

TP 31

818 - 1A.

MK.814.

STEAM GENERATOR.

INDEX MK. 814.

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STEAM GENERATOR - MK. 814.

1

1.1

The Mk. 814. is a portable battery charging unit. Steam is the source of power, this is raised in a boiler unit and transferred by flexible pipes to a steam engine. The steam engine is directly coupled to an A.C. Generator the output of which is rectified by a bridge rectifier which produces a D.C. voltage suitable for charging a 6 volt battery at approximately 2 to 3 amps.

1.2

The Mk. 814. Generator comprises the following:-

Generator Assembly.	814/10.
Boiler Assembly.	814/20.
Ash Box.	814/40.
Fire Door.	814/60.
Fire Box Asbestos Lined.	814/120.
Chimney Assembly (3 Sections).	814/130.
Tube Flexible 14 inches.	999/A/065.
Tube Flexible, Suction.	999/A/046.
Tube Flexible 20 inches.	999/A/047.
Tube Flexible, Exhaust.	999/A/051.
Oil, $\frac{1}{2}$ pint tin. Type F63. (2 Tins).	J.261.F.
Battery Connecting Lead Red. Battery Connecting Lead Black.	814/140.
Transit Case.	

2

Physical Data.

2.1

Generator Assembly. 814/10.

Height	10 $\frac{1}{2}$ inches.	27.6 cm.
Width	9 $\frac{1}{2}$ inches.	23.8 cm.
Depth	9 $\frac{1}{2}$ inches.	25.1 cm.
Weight	17 $\frac{1}{2}$ lbs.	8.0 kilos.

2.2

Chimney Assembly. 814/130.3 Sections Telescoped.

Length	1ft. 3ins.	38.1 cm.
Diameter	4ins.	10.2 cm.
Weight	5 lbs.	2.26 kilos.

2.3

Boiler Assembly. 814/20.

Height	10 $\frac{1}{2}$ inches.	26.7 cm.
Width	9 inches.	22.8 cm.
Depth	11 $\frac{1}{2}$ inches.	29.9 cm.
Weight	17 $\frac{1}{2}$ lbs.	8.0 kilos.

2.4

Fire Box and Door. 814/120 and 814/60.

Height	6 $\frac{3}{8}$ inches.	16.2 cm.
Width	10 inches.	25.4 cm.
Depth	10 $\frac{1}{2}$ inches.	25.8 cm.
Weight	7 $\frac{1}{2}$ lbs.	3.4 kilos.

2.5

Ash Box. 814/40.

Height	4 inches.	10.2 cm.
Width	10 $\frac{1}{2}$ inches.	26.7 cm.
Depth	10 inches.	25.4 cm.
Weight	7 $\frac{1}{2}$ lbs.	3.4 kilos.

2.6

Four Flexible Connecting Pipes.

Length	1ft. 11ins.	58.4 cm.
Weight	3 lbs.	1.3 kilos.

2.7

Total Weight of contents 60 lb.

27.2 kilos.

Trussit Case.

Height	15 $\frac{1}{2}$ ins.	39.4 cm.
Width	27 $\frac{1}{2}$ ins.	70.2 cm.
Depth	15 $\frac{1}{2}$ ins.	39.7 cm.
Weight (Empty)	46 lb.	20.9 kilos.
Weight (Full)	106 lb.	48.1 kilos.

Choice of Site.

- 3 Site must be firm level ground, and about one square yard to be cleared of any inflammable material, such as long grass etc.

To Prepare Generator with Lubricant.

- 4.1 Remove the filler plug situated next to the motor.

- 4.2 Pour oil into gear box until the gears are just covered.  
(Approximately 1/6th of a pint).  
Caution:- Air bubbles can give a false oil level, a piece of wire may be used to release trapped air.

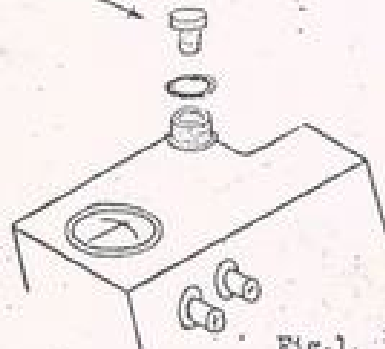


Fig.1.

- 4.3 Replace filler plug.

- 4.4 Remove the sump filler plug.

- 4.5 Pour oil into the sump to filler plug level.  
(Approximately 1/6th of a pint).

- 4.6 Replace filler plug.

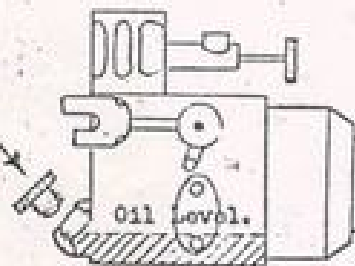


Fig.2.

5 To Assemble the Generator.

- 5.1 Place the fire bars on the site with the aperture facing into wind.

- 5.2 Place the fire box on the fire bars with the stoke hole also facing into wind.

- 5.3 Place the boiler on above with the water gauge opposite the stoke hole.

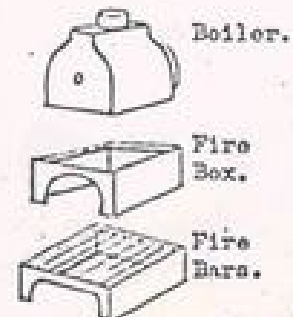


Fig.3.

- 5.4 Place the Generator set next to the boiler unit on the R.H. side of the stove hole 4" away as per Fig. 5.

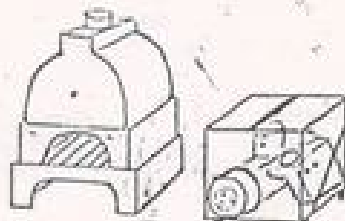


FIG. 4.

- 5.5 Screw on the steam pressure pipe to the top of the boiler (red to red).

- 5.6 Screw on the water pressure pipe to the union behind the water gauge on the boiler (green to green).

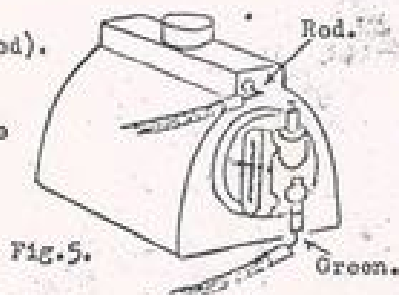


FIG. 5.

- 5.7 Screw on the other end of the water pressure pipe to the Generator, (yellow to yellow).

- 5.8 Screw on the suction pipe to union below yellow junction.

- 5.9 Place the filter end of the suction pipe in a suitable water supply (bucket of water, ditch etc).

- 5.10 Screw on steam pressure pipe, (blue to blue).

- 5.11 Remove the safety valve with the tool provided. (See Plate 5.).

- 5.12 Pour water into the boiler until the water level is within one inch of the top of the water level gauge.

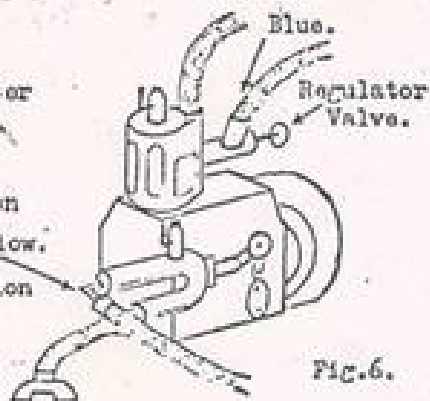


FIG. 6.

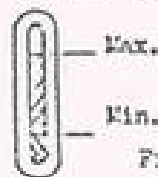
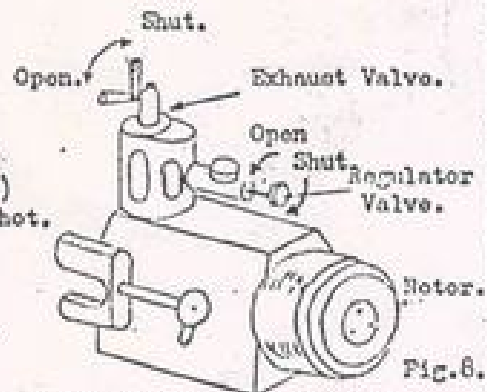


FIG. 7.

- 5.13 Replace the safety valve using light pressure only.
- 5.14 Place the chimney in position with the exhaust tube facing the Generator.
- 5.15 Connect one end of the exhaust pipe (large bore end) to the top of the Generator. The other end is not connected to the chimney at this stage because in the absence of steam the heat of the chimney will damage the rubber. (See Section 7.9).
- 5.16 Secure the pipe with the clip provided.
- 5.17 Fit the two chimney extensions.
- 5.18 Close the regulator valve (clockwise). See Fig.8).
6. To Fire the Boiler.
- 6.1 Place kindling material in the fire box and light, when well alight place on more fuel.
- 6.2 Place the fire door in position.
- 6.3 In approximately ten minutes (using dry wood) the safety valve will blow off steam. Operating pressure  $65 \pm 5$  lb. sq. in.
7. To Start Steam Engine.
- 7.1 When a full head of steam has been obtained open the exhaust valve next to the exhaust pipe on the Generator (horizontal when open). NOTE:- Keep hand clear of outlet as steam may escape.
- 7.2 Open the regulator valve by turning fully anti-clockwise.
- 7.3 Turn the Generator rotor clockwise slowly until water escapes from the exhaust valve.
- 7.4 When the water has finished escaping and a blue steam appears close the regulator valve (clockwise).
- 7.5 Close the exhaust valve (upright)  
Cautions:- The valve will now be hot.
- 7.6 Open the regulator valve fully.
- 7.7 Spin the rotor clockwise and the Generator will start.
- 7.8 If the Generator will not start it will be due to water in the regulator valve. Check that the boiler has not been overfilled, then repeat operations as above.
- 7.9 Connect the top end of the exhaust pipe to the chimney.



8.

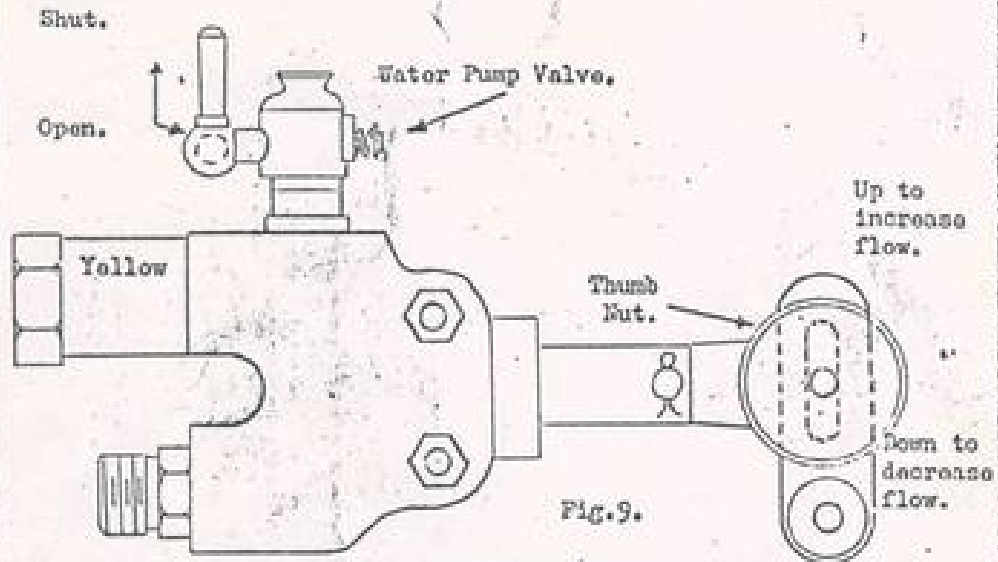
To Prime the Water Pump.

8.1

When the Generator is running, open the water pump valve (above yellow connector) until cold water is emitted in spurts.

8.2

Close the water pump valve (vertical). The system is now primed.



9.

Water Flow Adjustment.

9.1

The water level in the gauge can be maintained at a constant level by adjusting the flow of water through the water pump. The rate of flow of water to replenish the boiler is set by altering the length of stroke of the water pump. If rate is to be increased slacken off the knurled thumb nut on the water pump connecting rod, and slide upwards to obtain a longer stroke. Retighten thumb screw.

10.

To Stop the Steam Engine.

10.1

Close the regulator valve.

10.2

Extinguish the fire by raking it out.

NOTE:- Do not throw water on the fire as this will damage the asbestos lining or crack the boiler.

10.3

Open the exhaust valve. NOTE:- Beware of steam on hands.

10.4

Open the Regulator Valve.

10.5

Turn the rotor slowly clockwise until all the steam has escaped.

10.6

If required for further use leave all the valves on the Steam Engine open i.e. Open exhaust valve (horizontal).  
Open water pump valve (horizontal).  
Open regulator valve (anti-clockwise).

10.7

Remove the suction pipe from the water supply.



10.8.

If the aforementioned procedure is not observed and the exhaust and water pump valves are left closed, on cooling, thermosyphon action will take place. The boiler whilst cooling down will form a vacuum and the suction will pull the water up from the reservoir, through the steam engine, and overflow the boiler. Also the oil will be sucked out of the gear box by the same process. If this happens by accident, drain off the contents of the boiler and refill with clean water. Also refill the gear box with oil.

11.

Running Maintenance.

11.1

Check the oil level in the gear box every thirty minutes.

11.2

Keep a check on the water level on the gauge.

11.3

Check the water level of the reservoir.

11.4

Periodically put a drop of oil on the piston and other moving parts of the water pump.

12.

Circuit Diagram 12.814.

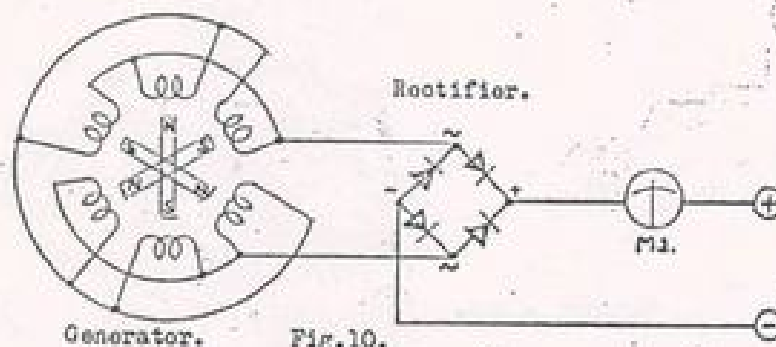


Fig. 10.

Comment.  
Rectifier.  
Ammeter.

Manufacturer.  
S.T.C. Ref. E.1418.  
Lucas Type CZU.27L. No. 36084.  
8 - 0 - 8 Amps.

Stores No.  
E7.125.  
R6008/C3.

13. To Charge Batteries.

13.1 Connect the batteries to be charged.  
Red to + terminal.  
Black to - terminal.

13.2 The charging current is indicated on the meter (full scale deflection is 6 amps).

13.3 The average 6 Volt Accumulator may be charged at 1 or 2 Amps. until the specific gravity is approximately 1.270 and it gasses freely. Reference must be made to Manufacturers instructions.

13.4 The time taken to charge may be taken as the current divided into the Ampere/Hour rating e.g. a battery rated at 20 A.H. will take ten hours to re-charge at 2 Amps.

13.5 Before commencing to re-charge a battery the terminals should be cleaned and the vent plugs removed to enable it to gas freely.

13.6 When fully charged replace the vent plugs and smear a little vaseline on the terminals and exposed metal parts.

14. Preparation of Electrolyte.

14.1 NEVER ADD WATER TO THE ACID. Always add the acid to the water. Do not splash it in but pour gently, stirring the liquid at the same time with a glass rod. Mixing must be done in a suitable glass or earthenware vessel. Some plastic vessels will do but iron and steel containers must not be used, even if they are enamelled.

14.2 As to the correct proportions, it is possible simply to go on adding acid until the desired S.G. is obtained but this is a very slow way because direct readings of the S.G. will need correction for temperature. When the acid and water are mixed together, heat is generated and the temperature rises.

14.3 The correct S.G. may be readily determined from table 1.

Table 1.

Parts of distilled water by volume to one volume of acid (1.835 S.G.)	To obtain, at 60°F. electrolyte of S.G.
4.0 parts.	1.210
3.9 "	1.215
3.1 "	1.260
2.9 "	1.270
2.8 "	1.275
2.7 "	1.290
2.5 "	1.320
2.0 "	1.340

14.4

Climatic and Temperature Corrections.

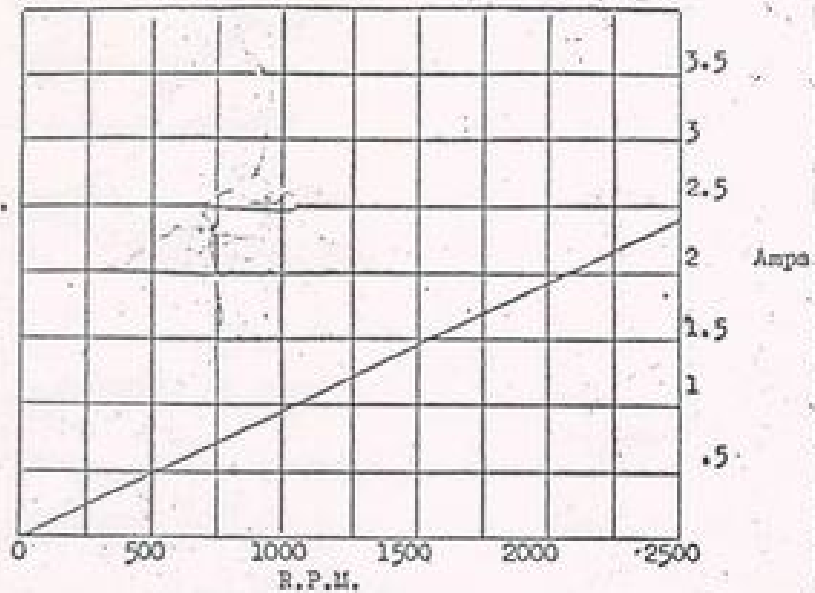
Most chemical actions are accelerated by heat. So, for hot climates, a weaker electrolyte is needed. Similarly for very cold climates a higher S.G. is needed. In this case, however, the purpose is not merely to help the chemical action but to ensure that the electrolyte shall not freeze.

Table 2.

If acid is at °F.	To obtain S.G. at 60°F.
50	deduct .004
55	" .002
60	- -
65	add .002
70	" .004
75	" .006
80	" .008
85	" .010
90	" .012
95	" .014
100	" .016
110	" .020
120	" .024

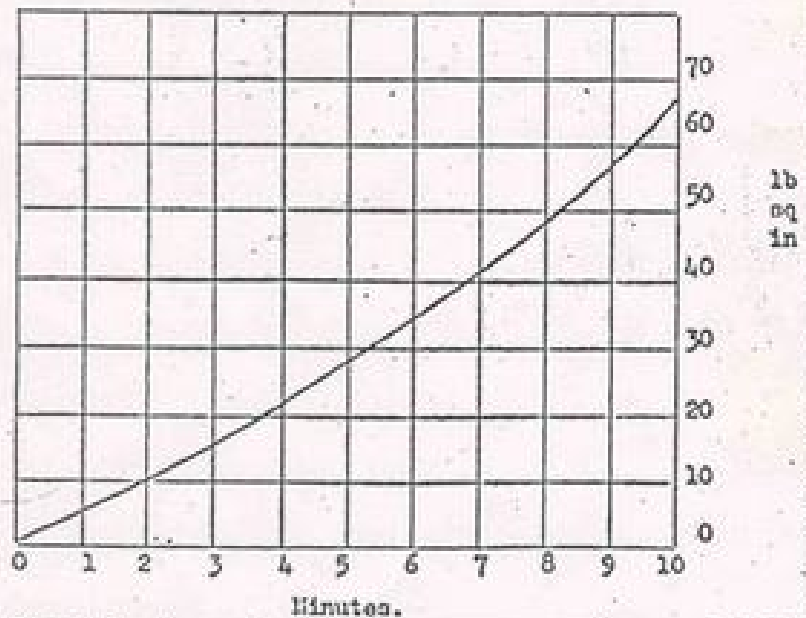
814 - 12A.

15.



Output of Mk. 814. Generator.  
Amperes into a 4 ohm Resistor.

16.



Time taken to reach full steam pressure using wood fuel.

17.

Equivalent Lubricating Oils.

17.1

The oil to be used in the steam engine must be water repellent and such an oil is generally called turbine oil or steam engine crank case oil. As a general rule a medium viscosity oil is used in temperate climates whilst a heavier oil may be used in tropical climates.

17.2

<u>Manufacturer.</u>	<u>Grade.</u>
Manchester Oil & Fallow Co.	F.63.
Vacuum Oil Co	D.T.E. Heavy/Medium.
Shell.	Vitron 33.
Castrol.	† Perfecto M.
B.P.	† CS.100 - Medium/Light. CS.125 - Medium. CS.150 - Heavy/Medium.
Esso.	Teresco 43 Light. * Teresco 47 Medium. Teresco 52 Heavy.

† Complies with service oil type OM65.

\* Complies with British Standard BS489.1955.

17.3

If the above grades of oil are not available, ordinary motor oils may be used, and then preferably an oil without any detergents or additives of any kind. This is because detergent oils tend to emulsify with water or water vapour.

17.4

As a general guide if turbine oil is unobtainable motor oil between S.A.E. 20. and S.A.E. 40. may be used.