INSTRUCTION MANUAL

for

GENERATING ..SETS

Fig. 2637—1 K.W. 32 or 50 Volt Battery Charging Generating Set.

Fig. 2948—1 K.W. 32 or 50 Volt Battery Charging Generating Set.

Fig. 2743/2744—1.5 K.W. 110 or 240 Volt Direct Lighting Generating Set.

Fig. 2745/2746—1.5 K.W. 110 Volt Battery Charging Generating Set.

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Fig. 2637 — 1 K.W. 32 or 50 Volt Battery Charging Generating Set.

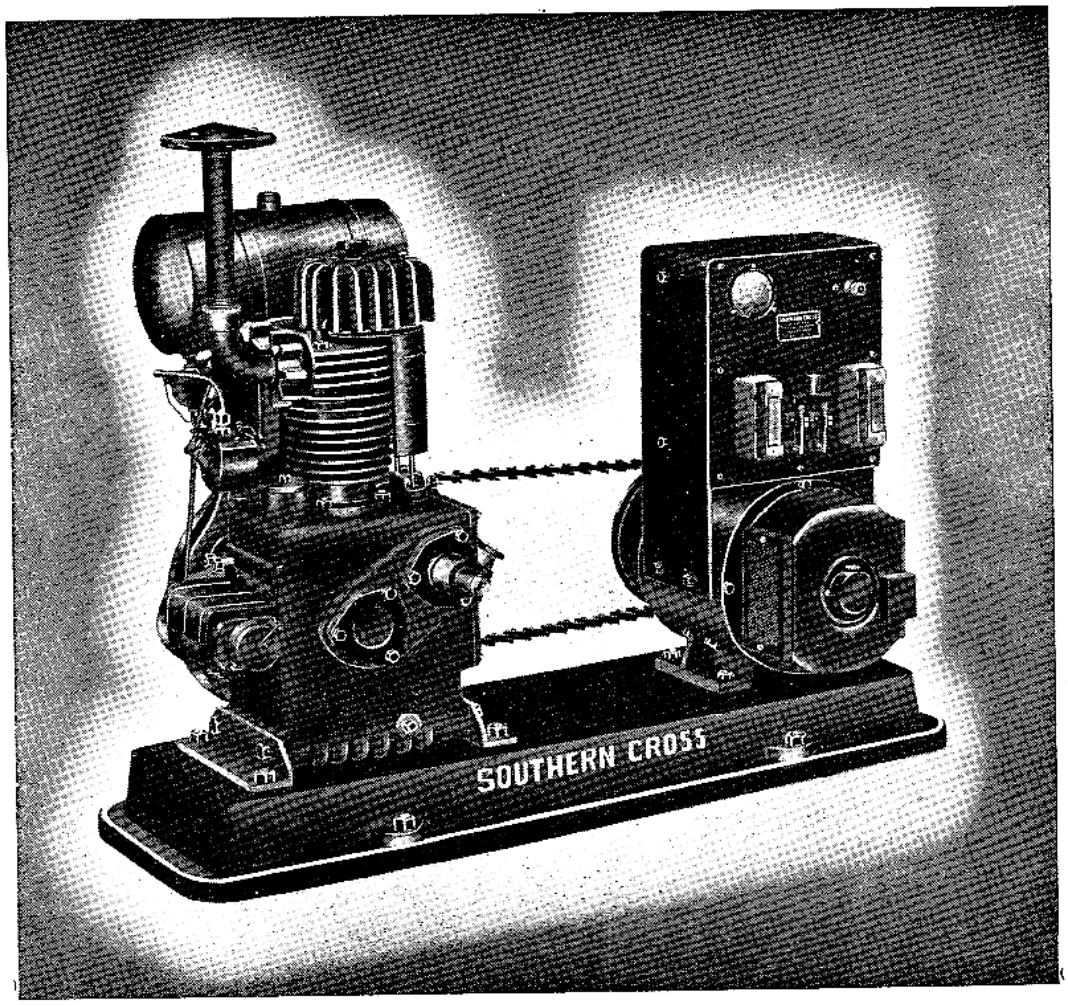


Fig. 2637 — 1 K.W. 32, 50 Volt Battery Charging Generating Set.

Unpacking.

When unpacking the generator and the engine, remove the boards carefully, as they will be required for making a mould for the concrete block.

Foundation.

The plant will give the best results if it is set up on a firm foundation—a block of concrete is the best.

The plant can also be bolted to an existing concrete floor, and in this case four holes are punched into the floor with a cold chisel to correspond with the foundation holes in the base.

The foundation bolts supplied with the engine, are set in position in the holes and the base fitted over them. Put nuts on bolts and after levelling the base, fill the holes with a mixture of 50-50 sand and cement.

Allow the mixture to set for 24 hours and then fit the engine and generator as set out under "Assembling Plant."

To Make a Concrete Block

If a concrete base is to be made, construct a rectangular wooden form from the timber of the case, making the inside dimensions 4ft. 0ins. x 1ft. 6ins. x 8ins. high.

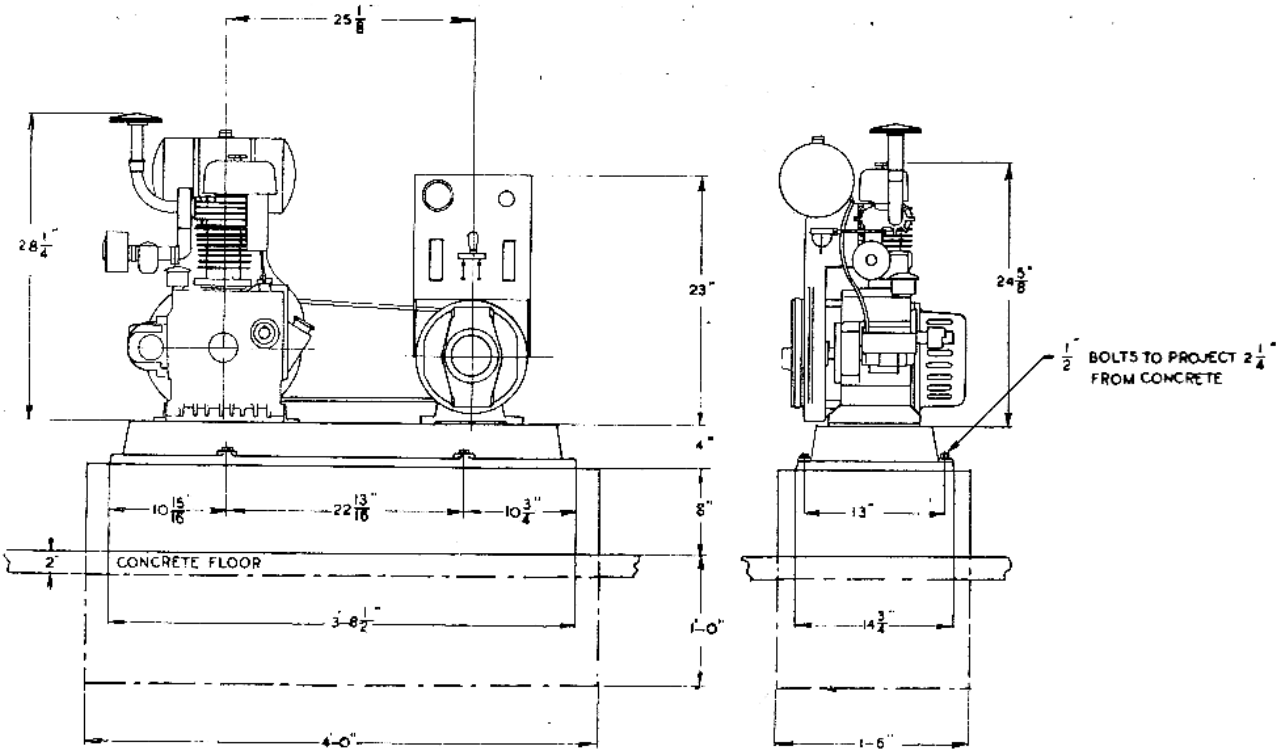
Decide on the most convenient position for the unit, making allowance for the batteries to be erected as near as possible to the Generator.

Sink a hole 12 inches deep in the ground to the same dimensions as the inside of the mould.

Nail two long pieces of timber across either end of the mould to support it, and then set the mould in position over the hole.

Lie two pieces of 2 inch x 1 inch timber across the top of the mould, and sit the base on top of them.

With a spirit level on top of the base check it for level. If necessary pack under one edge of the mould to make it level.



General Arrangement of Fig. 2637 — 1 K.W. 32, 50 Volt Battery Charging Generating Set.

With the base in its correct position, nail the two pieces of 2 inch x 1 inch timber to the sides of the mould so that each piece is directly below two of the foundation holes in the base. Mark the position of the foundation holes on the pieces of 2 inch x 1 inch timber, and then remove the base from the top of the mould.

At the positions just marked on the two crosspieces, drill holes to suit the foundation bolts supplied in the engine box. Place the large washers on the bolts, and then hang them in the mould from the drilled holes.

Screw the nuts down at least 1¼ inches on to the bolts.

Mix a batch of concrete using four parts stone, three parts sand and two parts cement, and fill the mould, not forgetting to add old bolts and bars to act as reinforcements.

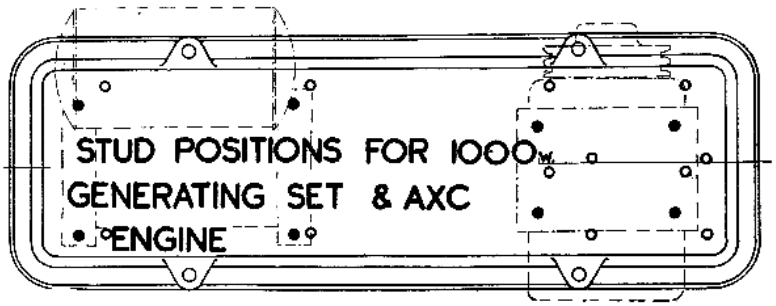
Smooth off the top of the block and allow the concrete to set at least 24 hours before removing the mould and the two timber crosspieces.

Sit the base on the concrete block and check it for level, packing it with shims, if necessary.

Surface the block with a 50/50 mixture of sand and cement, and then allow it to set for at least another day.

Tighten down the nuts on the foundation bolts.

Assembling Plant



Take the studs supplied in the generator box and screw them into the set of holes in the base that are shown in black on the illustration above.

Lift the engine and the generator with the switchboard attached, on to the base and tighten the nuts on the studs.

With a piece of string or a straight edge, test the two pulleys for alignment, and, if necessary, shift the generator pulley until they line up. Further adjustment can be made by swivelling the generator or engine with the bolts partly loosened.

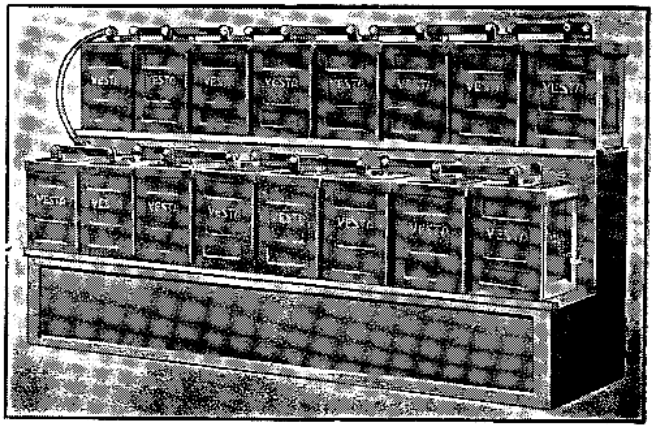
When in line tighten down both engine and generator to the base. The belt may now be put on. If the belt is slack it may be tightened by removing a link. See page 12.

Setting Up the Batteries

Make a battery stand similar to the one illustrated, allowing a spacing of 1½ inches between the batteries.

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

Tack the battery instruction chart on the wall behind the batteries. Also drive two nails into the wall to support the bulb of the hydrometer and allow it to hang free without any risk of breaking.



Battery Stand

Electrical Connections

Using 7/.064 for 32 Volt and 7/.044 for 50 Volt, connect the battery positive terminal on the back of the switchboard to the positive terminal of the battery, and the negative terminal to the negative terminal of the battery.

Also connect wires from the positive and negative line terminals out to the point where the overhead line goes across to the house.

On 32 and 50 Volt Plants 7/.036 wiring is to be used in the house and 3/.036 switch leads. No more than five lights are to be connected to one circuit. A separate circuit is to be made of 7/.036 wire for each power point on 32 Volt Plants.

It is recommended that the installation should not be earthed, as it is not necessary to earth low voltage systems.

To Start Plant

See that lubricating oil is in the crankcase. Refer to page three of the engine instruction book.

Using a clean funnel, fill the fuel tank with petrol.

1. Turn on fuel cock, No. 123, on filter, allowing fuel to flow to the carburettor.
2. Remove cowl side plate, No. 173, and then the spark plug, No. 210 from the cylinder head, No. 3. Pour in about one teaspoonful of lubricating oil and screw in the spark plug with the box spanner supplied, and replace cowl.
   This operation is only necessary for the first start of a new engine or the first start of an engine which has been standing idle for a long period.
3. Oil rockers through oil holes in cylinder head cover, first removing packing plugs.
4. Open needle valve, No. 96, about one turn.
5. Turn flywheel, No. 4, in the opposite direction to the arrow on the flywheel until compression is felt.
6. Press starter switch on switchboard and momentarily choke the engine when starting, but do not overchoke the engine, or it will be hard to start.

Occasionally the engine may stop on the compression stroke and the generator will not develop sufficient power to turn it over when the starter switch is pressed.

If this occurs, release button and turn the engine flywheel backwards until compression is felt and then press starter switch again.

As the engine warms up, gradually close the needle valve, No. 96, to the running position, the final setting being made about ten minutes after the engine has started.

A little care spent in adjusting the needle valve will result in a great saving in fuel. The exhaust should be smokeless.

To stop engine, screw needle valve down on seat. Do not use undue pressure as it will damage the seat.

Failure to Charge

The fuse on the right hand side of the switchboard, looking at the front, is connected in series in the charging circuit of the generator. If at any time the cutout should be accidentally closed while the generator is stationary, the fuse will blow; thus protecting the generator. If this fuse is blown, the generator will not charge, so it should be examined if the generator ever fails to charge.

Adjust Speed

1. The engine, as supplied, is set to run at 1,800 r.p.m., and at this speed the charging rate will be too high.
2. Loosen governor spring tension screw to reduce speed to approximately 1,400 r.p.m., which will give a generator speed of 1,660 r.p.m.
3. The rated output of the Plant in amperes is 25 amps for 32-40 Volt Plants and 16 amps for 50-62 Volt plants. (Note that the output is based on the charging voltage when the batteries are fully charged).
4. Charge the batteries until the specific gravity of the electrolyte and the charging rate have remained constant for two hours.
   Should the final charging rate be less than that recommended by the battery manufacturers for the

particular battery installed, move the clips of the field resistance closer together (about ¼in. at a time), and charge the batteries again until the specific gravity and the charging rate 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.
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.

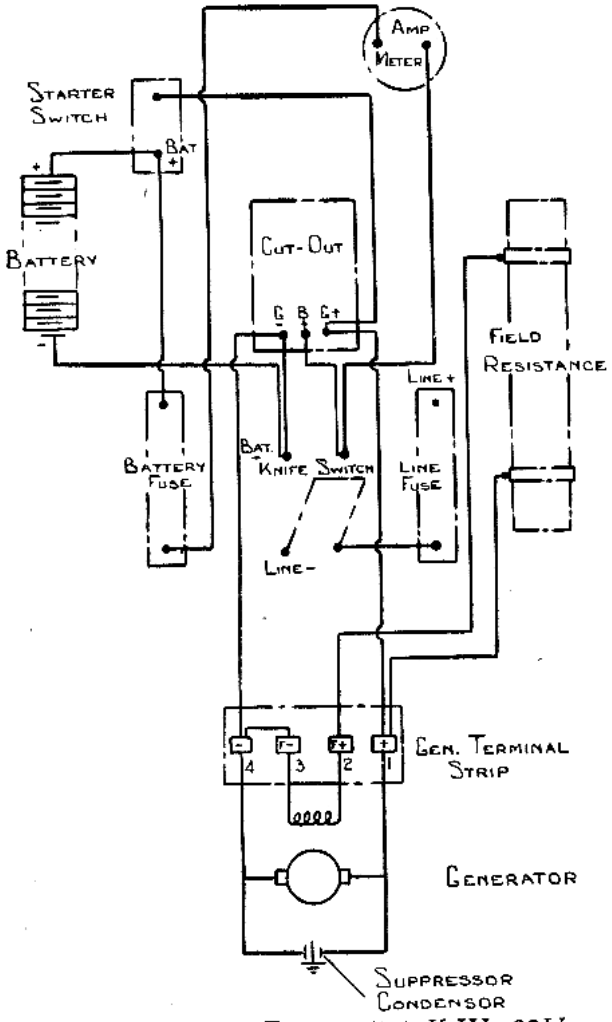
5. Later on, when the batteries are partly discharged, it will be found that the charging rate will increase automatically, due to the voltage of the battery reducing as it discharges.

6. With the battery discharged to about ½ charge, the charging rate should then be about the maximum: 20-25 Amps for the 32-40 Volt Plant and 14-16 Amps for the 50-62 Volt Plant.

7. In both settings check with Battery Chart to make sure that the rates do not exceed those recommended for the size of battery being used. If it is desired to reduce the charge, move the clips on the Field Resistance on the back of the Switchboard further apart. To increase the charge, move them closer together.

General Running Instructions

ENGINE.—Refer to Engine Instruction Book.
GENERATOR.—Refer to page 12.
CUTOUT.—Refer to page 11.
BATTERIES.—Refer to page 11.
BRAMMER BELTS.—Refer to page 12.



Layout Diagram for Fig. 2637 1 K.W. 32V. or 50V. Battery Charging Generating Set.

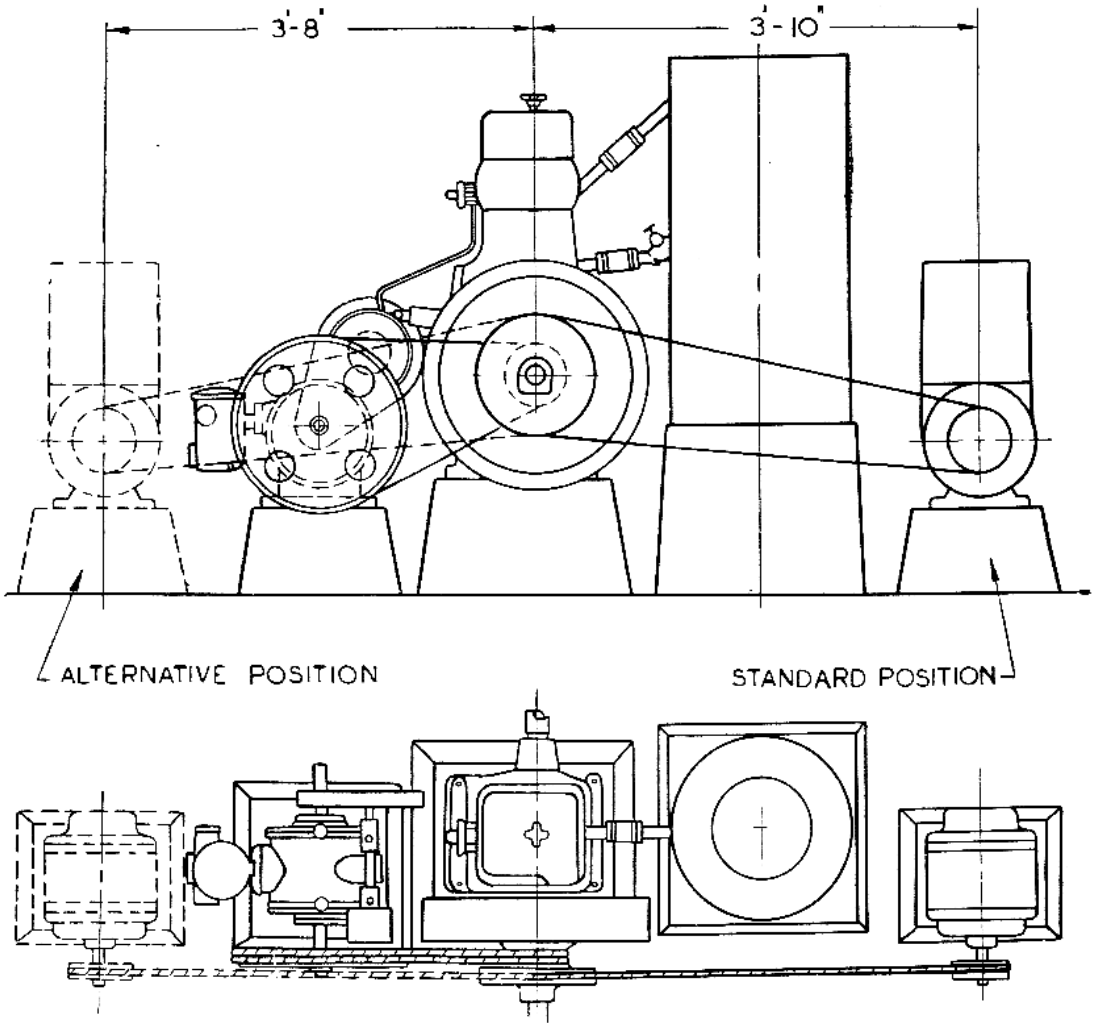
NOTE.—If the batteries are closer to the house than the engine room, the line leads can be connected direct to the battery terminals, and in this case, the wire from the battery negative to the switchboard **must be connected** to the terminal marked "Line" on the Switchboard. This brings the knife switch into the battery charging circuit and this switch must be closed before the batteries can be charged.

Fig. 2948 — 1 K.W. 32/50 Volt Battery Charging Generating Set

This generator is for driving by a Mark YB Diesel Engine driving "CO" Pattern Southern Cross Milking Machines.

Lay-out of Drive

The illustration below shows how the Generator Drive is made.



General Arrangement of Fig. 2948 — 1 K.W. 32 or 50 Volt Battery Charging Generating Set

The standard position of the Generator is behind the Engine Cooling Tank or in cases of Hopper Cooled Engines, the Generator can be moved up closer to the Engine. As an alternative the Generator can be placed out past the Vacuum Pump, but in this position the Moisture Trap Inlet Pipe has to be screwed into the inlet port of the Moisture Trap on the side away from the belt. This is done to avoid the pipe fouling the Brammer belt drive to the Generator.

Foundation

The unit will give the best results if it is set up on a firm foundation—a block of concrete is best. From the timber of the case, construct a wooden mould 9 inches high with inside dimensions at the top of the mould 1ft. 1in. x 10in.

Fit the Generator Pulley to the Generator and support the Generator on the mould on a piece of 5in. timber.

Using a line cord, determine the correct position for the Generator foundation by lining the pulley up

with the driving pulley which is bolted to the Mark YB Flywheel Pulley. Mark the position of the inside of the mould and sink a hole 12 inches deep. Mix a batch of concrete, using four parts stone, three parts sand and two parts cement and fill the hole to ground level, putting in old steel bars for reinforcements. Again set up the Generator on top of the mould and line it up making sure that the top of the mould is level. Put the washers on the foundation bolts and put them through the base of the Generator, screwing the nuts on two or three threads, only, so that the bolts hang as far as possible into the mould.

Pour in enough concrete to hold the foundation bolts in position, and then unscrew the foundation bolt nuts, remove the generator and fill the mould to the top. Again set the Generator on top of the mould, checking the position of the foundation bolts and the lining up, smooth off the top of the block and allow the concrete to set for 24 hours.

Then remove the mould and surface the block with a 50/50 mixture of sand and cement. Allow the block to stand for at least another day.

Then tighten the Generator down on the block. The belt may now be put on.

Setting Up Batteries

Refer to Page 3.

Electrical Connections

Refer to Page 3.

To Start and Stop Plant.

Refer to pages 7 and 8 of the Mark YB Diesel Engine Instruction Book for instructions on how to start and stop the Engine.

WARNING.—Although an electric starter is fitted to the switchboard of this Generator, it has been disconnected, and is not to be used. This Generator will not electrically start a Mark YB Diesel Engine, but will electrically start a Mark AX-C Petrol Engine. DO NOT CONNECT THE STARTER AS AN EXPERIMENT AS SERIOUS DAMAGE TO THE GENERATOR WILL RESULT.

Generator Speed

The correct Generator Speed is 1,660 r.p.m.

General Running Instructions

It should be noted that approximately 2 horsepower is required to drive a "CO" Pattern Milking Machine, Skim Milk Pump and Separator, and as a Mark YB Diesel Engine running at 900 r.p.m. is only rated at 3 h.p. at sea level, and 62 degrees Fahrenheit, only approximately 1 h.p. at a maximum can be used in driving the Generator without overloading the Engine. With 5 and 6 Unit plants where the Engine runs at 1,200 r.p.m. and is rated at 4 h.p. at sea level and 62 degrees Fahrenheit, approximately 1½ h.p. can be used.

A 1 K.W. 32 Volt Generator requires 2 h.p. for full output, so that it should be clearly understood that the Mark YB Diesel Engine on a 2, 3, 4, 5 or 6 unit plant **will not drive the Milking Machine, Skim Milk Pump, Separator and the 1 K.W. Generator when it has to deliver the full output.**

On a Battery Charging Generating Set, full output is only required:

(1) When the Batteries are fully discharged and then only until the batteries are brought up to about three-quarter charge.
In cases where the batteries are fully discharged, the belts should be taken off the Vacuum Pump, Skim Milk Pump and Separator Drive, and the Engine allowed to run for about 1½ to 2 hours to put a charge into the batteries.

(2) When an excessive load is applied to the plant (such as the use of household electrical appliances) and both the batteries and Generator are supplying the load.
In this case, nothing can be done but to reduce the load (i.e., discontinue the use of some of the electrical appliances).

If the Batteries are of a very small capacity so that they become discharged between milkings, the load on the engine can be reduced by reducing the charging rate. The method of reducing the charging rate is set out on page 3, Section "Adjust Speed," Paragraph 4.

Wiring Diagram

The Wiring Diagram for this Generator is shown on page 4. The wire connecting the starter switch to the cut-out has been removed to disconnect the starter.

Overloading Engine

On no account run the Engine for long periods when the exhaust shows black smoke. This is a sure indication that the engine is overloaded or out of adjustment.

First, endeavour to overcome the black exhaust smoke by reducing the charging rate of the Generator.

Then, if the exhaust still shows black smoke, and if the batteries are not fully discharged, then follow the instruction for checking the engine as set out on Page 17 of the Engine Instruction Book.

For further general instructions turn to page 11 of this Instruction Book.

Fig. 2743/2744 — 1.5 K.W. 110 or 240 Volt Direct Lighting Generating Sets

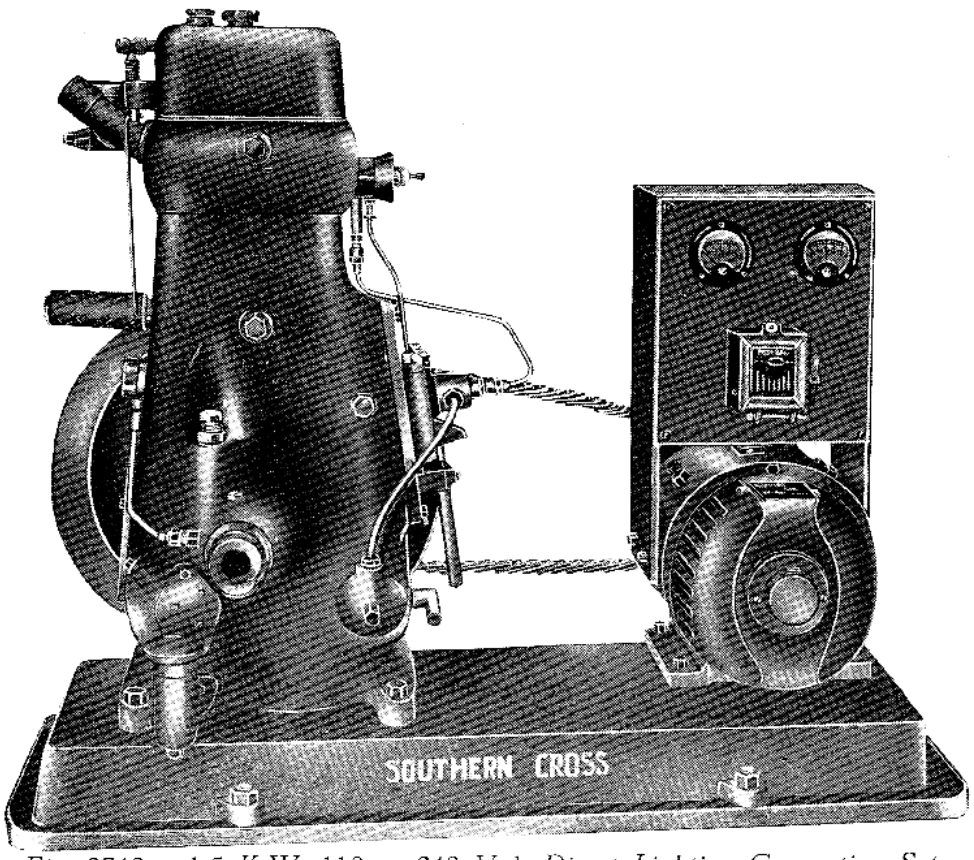


Fig. 2743 — 1.5 K.W. 110 or 240 Volt Direct Lighting Generating Set.

Unpacking

For instructions for:

UNPACKING.—Refer to page 1.

FOUNDATION.—Refer to page 1.

CONCRETE BLOCK.—Refer to page 1.

The above instructions are similar to those for Fig. 2637 1 K.W. 32-50 Volt Battery-Charging Generating Set.

To Make a Concrete Block

Refer to Page 1.

Either a wooden stand or a concrete block is then made to take the cooling tank.

Assembling Plant

Take the studs supplied in the generator box and screw them into the set of holes in the base that are shown in black on the illustration on page 9.

Lift the engine and place it in position on the studs: tighten the nuts.

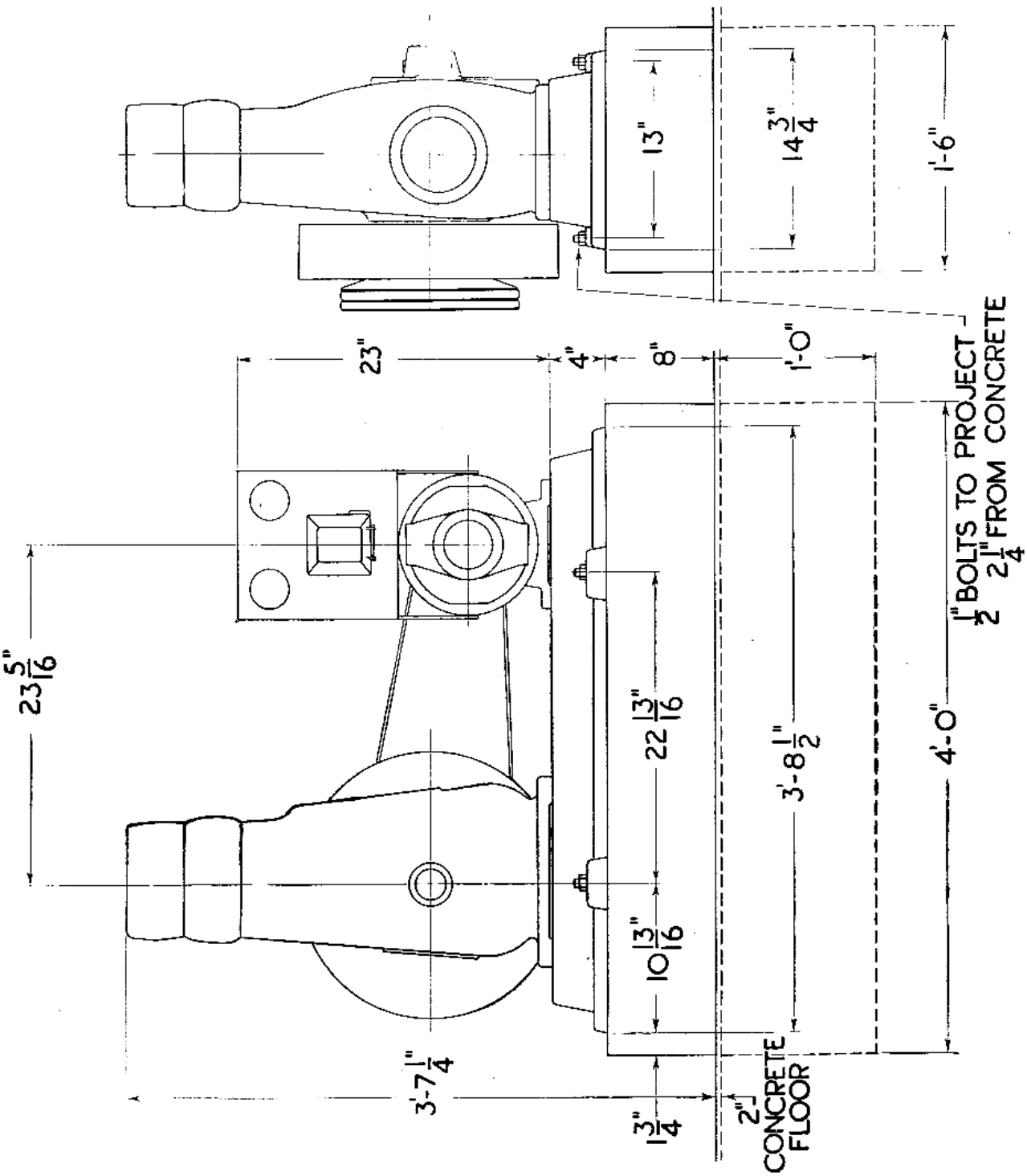
Now install cooling tank as set out in the Engine Instruction Book.

Fit the pulley to the engine flywheel.

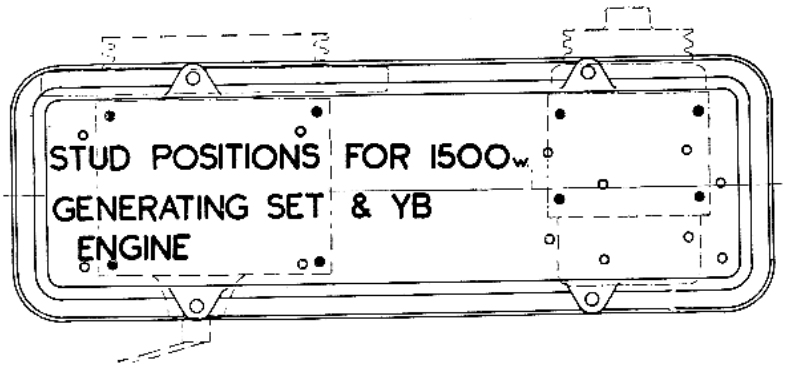
Set generator with switchboard attached in position on base. With a piece of string or a straight edge test the two pulleys for alignment and, if necessary, shift the generator pulley until they line up. Further adjustment can also be obtained by swivelling the generator with the nuts partly loosened.

When in line, tighten down the generator. Then tighten belts, if necessary, by removing a link. See page 12.

For instructions on the engine cooling system, lubricating system, exhaust system and fuel system, refer to pages 5 and 6 of the Engine Instruction Book.

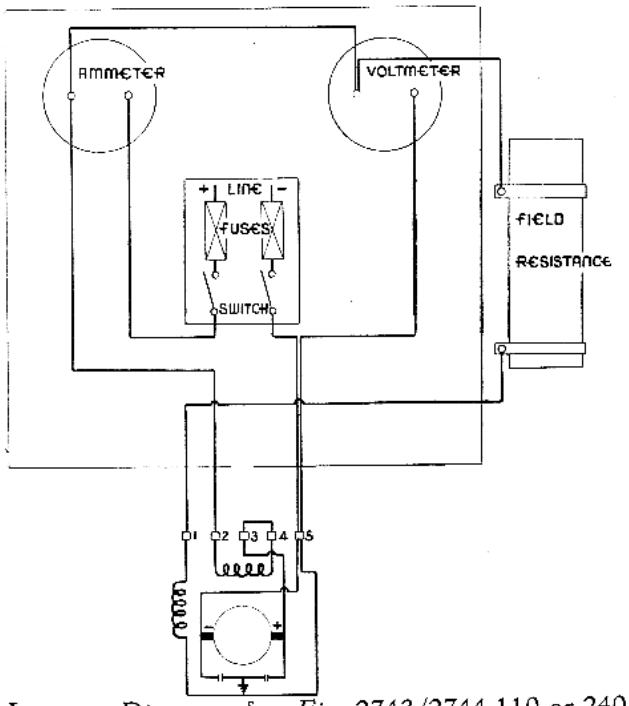


General Arrangement of Fig. 2743/2744 1.5 K.W. 110 or 240 Volt Direct Lighting Generating Set or Fig. 2745/2746 1.5 K.W. 110 Volt Battery Charging Generating Set.



Electrical Connections for 110V. and 240V. Sets

Using 7/.036 VIR Cable for 110 Volt and 3/.036 VIR Cable for 240 Volt Generating Sets, connect wires from the positive and negative line terminals to the point where the overhead lines go to the house.



Lay-out Diagram for Fig. 2743/2744 110 or 240 Volt Direct Lighting Generating Set.

To Start Plant

Carefully carry out the instructions given under the heading "Running Instructions" on Pages 7 and 8 of the Engine Instruction Book.

Start the engine, and as it gains speed the voltage will rise. The load may then be applied to the plant.

Engine Speed

As the Diesel Engine, when supplied, is set to run at 1,200 r.p.m., the voltage at first will be too high, as the correct engine speed on FULL LOAD is 1,000 r.p.m.

Reduce the engine speed by altering the governor spring adjustment until no load voltage is 110-115 Volts or 220-230 Volts.

Then switch on load until the plant is fully loaded. The full load current is:

13.6 amps for 110 Volt Plants.

6.8 amps for 220 Volt Plants.

Check voltage and adjust engine speed, if necessary. Then check at no load again. The voltage should remain approximately constant at all loads except for a momentary surge when sudden changes of load occur.

Fig. 2745/2746 — 1.5 K.W. 110 Volt Battery Charging Generating Set

For Instructions for:—

UNPACKING.—Refer to page 1.

FOUNDATION.—Refer to page 1.

CONCRETE BLOCK.—Refer to page 7.

ASSEMBLING PLANT.—Refer to page 7.

ELECTRICAL CONNECTIONS.—Refer to page 9.

TO START PLANT.—Refer to page 9.

BATTERIES.—Refer to page 3.

Engine Speed

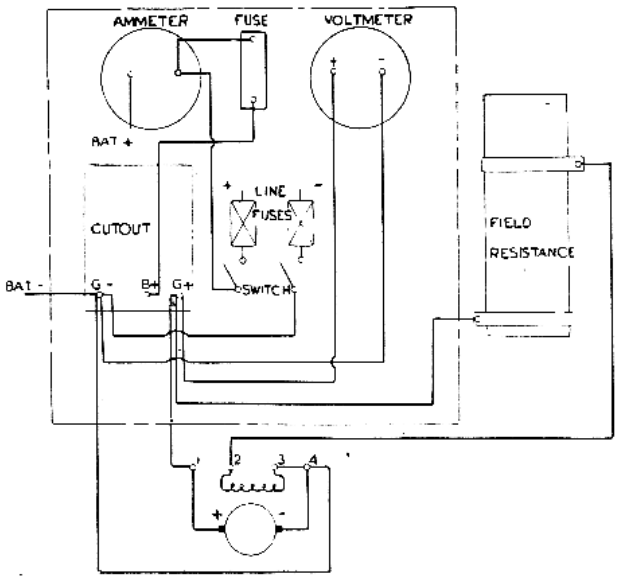
The correct engine speed on FULL LOAD is 1,000 r.p.m. This adjustment is made to the engine governor, as described in the Engine Instruction Book.

If a revolution counter is not available, the speed can be adjusted by the charging rate to the batteries. The governor should be adjusted to provide a charge of 14 Amperes to the batteries, with the main switch on the switchboard off, and with the batteries in a condition of discharge, S.G. 1.150 to 1.175.

The charge to a fully-charged battery then should be 5 Amperes (S.G. 1.250.)

Failure to Charge

The fuse at the top of the switchboard is connected in series in the charging circuit of the generator. If at any time the cutout should be accidentally closed while the generator is stationary, the fuse will blow, thus protecting the generator. If this fuse is blown, the generator will not charge, so it should be examined if the generator ever fails to charge.



Layout Diagram for Fig. 2745/2746 110 Volt Battery Charging Generating Set.

GENERAL INSTRUCTIONS FOR ALL PLANTS

Batteries

If a battery is to give its maximum life and complete satisfaction, then it must be regularly charged and discharged to about quarter charge, and not kept in a fully charged condition all the time.

When a set of batteries is installed, they should be charged immediately at the specified rate until the gravity reading on the hydrometer ceases to rise after three consecutive hourly readings, and the cells are gassing freely.

The capacity of the batteries should be such that the load can be carried from 5 to 7 days without recharging. If the load is greater than half the normal discharge rate at any time during the week, the batteries should be assisted by operating the engine over this period.

Once every 60 days the batteries should be given an equalising charge. Continue charging for approximately two hours after the battery has reached a fully charged condition.

Voltage and Specific Gravity

When a battery is fully charged its specific gravity is approximately 1250; the correct fully charged specific gravity for the batteries is given on the chart supplied with them.

As the battery discharges, the specific gravity reduces to 1150, which is the equivalent of a fully discharged battery.

However, do not allow the batteries to discharge to below quarter charge (about 1175 specific gravity.)

Do

1. Do check the battery every second day with the hydrometer.
2. Do charge and discharge to half or quarter charge regularly, as specified.
3. Do wipe down battery after checking.
4. Do overcharge battery every 60 days.
5. Do keep batteries charged when not in use.

Don't

1. Don't maintain a practically fully charged battery at all times. This reduces the life of the battery by approximately 30 to 38 per cent.
2. Don't maintain a practically fully charged battery at all times and considerably overcharge on each recharge. This will shorten the life of the battery by approximately 70 to 80 per cent.
3. Don't allow battery to stand in a discharged condition and idle for monthly or two-monthly periods and then charge and use. This will shorten their life by 30 to 40 per cent.
4. Don't exceed maker's recommendation for rate of charge.
5. Don't bring a naked light near the batteries.

Cutout

The cutout is adjusted correctly before leaving the factory, and should not require any further adjustment when installing the plant.

However, after the plant has been in use for some time the cutout points may become burnt and require cleaning.

To clean the points proceed as follows:—

1. Remove one of the battery wires.
2. With a magneto file, carefully file the contacts so that they are quite clean. Do not file away more than necessary, and see that the contacts, when closed, press firmly and evenly over the both faces.
3. Replace the battery wire.
4. Start the engine and observe the action of the cutout and see that the contacts open and close properly, and tighten spring on moving contact if contacts do not open promptly when engine is stopping. The ammeter should not show more than 5 amps discharge before the contacts open.

Lubrication of Generators

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 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.

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 Grease is:

Shell Nerita or equivalent.

Commutator and Brushes

It is important that the commutator be kept free from dust and dirt. Check the commutator while the engine is running. It should be practically sparkless at all times.

Periodically clean the commutator with SAND PAPER, not emery paper.

If sparking does occur at the brushes, steps should be taken immediately to cure it or serious trouble will quickly occur. First see that the brushes are free in the holders. If taken out they must be replaced in exactly the same position after cleaning.

Next check the brushes for wear. If they are worn down so that the pressure finger is not holding them firmly on the commutator, or they are less than $\frac{3}{8}$in. long, fit new brushes of the size and grade stamped on the generator name plate.

To Fit New Brushes

The position of the brush rocker has been marked with white paint. After checking this position, loosen the Brush Rocker by slacking off the clamp screw and the Commutator End Bearing Cap Screws. This permits the Brush Rocker to be swivelled around to expose each brush holder.

Remove old brushes and try new brushes in 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 just slide in the holder.

With new brushes in position bed them on to the commutator with a piece of abrasive cloth between the brush and the commutator.

Draw the cloth backwards and forwards until the brushes assume the correct curvature, and be careful to keep the cloth around the commutator so that a flat is not formed on the brush. When the process is nearly completed, fine glass paper should be used to obtain a very smooth finish.

After bedding, remove each brush from its holder and carefully clean away every trace of dust from the commutator, brushes and holders. Make sure also that no specks of abrasive material are embedded in the brush face.

Now reassemble and shift brush rocker to correct position and retighten screws.

Test generator again, but allow it to run for a few hours on light load before putting on full load, to allow the brushes to settle down properly.

If the above does not cure the trouble, obtain the services of a reliable electrician to check the machine over.

Brammer Belts

Brammer Belting should always be installed one link short in every 12 inches of length. Each belt in a set should have exactly the same number of links. No further attention is necessary unless slippage is occurring.

To remove a length of belting from the coil, first ascertain length required and note where links have to be released. Hold the belt in both hands with thumbs on the rivet heads either side of the rivet in the link which is to be loosened.

Grasp the belt firmly and bring the thumbs towards each other, and the link between the thumbs will move along and the rivet will slip into the large hole in the middle of the link. A wriggling motion will help if the stud is stubborn. When the rivet slides into the large hole, the link can be lifted off.

Repeat this process with the next link and the belt will come apart.

To link up, take the two ends and pass the rivet on the one end through the large hole in the middle of the link on the other end of the belt. Slip the rivet back into the small hole at the narrow end of the link. With thumbs on rivet heads either side of the loose links and the belt held firmly, bend it so that the thumbs come together. At the same time force the large opening in the link down over the rivet head until the head is through. With rivet head through to large hole in the link, straighten the belt and then bend slightly in opposite direction so that the rivet slides along to its correct position.

Repeat this procedure for the other rivet and the coupling is complete.

Slipping Belts

Slipping belts are usually indicated by a drop in voltage or output on load, and are recognised by the bulge which appears in the path of the slack side of the belt near the generator pulley. This indicates slippage which should be immediately corrected by removal of one or more links to prevent wear of the belts.

Marks CR-B and CR-C Battery Charging Switchboards

If a car or radio battery is to be charged from the Generating Set, a Southern Cross Mark CR-B or Mark CR-C Battery Charging Switchboard should be used.

These switchboards are provided with lamp resistances to give a reduced charging rate which will not harm the battery.

The Mark CR-B Switchboard is for use with 32 and 50 Volt Generating Sets, and the Mark CR-C Switchboard is for use with 110 and 240 Volt Sets.

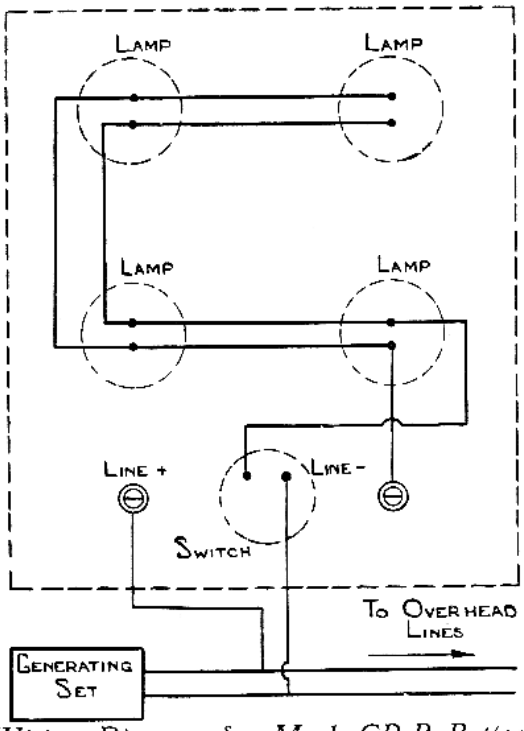
The Mark CR-B Switchboard consists of a panel on which are mounted 4-40 Watt lamps, switch and 2 3 foot leads with Battery Clamps.

The Mark CR-C Switchboard consists of a panel on which are mounted 6 lamps (60 Watt for 110 Volt Sets and 100 Watt for 240 Volt Sets), Switch, and a plug to which is fitted 2-3 foot leads with Battery Clamps. It should be noted that on 1.5 K.W. 110 Volt Sets, approximately one quarter of the output of the plant is used by the Battery Charging Switchboard using the 6-60 Watt lamps. Also on 1.5 K.W. 240 Volt Sets, approximately half of the output of the plant is used by the switchboard using 6-100 Watt lamps. Some of the six lamps can be removed from the board to reduce the power consumed by it, but this will reduce the charging rate to the radio or car battery. (See "Charging Rates" on page 14.

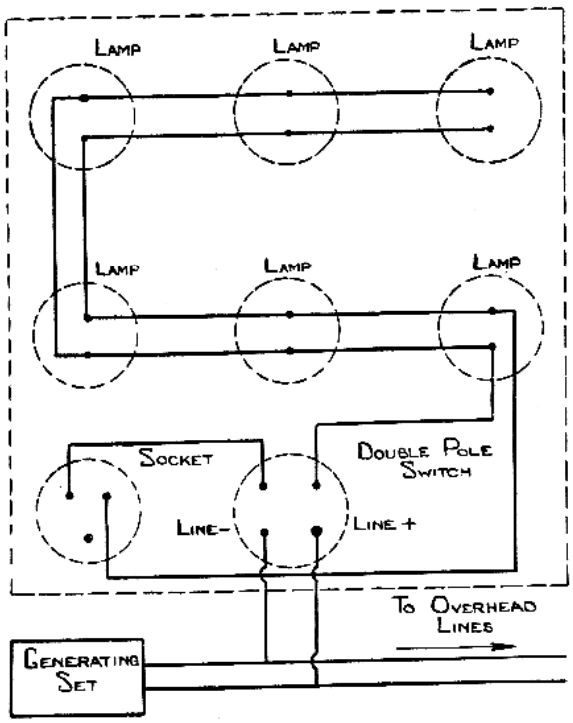
Installation of Switchboard

The switchboard should be mounted on a wall in a convenient position, preferably not over the main bank of batteries.

To connect up a Mark CR-B or Mark CR-C Switchboard to the supply lines from the generating set, connect the "line —" terminal on the back of the switchboard to the negative line, and the "line+" terminal to the positive line. (See wiring diagram below.)



Wiring Diagram for Mark CR-B Battery Charging Switchboard



Wiring Diagram for Mark CR-C Battery Charging Switchboard

The switchboard is provided with a switch which must be kept in the "off" position when the switchboard is not being used.

On Direct Lighting Generating Sets the switch on the switchboard is switched "on" while charging, but **as soon as the set is stopped the switch must be switched "off" or the battery will discharge back into the line at a low rate.**

In the case of the Battery Charging Generating Set, however, the switch should be switched off when the set is stopped, otherwise the Car or Radio Battery will be charged, drawing its charge from the main bank of batteries. This method of charging may be used but is not recommended, as it is very wasteful of power.

CAUTION.—The switch on the switchboard must be switched off and in the case of the Mark CR-C Switchboard, the plug should be pulled out if the battery clips are to be handled at all. IT IS DANGEROUS TO TOUCH THE BATTERY CLIPS WHILE THE SWITCH IS ON.

Two Volt, 4 Volt, 6 Volt and 12 Volt Batteries may be charged, or two or more batteries may be connected in series, that is positive to negative, and charged at once, provided the total battery voltage on charge from a 32 Volt or 50 Volt generating set does not exceed 18 Volts and the total battery voltage on charge from a 110 Volt or 240 Volt generating set does not exceed 50 Volts.

Charging Rates

The charging rate of the switchboard can be reduced by removing lamps from the board, or increased by fitting more powerful lamps, e.g., fitting 4-60 Watt lamps to the Mark CR-B Switchboard instead of the 4-40 Watt lamps supplied.

The charging rates set out below have been worked out using the lamps supplied with the board and allow for the charging of one battery only. Increased battery voltage will slightly increase the charging rate except on the 110 Volt and 240 Volt sets where the difference is very small.

Mark CR-B Switchboard
32 VOLT SET — 40 WATT LAMPS

No. of Lamps	2 Volt Battery	6 Volt Battery	12 Volt Battery
4	5.3 amps.	6.1 amps.	8 amps
3	4 amps	4.6 amps	6 amps
2	2.6 amps	3 amps	4 amps
1	1.3 amps	1.5 amps	2 amps

Mark CR-B Switchboard
50 VOLT SET — 40 WATT LAMPS

No. of Lamps	2 Volt Battery	6 Volt Battery	12 Volt Battery
4	3.3 amps	3.6 amps	4.2 amps
3	2.5 amps	2.7 amps	3.1 amps
2	1.6 amps	1.8 amps	2.1 amps
1	.8 amps	.9 amps	1 amp

Mark CR-C Switchboard
110 VOLT SET — 60 WATT LAMPS

No. of Lamps.	2, 6 or 12 Volt Battery
6	3.3 amps
5	2.7 amps
4	2.2 amps
3	1.6 amps
2	1.1 amps
1	.5 amps

The Charging time for a 50 ampere hour capacity Radio Battery at 3 amperes charging rate is approximately 20 hours.

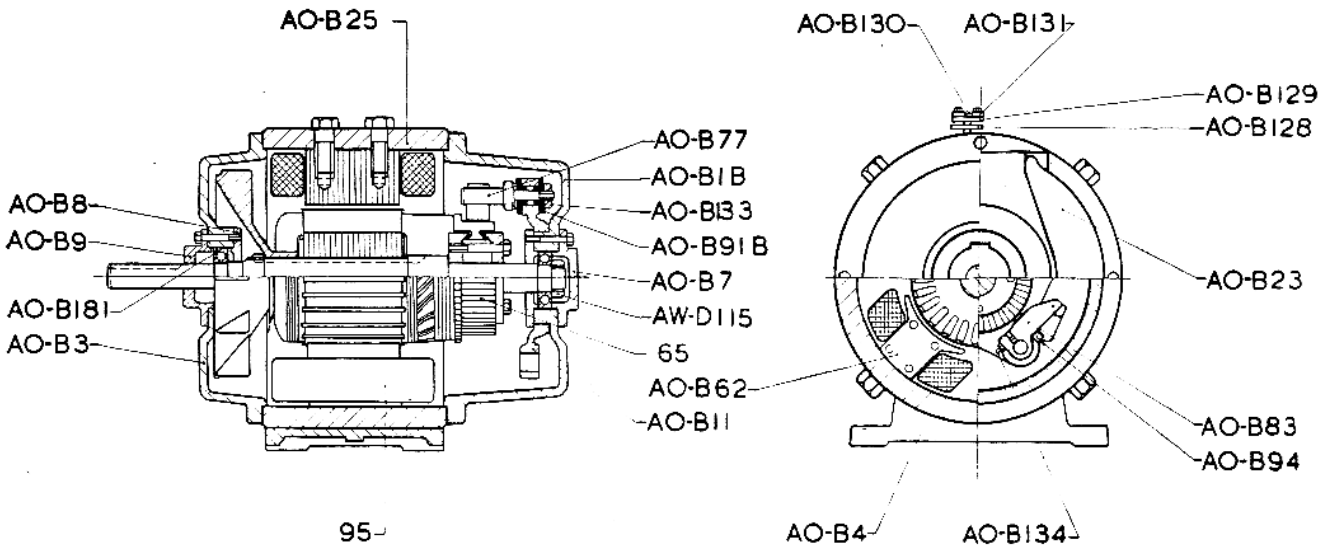
The charging time for a 100 ampere hour capacity Car Battery at 3 amperes charging rate is approximately 40 hours.

Mark CR-C Switchboard
240 VOLT SET — 100 WATT LAMPS

No. of Lamps.	2, 6 or 12 Volt Battery
6	2.5 amps
5	2.1 amps
4	1.6 amps
3	1.2 amps
2	.8 amps
1	.4 amps

The charging time for 150 ampere hour capacity Truck Battery at 3 amperes charging rate is approximately 60 hours.

PARTS LIST



Mark AO-B to AO-H 1 and 1.5 K.W. Generators — Sectional View.

IMPORTANT.—When ordering a part for a Generator or Switchboard, please supply the following information from the Generator nameplate.

(a) Mark ..... Generator.
(b) Generator No. .....
(c) Name and Number of Part.

Generators and Switchboards

(a) Mark AO-B—1 K.W., 32 Volt, Shunt Wound Generator uses Mark AU-B Switchboard.
(b) Mark AO-C—1 K.W., 50 Volt, Shunt Wound Generator uses Mark AU-B Switchboard.
(c) Mark AO-F — 1.5 K.W., 110 Volt, Shunt Wound Generator uses Mark AU-D Switchboard.
(d) Mark AO-G—1.5 K.W. 110 Volt Compound Wound Generator uses Mark AU-F Switchboard.
(e) Mark AO-H—1.5 K.W., 220 Volt, Compound Wound Generator uses Mark AU-F Switchboard.

1. Marks AO-B, AO-C, AO-F, AO-G and AO-H Generator Parts.

Mark AO-B	Mark AO-C	Mark AO-F	Mark AO-G	Mark AO-H	No. off	Name of Part.
AO-B 1B	AO-B 1B	AO-B 1B	AO-B 1B	AO-B 1B	1	Commutator End, End Shield
AO-B 3	AO-B 3	AO-B 3	AO-B 3	AO-B 3	1	Drive End, End Shield
AO-B 7	AO-B 7	AO-B 7	AO-B 7	AO-B 7	1	Commutator End Bearing Cap—O'side
AO-B 8	AO-B 8	AO-B 8	AO-B 8	AO-B 8	2	Bearing Cap—Inside
AO-B 9	AO-B 9	AO-B 9	AO-B 9	AO-B 9	1	Drive End Bearing Cap—Outside
AO-B 11	AO-B 11	AO-B 11	AO-B 11	AO-B 11	1	Brush Rocker
KN 22	KN 22	KN 22	KN 22	KN 22	1	Suppressor Condensor
AO-B 23B	AO-B 23B	AO-B 23B	AO-B 23B	AO-B 23B	2	End Shield Cover
AO-B 25	AO-B 25	AO-B 25	AO-B 25	AO-B 25	1	Generator Body
AO-B 62	AO-B 62	AO-B 62	AO-B 62	AO-B 62	4	Main Pole
AO-B 65	AO-C 65	AO-F 65	AO-F 65	AO-H 65	1	Armature
AO-B 77B	AO-B 77B	AO-B 77B	AO-B 77B	—	4	Brush Holder Spindle
—	—	—	—	AO-B 77B	2	Brush Holder Spindle.
AO-B 83	AO-B 83	AO-B 83	AO-B 83	—	4	Brush Holder
—	—	—	—	AO-B 83	2	Brush Holder.
AO-B 91B	AO-B 91B	AO-B 91B	AO-B 91B	—	8	Brush Holder Spin. Insulating Washer
—	—	—	—	AO-H 91B	4	Brush Holder Spin. Insulating Washer
AO-B 94	AO-B 94	AO-B 94	AO-B 94	—	4	Brush
—	—	—	—	AO-H 94	2	Brush
AO-B 95	AO-C 95	AO-F 95	AO-G 95	AO-H 95	4	Field Coil
AW-D115	AW-D115	AW-D115	AW-D115	AW-D115	1	Bearing Locking Nut
AO-B128	AO-B128	AO-B128	AO-B128	AO-B128	1	Terminal Insulating Strip
AO-B129	AO-B129	AO-B129	AO-B129	AO-B129	1	Terminal Strip
AO-B130	AO-B130	AO-B130	AO-B130	AO-B130	5	Terminal Bridge
AO-B131	AO-B131	AO-B131	AO-B131	AO-B131	10	Terminal Clamp
AO-B133	AO-B133	AO-B133	AO-B133	—	4	Brush Holder Spindle Nut
—	—	—	—	AO-H133	2	Brush Holder Spindle Nut
AO-B134	AO-B134	AO-B134	AO-B134	—	4	Brush Holder Clamp Screw
—	—	—	—	AO-H134	2	Brush Holder Clamp Screw
AO-B181	AO-B181	AO-B181	AO-B181	AO-B181	2	Armature Shaft Bearing

2. Marks AU-B, AU-D and AU-F Switchboard Parts

Mark AU-B	Mark AU-D	Mark AU-F	No. off	Name of Part.
AU-B 19	AU-B 19	AU-B 19	2	Stud for Rheostat
AU-B 45	AU-B 45	AU-B 45	1	Switchboard Frame
AU-B 50	AU-B 50	AU-B 50	1	Switchboard Backplate
KC 53	KC 53	KC 53	2	Clip for Rheostat
AU-B 58	AU-D 58	AU-D 58	1	Rheostat
AU-B 59	AU-B 59	AU-B 59	1	Rheostat Insulating Strip
AU-B 63	AU-D 63	AU-F 63	1	Switchboard
KC 67	KC 67	KC 67	4	Rheostat Stud Washer
KC 72	AU-D 72	AU-F 72	1	Ammeter
—	AU-D 73	AU-D 73	1	Voltmeter
KC 74B	—	—	2	Fuse
—	KD 74	KD 74	1	Fuse and Switch
KC 75	—	—	1	Knife and Switch
—	AU-D 75	—	1	Fuse
KC 76	—	—	1	Starter Switch

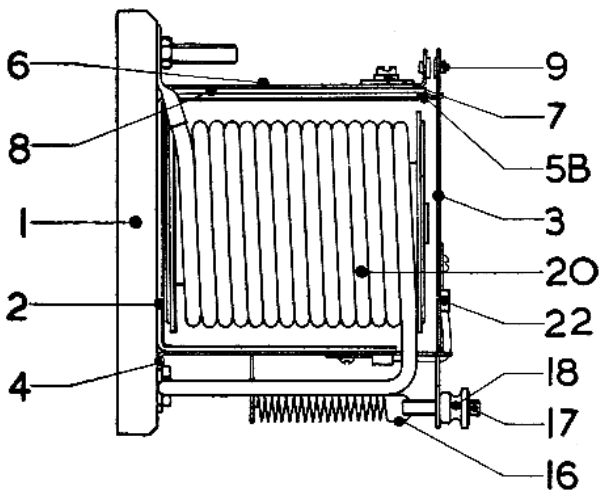
3. Base and Fittings for Figs. 2637, 2743/2744 and 2745/2746 Generating Sets

Fig. 2637	Fig 2743/2744	Fig. 2745/2746	No. off	Name of Part.
KC 1B	KC 1B	KC 1B	1	Base for Engine and Generator
—	KC 2B	KC 2B	1	Engine Pulley
AU-B 6	KC 6B	KC 6B	1	Generator Pulley
J511	J511	J511	1	Pulley Setscrew

4. Marks AY-B, AY-C and AY-D Cutout Parts

Mark AY-B used on 32 Volt Sets.
Mark AY-C used on 50 Volt Sets.
Mark AY-D used on 110 Volt Sets.

No. off	Sym. No.	Name of Part.
1	AY-B 1	Base
1	AY-B 2	Frame
1	AY-B 3	Armature
1	AY-B 4	Armature Fulcrum
1	AY-B 5B	Armature Stop
1	AY-B 6	Fixed Contact Plate
1	AY-B 7	Fixed Contact Insulating Washer
1	AY-B 8	Frame Fixed Contact Plate Insulator
4	AY-B 9	Points
1	AY-B 16	Tension Spring
1	AY-B 17	Tension Spring Screw
1	AY-B 18	Tension Spring Screw Nut
1	AY-B 20	Bobbin Assembly (Mark AY-B only)
1	AY-C 20	Bobbin Assembly (Mark AY-C only)
1	AY-D 20	Bobbin Assembly (Mark AY-D only)
1	AY-B 22	Armature to Fulcrum Connection
1	KC116	Resistor (Mark AY-C only)
1	AU-D116	Resistor (Mark AY-D only)



Marks AY-B, AY-C and AY-D Cutout.

NOTE.—For Parts of Engine refer to Separate Engine Instruction Book.

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Radio Interference

D.C. Generators and motors, when running, cause radio interference, and if this interference is allowed to get into the radio set it may result in so much noise that radio stations become inaudible behind the interference.

Radio interference may be suppressed, but it is almost impossible to completely eliminate it. The greater the degree of suppression required — the more expensive it becomes.

However, interference can be minimized by careful installation. When buying your radio set, get your radio man to suggest the best installation for your particular case.

The following items should be carefully studied before installing your radio, to make sure that interference is minimized.

1. Locate the receiving aerial as far away as possible from the generating plant, and run it at right angles (not parallel) to the power lines from the engine shed to the house, keeping the aerial as high as possible. Use shielded wire from the lead-in to the house right to the set, or use the aerial filters and twin lead-in wires which are available from your radio store. Consult your radio man on this point and use the type of lead-in he recommends.
2. Keep the commutator and brush gear clean. Ensure that brushes are free in their holders and that there is no excessive sparking. Brushes sticking in the holders will spark badly, and will burn away and cause interference.
3. Where a petrol or kerosene engine is used, it will probably be necessary to fit an automobile type of ignition suppressor in the spark plug lead.
4. In new installations, it will be found that the noise will lessen over the first few weeks' runnings as the brushes bed down and acquire the normal smooth surfaces.
5. Where convenient placement of the aerial is not possible and the noise level is still objectionable, after ensuring that the above conditions are met with, it may prove necessary to fit an alternative suppression device, such as a larger suppressor condensor or a line filter. Consult your radio technician.