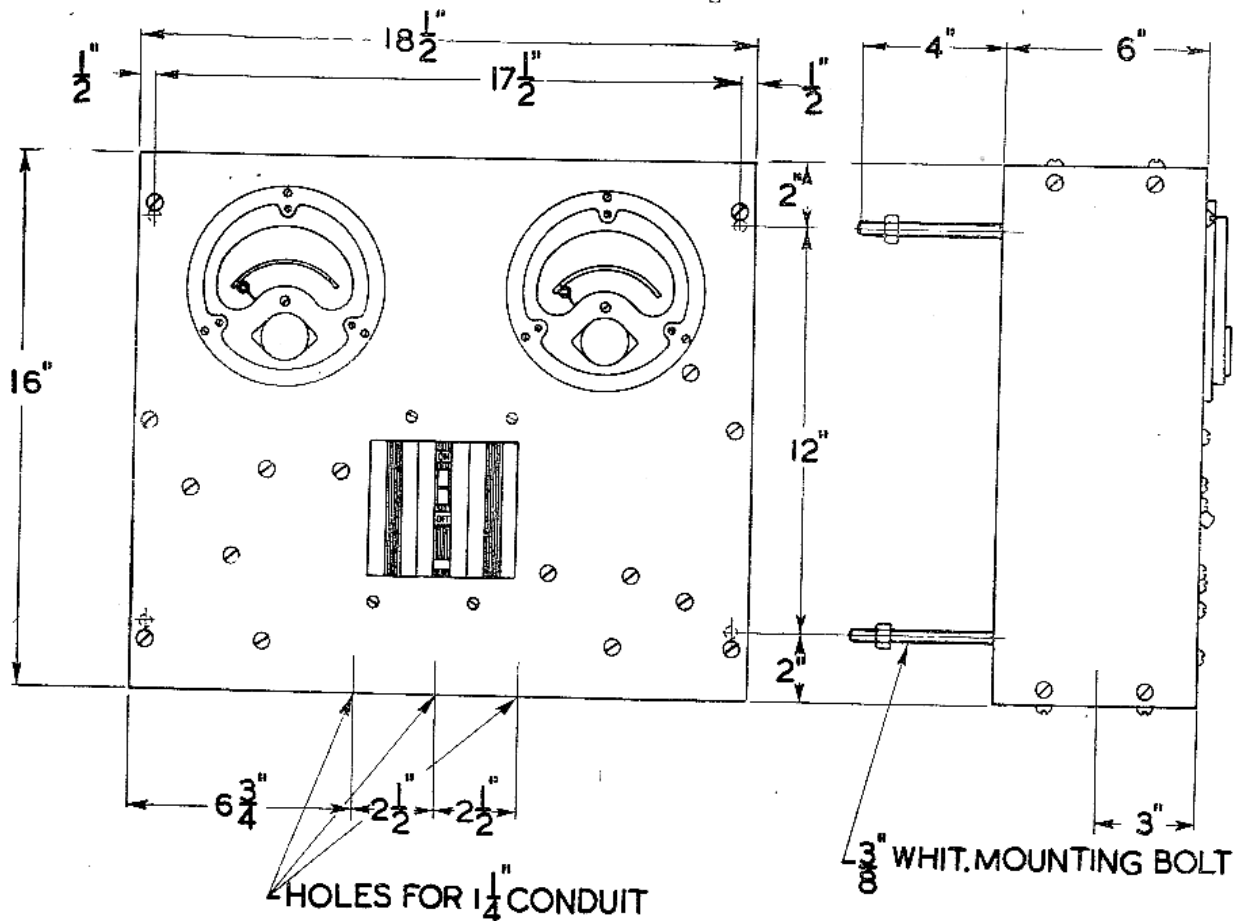
Start the engine, and, as it gains speed, the cutout points should close and the ammeter show a momentary charge of about 50 Amperes, settling down to about a 30 Ampere charge.

On slowing down the engine the cutout points should open with about 2 Amperes discharge.

Battery Charging.

The charge to the batteries will vary according to the condition of the battery.

A discharged battery will be charged at about 30 Amperes, dropping back slowly as the battery becomes charged.



General Arrangement of Mark CZ-D Switchboard.

OPERATING

Fig. 2872/2873 4.5 KW. 110 or 240 Volt Direct Lighting Generating Set.

Connections.

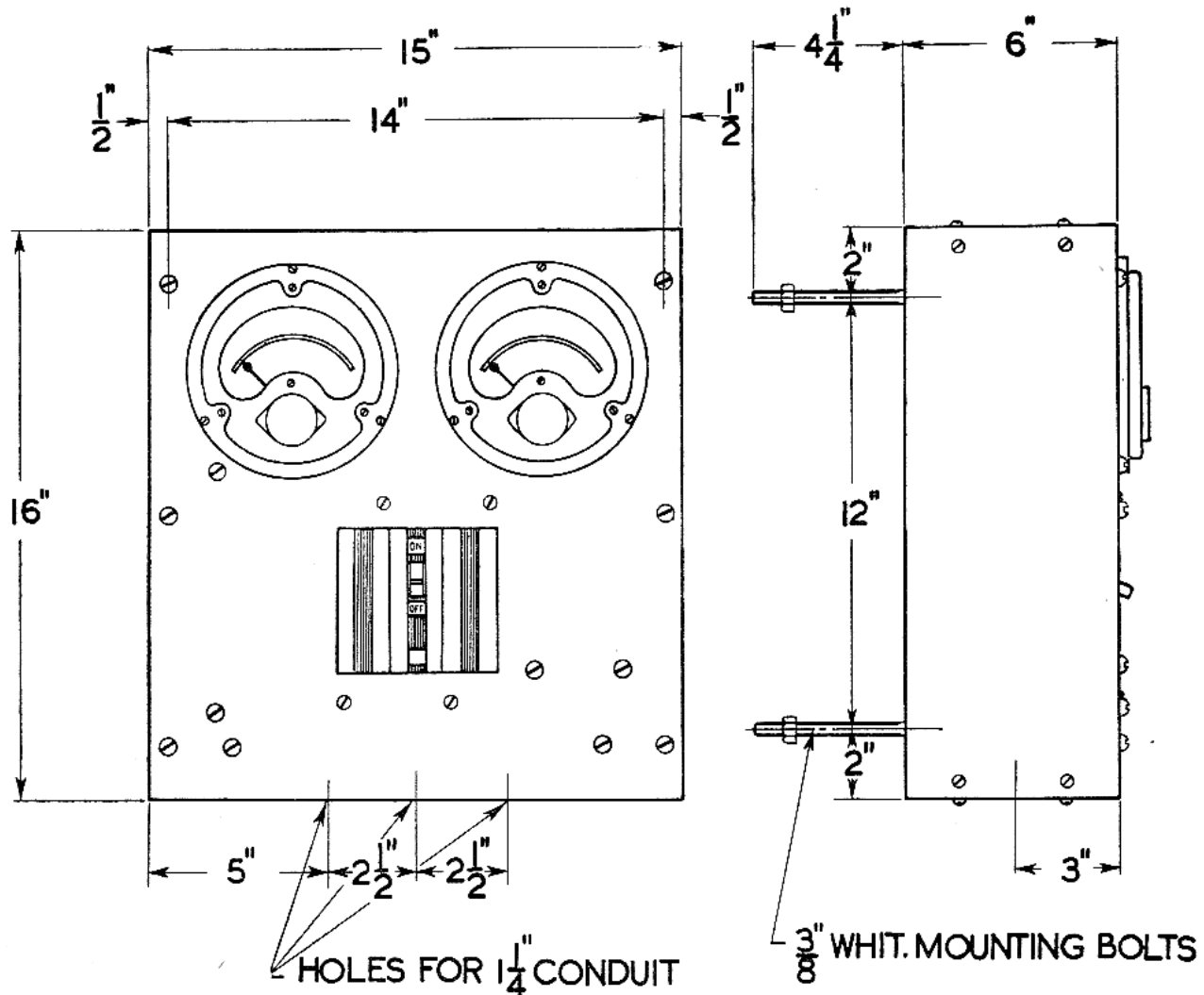
A Mark CZ-B Switchboard is used in this Generating Set. The size of the Switchboard is illustrated below.

The connections are made as shown in the wiring diagram for this set. (Page 10.) The Generator Terminals "S" and "PB" are not used. All connections between the Generator and Switchboard should be made with 7/.064 VIR Cable run in 1½ in. Conduit.

The neutral conductor should be earthed through the Main Circuit Breaker. Do not under any conditions earth the system on the generator side of the Main Circuit Breaker as its ratings may be exceeded.

To Start Generating Set.

1. Prepare engine for first run as detailed on Pages 8 and 9 of the Engine Instruction Book.
2. Make sure the Main Circuit Breaker is "OFF."



General Arrangement of Mark CZ-B and CZ-C Switchboards.

3. Start engine as detailed on Pages 9 and 10 of the Engine Instruction Book.

As the engine gains speed the voltmeter needle should commence rising, and, after about half a minute, should settle at 110 Volts or 240 Volts, depending on the voltage of the set.

4. Load may now be switched on, the load being indicated by the Ammeter.

To Stop Generating Set.

1. Open Main Circuit Breaker.
2. Stop engine as detailed on Page 10 of the Engine Instruction Book.

To Adjust Voltage.

The voltage of the Generator has been set at the Factory to 110 Volts or 240 Volts, according to whether the Generator is 110 or 240 Volt. If it is required higher or lower for some reason the adjustment may be made on the Field Resistance.

1. Start Generator and note Voltage after 5 minutes.
2. Stop Generator.
3. Remove the left-hand side of the switchboard to expose the Field Resistance.
4. To raise the voltage move the clips on the Field Resistance closer together.

To lower the voltage move the clips further apart.

Only move the clips $\frac{1}{16}$ in. at a time until the required voltage is approached, when finer adjustment may be necessary.

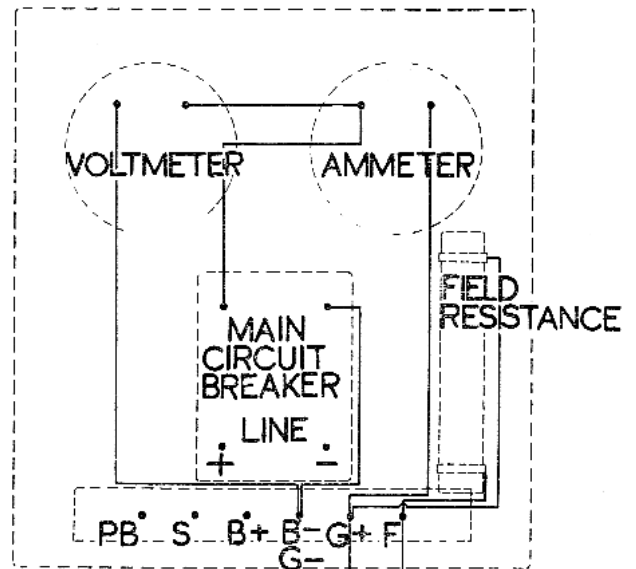
5. Start engine and check voltage of Generator again.

6. Stop engine and, if necessary, readjust the Field Resistance Clips.

7. When the voltage is correct, after about a five minute run, stop engine. Replace the side on the Switchboard.

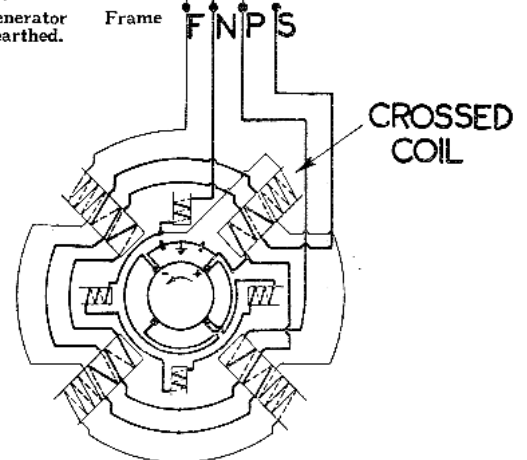


MARK CZ-B SWITCHBOARD



VIEW FROM BACK OF SWITCHBOARD

NOTE.—The neutral should be earthed on the line side of the Main Circuit Breaker. Under no circumstances earth the system on the Generator Side of the Main Circuit Breaker as the Breaker Ratings may be exceeded.
The Generator Frame should be earthed.



VIEW FROM COMMUTATOR END

Wiring Diagram for Fig. 2872/2873 4.5 KW. 110 or 240 Volt Generating Set.

NOTE:—The Terminal branded PS in the Terminal Box is not used in this installation.

OPERATING

Fig. 2874/2875 4.5 KW. 110 or 240 Volt Direct Lighting Generating Set. (With Electric Starting).

Connections.

A Mark CZ-C Switchboard is used in the Generating Set. The size of the Switchboard is illustrated on page 9.

This Generating Set is provided with Electric Starting Equipment and care must be taken that it is connected up exactly as shown in the wiring diagram for this set. (Page 12.) The Generator Terminal marked "PS" is not used.

All connections between the Switchboard and Generator or Switchboard and Batteries should be made with 7/.064 VIR Cable run in 1½ in. Conduit.

The Battery Charging Board should be mounted in a convenient position on the wall, using the screws provided. It should be connected to the load side of the Main Circuit Breaker and only the positive side should be connected. Do not connect the negative line to the Battery Charging Board. The negative return is made directly between the batteries and the common negative terminal on the switchboard.

The neutral conductor should be earthed through the Main Circuit Breaker. Do not under any conditions earth the system on the Generator side of the Circuit Breaker, as the Breaker Ratings may be exceeded.

Connect the batteries only after all other wiring has been completed. Before connecting the lead to the batteries from the Battery Charging Board, make sure the switch on the Battery Charging Board is "OFF."

To Start Generating Set.

1. Prepare engine for first run as detailed on Pages 8 and 9 of the Engine Instruction Book.
2. Make sure Main Circuit Breaker is "OFF."
3. See that Fuel Cock is on.
4. Lift Automatic Overload Stop to allow pump control rod to move into fully open position.

If this is not done the engine will be difficult to start, as it will not receive sufficient fuel.

5. Lift Valve Lever to release compression.
6. Fill oil starter plug with lubricating oil, use two fillings, put into head, and screw up.
7. Push Starter Button and allow generator to crank engine. After about five or six revolutions push valve lift lever down, holding push button closed until engine commences to fire.

If the engine doesn't commence firing then the instructions on Pages 8 and 9 of the Engine Instruction Book have not been followed.

- NOTE.**—1. Do not hold the Push Button closed for more than about thirty seconds at a time.
2. After each attempted start allow the batteries to stand idle for at least one minute while the engine is checked over to see why it did not start.
 3. Always release the valve lift lever before attempting to start the engine.

As the engine gains speed the voltmeter needle should commence rising, and, after about half a minute, should settle at 110 Volts or 240 Volts, depending on the voltage of the set.

The load may now be switched on, and is indicated by the Ammeter.

Charging the Starting Batteries.

When the generator is up to voltage and the load switched on, the switch on the Battery Charging Board may be switched "ON." The lamps should then glow and the ammeter on the Battery Charging Board indicate a charge to the batteries. When the batteries have received sufficient charge they may be switched "OFF" by the switch on the Battery Charging Board. The batteries are only charged at about 3 Amperes, as they absorb some of the output of the Generator.

To Stop Generating Set.

1. Switch "OFF" charge to Starting Batteries.
2. Open Main Circuit Breaker.
3. Stop Engine as detailed on Page 10 of the Engine Instruction Book.

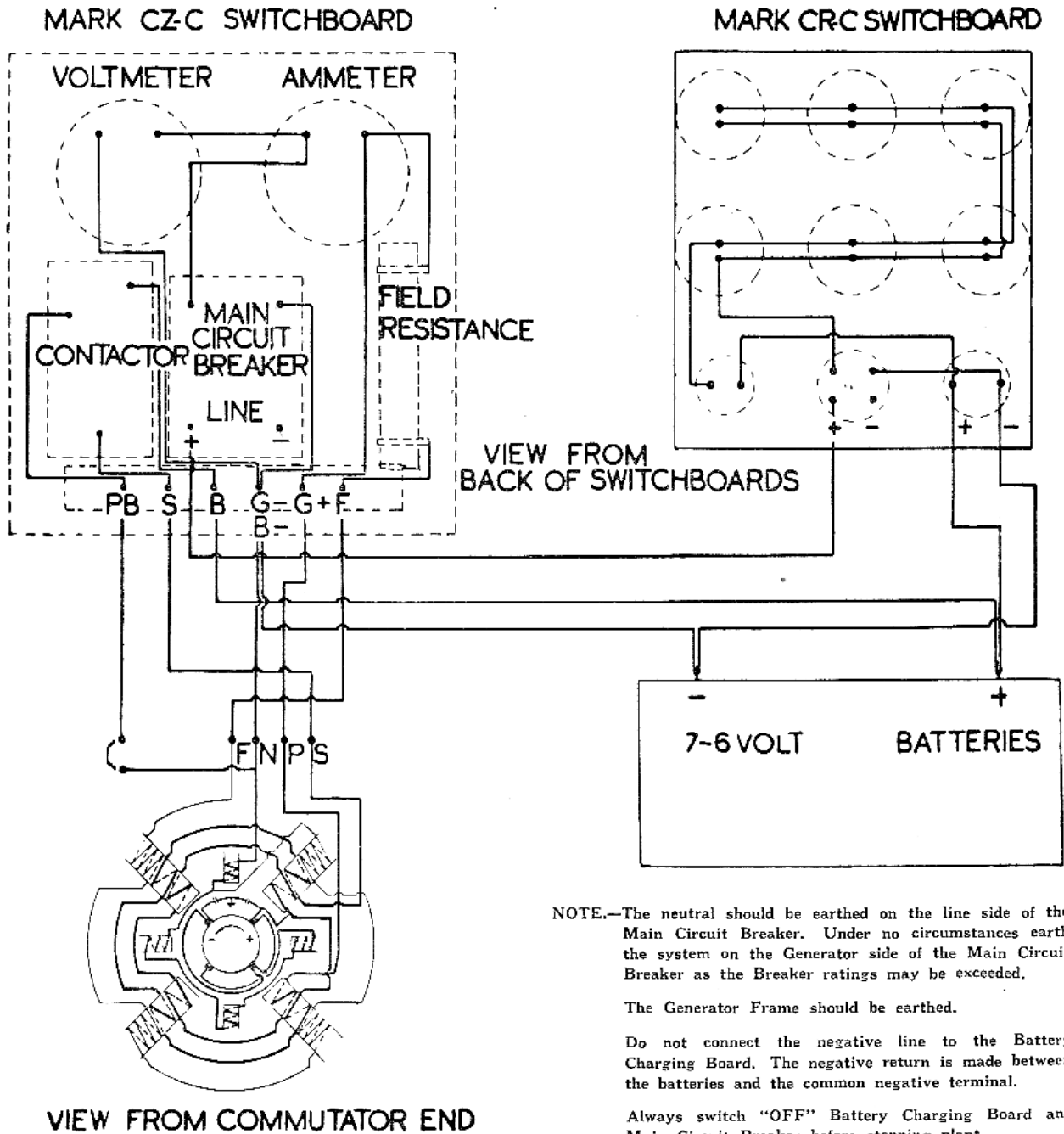
To Adjust Voltage.

The Voltage of the Generator has been set at the Factory to 110 Volts or 240 Volts, according to whether the Generator is 110 or 240 Volt. If it is required higher or lower for some reason, the adjustment may be made on the Field Resistance.

1. Start Generator and note voltage after 5 minutes.
2. Stop Generator.
3. Remove the left-hand side of the Switchboard to expose the Field Resistance.
4. To raise the voltage move the clips on the Field Resistance closer together.

To lower the voltage move the clips further apart. Only move the clips ¼ in. at a time until the required voltage is approached, when finer adjustment may be necessary.

5. Start engine and check voltage of generator again.
6. Stop engine and, if necessary, readjust the Field Resistance Clips.
7. When the Voltage is correct, after about a five minute run, stop engine. Replace the side on the switchboard.



Wiring Diagram for Fig. 2874/2875 4.5 KW. 110 or 240 Volt Generating Set with Electric Starting.

NOTE:—The Terminal branded PS in the Terminal Box is not used in this installation.

CARE OF 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.

The Generator is fitted with ball bearings which have been packed with grease before the machine left the works, and they do not require further attention before the plant is put into operation.

However, it is advisable to remove the end caps from the bearings at least once a year to examine them. 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, grease should be added to the bearing. Only fill the bearing cage, don't fill the cap with grease, or the bearing will overheat and grease will be forced from the bearing over the windings of the generator.

The faults arising from over lubrication are far greater than those occurring from under lubrication. Under no condition must oil or grease containing graphite be used.

Recommended greases are:—

SKF. No. 28 Grease.

Shell RB Grease.

Shell No. 2 Fibre.

Gargoyle No. 8 Grease.

Commutator.

Keep it clean and bright. Do not allow copper or carbon dust to collect on the insulation between the bars, nor about the junction of the armature windings with the bars.

Brushes.

Keep the brushes free in their holders and all even in pressure. When worn down to $\frac{1}{16}$ in. long they should be replaced with new brushes of the size and grade stamped on the name plate.

To Fit New Brushes.

The Brush Rocker is set in the neutral position, and this position is marked by a white line painted on the Brush Rocker and Bearing Cap. This may be seen by removing the Endshield Covers.

The Brush Rocker may be loosened by slackening off the clamp screw and loosening off the Commutator End Bearing Cap.

This permits the Brush Rocker to swivel around to expose each brush holder.

Remove the old brushes and try the new brushes of the size and grade stamped on the name plate in the Brush Holder.

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 slide in the holder.

With new brushes in position, bed them on the commutator by inserting a strip of sandpaper between the brush and the commutator, sand side out. By drawing this strip backward and forward the bearing face of the brush is smoothed down to the same curvature as the commutator.

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.

Reassemble and shift Brush Rocker to neutral position and retighten screws.

The generator may be started up again, but it is advisable to run it on light load for a few hours before putting on full load to enable the brushes to settle down properly.

Sparking at Brushes.

The commutator must be examined occasionally while the plant is running. It should be practically sparkless at all times. If sparking does occur steps should be taken immediately to cure it or serious trouble may arise in a short time.

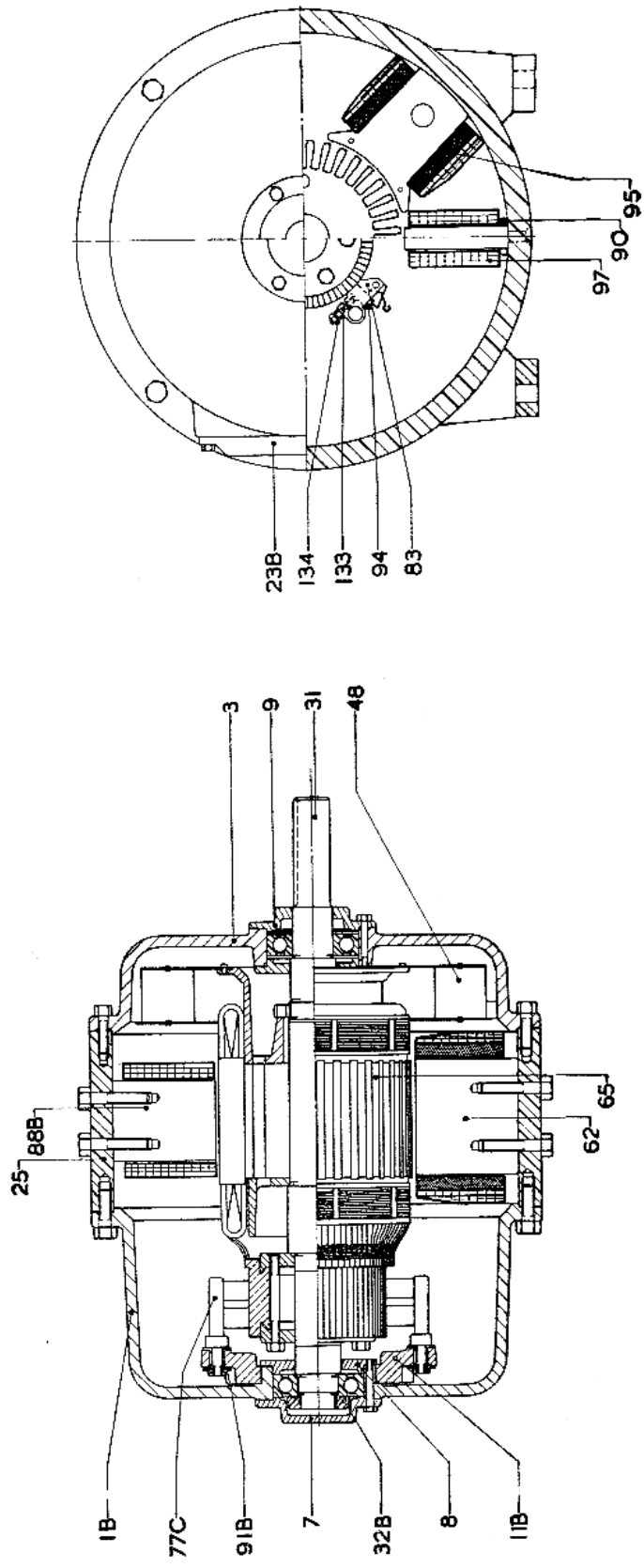
The sparking may be due to several causes:—

- (1) Brush Rocker not in neutral position (check markings).
- (2) Overloading Generator.
- (3) Jumping of brushes due to vibration or incorrect pressure on the Brush Tension Arm.

When the Generator is supplied the tension of the brush is correct with the spring in the lowest notch of the Tension Arm, and as the Brush wears it is necessary to place it in a notch further back.

Batteries.

An instruction chart giving details of the care of batteries is supplied with the batteries.



Mark AO-K and AO-L 110 and 240 Volt Generators—Sectional View.

PARTS LIST

* * * *

Parts for Mark AO-K 4.5 KW. 110 Volt Generator.

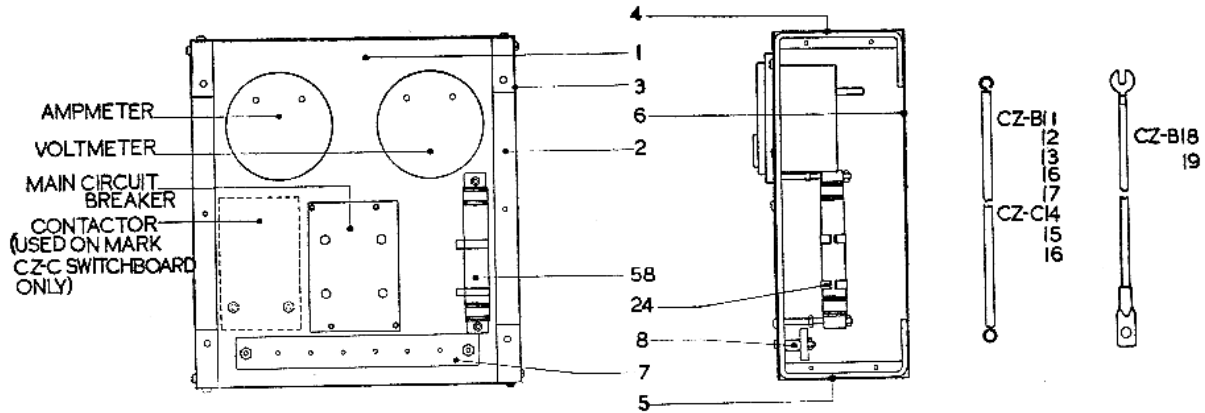
No. Off. Sym. No.	Name of Part.	No. Off. Sym. No.	Name of Part.
1 AO-N 1B	Commutator End Endshield.	1 AO-N 62	Main Pole.
1	3 Drive End Endshield.	1 AO-K 65	Armature.
1	7 Commutator End Bearing Cap—Out- side.	4 AO-N 77C	Brush Holder Spindle.
2	8 Bearing Cap—Inside.	8	83 Brush Holder.
1	9 Drive End Bearing Cap—Outside.	4	88B Interpole.
1	11B Brush Rocker.	4	90 Interpole Coil Support Pin.
1 KN 22	Suppressor Condenser.	8 AO-B 91B	Brush Spindle Insulating Washer.
2 AO-N 23B	Commutator End Endshield Cover.	8 AO-N 94	Brush.
1	25 Generator Body.	4 AO-K 95	Field Coil.
1	32 Commutator End Bearing Nut.	4	97 Interpole Coil.
1 AO-K 40	Terminal Box.	AO-N100	Pole Shim.
1	41 Terminal Box Cover.	4 AO-B133	Brush Holder Spindle Nut.
1 AO-N 48	Fan.	8	134 Brush Holder Clamp Screw.
		2 AO-N191	Armature Shaft Bearing.

Parts for Mark AO-L 4.5 KW. 240 Volt Generator.

No. Off. Sym. No.	Name of Part.	No. Off. Sym. No.	Name of Part.
1 AO-N 1B	Commutator End Endshield.	1 AO-N 62	Main Pole.
1	3 Drive End Endshield.	1 AO-L 65	Armature.
1	7 Commutator End Bearing Cap—Out- side.	4 AO-N 77C	Brush Holder Spindle.
2	8 Bearing Cap—Inside.	4	83 Brush Holder.
1	9 Drive End Bearing Cap—Outside.	4	88B Interpole.
1	11B Brush Rocker.	4	90 Interpole Coil Support Pin.
1 KN 22	Suppressor Condenser.	8 AO-B 91B	Brush Spindle Insulating Washer.
2 AO-N 23B	Commutator End Endshield Cover.	4 AO-N 94	Brush.
1	25 Generator Body.	4 AO-L 95	Field Coil.
1	32 Commutator End Bearing Nut.	4	97 Interpole Coil.
1 AO-K 40	Terminal Box.	AO-N100	Pole Shim.
1	41 Terminal Box Cover.	4 AO-B133	Brush Holder Spindle Nut.
1 AO-N 48	Fan.	4	134 Brush Holder Clamp Screw.
		2 AO-N191	Armature Shaft Bearing.

Parts for Mark BO-K Base and Fittings.

No. Off. Sym. No.	Name of Part.	No. Off. Sym. No.	Name of Part.
1 BO-K 1	Base.	2 BO-K152	Generator Dowel.
		2 AW-D160	Engine Dowel.



Mark CZ-B and CZ-C Switchboards—Sectional View.

Parts for Mark CZ-B Switchboards.

(USED ON FIG. 2872/2873 4.5 KW. GENERATING SET).

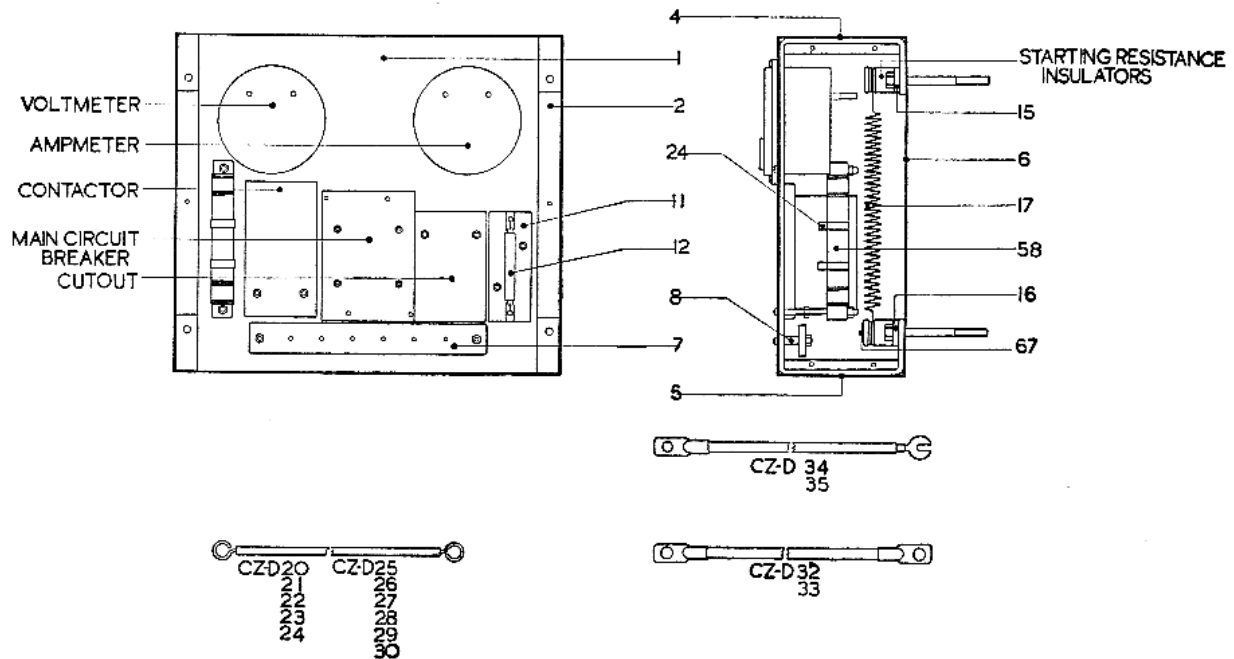
No. Off.	Sym. No.	Name of Part.	No. Off.	Sym. No.	Name of Part.
1	CZ-B 1	Panel.	1	CZ-B 16	Terminal Strip "G—" to Circuit Breaker Connection.
2	2	Frame.	1	17	Ammeter to Circuit Breaker Connection.
2	3	Side.	1	18	Terminal Strip "G+" to Field Resistance Connection.
1	4	Top.	1	19	Terminal Strip "F" to Field Resistance Connection.
1	5	Bottom.	2	AM-H 24	Field Resistance Clips.
1	6	Back.	1	AU-G 58	Field Resistance.
1	7	Terminal Strip.	1	72B	Ammeter.
2	8	Terminal Strip Distance Piece.	1	73B	Voltmeter.
1	11	Terminal Strip "G+" to Ammeter Connection.	1	CZ-B 75	Main Circuit Breaker.
1	12	Terminal Strip "G—" to Voltmeter Connection.			
1	13	Ammeter to Voltmeter Connection.			

Parts for Mark CZ-C Switchboards.

(USED ON FIG. 2874/2875 4.5 K.W. GENERATING SET WITH ELECTRIC STARTING.)

No. Off.	Sym. No.	Name of Part.	No. Off.	Sym. No.	Name of Part.
1	CZ-B 1	Panel.	1	CZ-B 16	Terminal Strip "G—" to Circuit Breaker Connection.
2	2	Frame.	1	CZ-C 16	Terminal Strip "B+" to Contactor Connection.
2	3	Side.	1	CZ-B 17	Ammeter to Circuit Breaker Connections.
1	4	Top.	1	18	Terminal Strip "G" to Field Resistance Connection.
1	5	Bottom.	1	19	Terminal Strip "F" to Field Resistance Connection.
1	6	Back.	2	AM-H 24	Field Resistance Clips.
1	7	Terminal Strip.	1	AU-G 58	Field Resistance.
2	8	Terminal Strip Distance Piece.	1	72B	Ammeter.
1	11	Terminal Strip "G+" to Ammeter Connection.	1	73B	Voltmeter.
1	12	Terminal Strip "G—" to Voltmeter Connection.	1	CZ-B 75	Main Circuit Breaker.
1	13	Ammeter to Voltmeter Connection.	1	BR-G 5	Electric Starting Push Button Control.
1	CZ-C 14	Terminal Strip "PB" to Contactor Connection.	1	CZ-C 31	Suppressor Condenser Assembly.
1	15	Terminal Strip "S" to Contactor Connection.			

NOTE: For Parts List for Contactor, See Page 18.



Mark CZ-D Switchboard—Sectional View.

Parts for Mark CZ-D Switchboards.

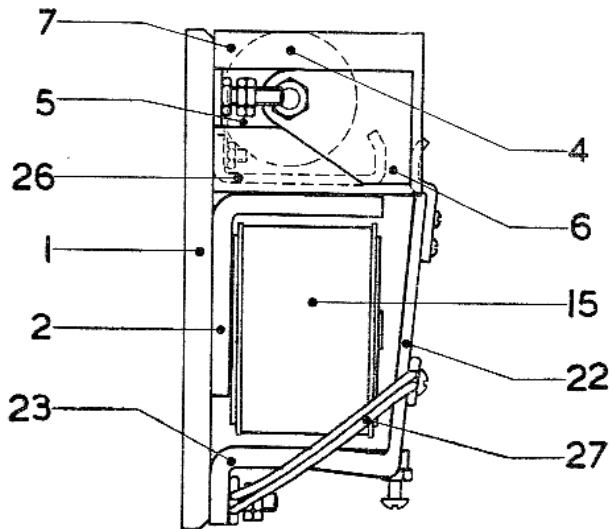
(USED ON FIG. 2870/2871 4.5 K.W. BATTERY CHARGING GENERATING SET.)

No. Off.	Sym. No.	Name of Part.	No. Off.	Sym. No.	Name of Part.
1	CZ-D 1	Panel.	1	CZ-D 26	Terminal Strip "B + " to Ammeter Connection.
2	CZ-B 2	Frame.	1	27	Terminal Strip "G - " to Circuit Breaker Connection.
2	3	Side.	1	28	Terminal Strip "B + " to Circuit Breaker Connection.
1	CZ-D 4	Top.	1	29	Terminal Strip "G + " to Voltmeter Connection.
1	5	Bottom.	1	30	Starting Resistance Inter Connection.
1	6	Back.	1	32	Terminal Strip "B + " to Starting Resistance Connection.
1	CZ-B 7	Terminal Strip.	1	33	Contactor to Starting Resistance Connection.
2	8	Terminal Strip Distance Piece.	1	34	Terminal Strip "F" to Field Resistance Connection.
1	CZ-D 11	Cutout Fuse Base.	1	35	Voltmeter to Field Resistance Connection.
1	12	Cutout Fuse.	1	37B	Terminal Strip to Cutout Connection.
1	15	Starting Resistance Bracket—Top.	1	AU-G 58	Field Resistance.
1	16	Starting Resistance Bracket—Bottom.	1	KC 67	Starting Resistance Insulating Washers.
1	17	Starting Resistance.	7	CR-B 8	Starting Resistance Insulators.
1	20	Terminal Strip "G + " to Cutout "G + " Connection.	1	AU-G 72B	Ammeter.
1	21	Terminal Strip "G - " to Voltmeter Connection.	1	73B	Voltmeter.
1	22	Terminal Strip "S" to Contactor Connection.	1	CZ-B 75	Main Circuit Breaker.
1	23	Terminal Strip "PB" to Contactor Connection.	1	BR-G 5	Electric Starting Push Button Control.
1	24	Cutout "B + " to Cutout Fuse Connection.	1	CZ-C 31	Suppressor Condenser Assembly.
2	AM-H 24	Field Resistance Clips.			
1	CZ-D 25	Cutout Fuse to Ammeter Connections.			

NOTE: For Parts List for Contactor and Cutout, See Page 18.

Parts for Mark CY-C Contactor.

(USED IN MARK CZ-C AND CZ-D SWITCHBOARDS).



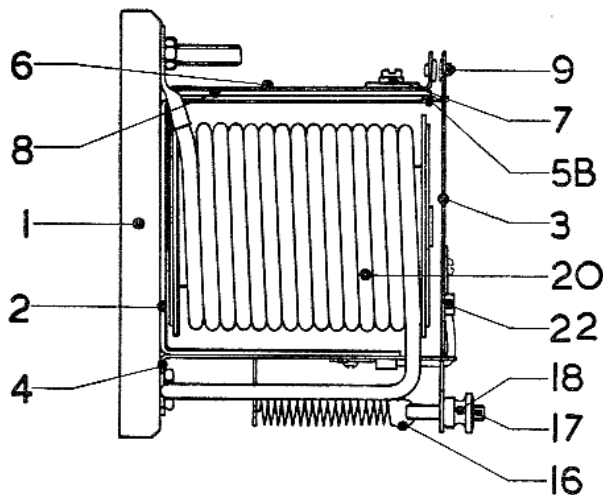
No.	Off.	Sym. No.	Name of Part.
1	CY-C	1	Base.
1		2	Frame.
1		4	Magnetic Blowout Coil.
2		5	Magnetic Blowout Coil Bracket.
2		6	Arc Control Plate.
2		7	Arc Chute.
1		15	Actuating Coil.
1		22	Moving Contact.
1		23	Moving Contact Support.
1		26	Fixed Contact.
1		27	Flexible Connection.

Mark CY-C Contactor—Sectional View.

Parts for Mark AY-D Cutout.

(USED IN MARK CZ-D SWITCHBOARD).

No.	Off.	Sym. No.	Name of Part.
1	AY-B	1	Base.
1		2	Frame.
1		3	Armature.
1		4	Armature Fulcrum.
1		5B	Armature Stop.
1		6	Fixed Contact Plate.
1		7	Fixed Contact Insulating Washer.
1		8	Frame Fixed Contact Plate Insulator.
4		9	Points.
1		16	Tension Spring.
1		17	Tension Spring Screw.
1		18	Tension Spring Screw Nut.
1	AY-D	20	Bobbin Assembly.
1	AY-B	22	Armature to Fulcrum Connection.
1	KC116		Cutout Resistor.



Mark AY-D Cutout—Sectional View.

NOTE: For Parts of Engines refer to Separate Engine Instruction Book.