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## Chapter 2

### VOLTAGE REGULATOR, TYPE 23

#### LIST OF CONTENTS

	Para.			Para.
Introduction ... ..	1	Testing of regulator ... ..		9
Description ... ..	2	Regulation test ... ..		11
Installation ... ..	7	Stability tests ... ..		12
Servicing ... ..	8	Compounding test ... ..		15

#### LIST OF ILLUSTRATIONS

	Fig.		Fig.
Voltage regulator, Type 23 ... ..	1	Circuit diagram ... ..	4
View showing compression screw and terminal block	2	Test circuit diagram ... ..	5
Underside of regulator ... ..	3		

#### LEADING PARTICULARS

<b>Voltage regulator, Type 23</b> ... ..	Stores Ref. 5UC/2844
Controlled voltage ... ..	27.0 to 28.5 volts
Maximum pile loading ... ..	125 watts
Pile resistance range ... ..	1.5 to 20 ohms
Carbon pile ... ..	Stores Ref. 5UC/4260
Operating coil current ... ..	1.18 to 1.22 amp.
Operating coil resistance ... ..	6.5 ohms cold
Stabilizing shunt coil ... ..	480 ohms
Ballast resistor, 26 ohms ... ..	Stores Ref. 5UC/3273
Trimmer resistor, 5 ohms ... ..	Stores Ref. 5UC/5082

#### Introduction

1. The voltage regulator, Type 23, is used to maintain the output of the 6 kW generator, Type P2 or P3, between the limits of 27 and 28.5 volts. Where two or more generators are used in parallel, a master regulator, Type 32, is used to control the voltage coil circuit of the individual generator regulators. A description of the Type 32 regulator and a circuit diagram of the complete installation is given in Chap. 3.

#### DESCRIPTION

2. The regulator (*fig. 1 and 2*) is of the single carbon pile type, and in general construction and principle of operation is similar to the standard design as described in A.P.4343, Vol. 1, Sect. 6, Chap. 1.

3. A finned cooler is fitted over the ceramic tube housing the carbon washers, and the whole unit is mounted upon a base under which are housed the ballast and trimmer resistors and the rectifier unit (*fig. 3*). The trimmer adjuster, which is slotted for screw-driver operation, is brought to the front of the regulator through a hole in the base plate as shown in *fig. 1*.

4. The main operating coil is connected through the rectifier and terminals 1 and 4 across the generator output, through the pile of the master regulator, Type 32 (*fig. 4*). Voltage stabilization is assisted by the provision of a small shunt coil connected directly across the generator field through terminals 3 and 5. This coil acts as a damping

(A.L.I, Aug. 57)

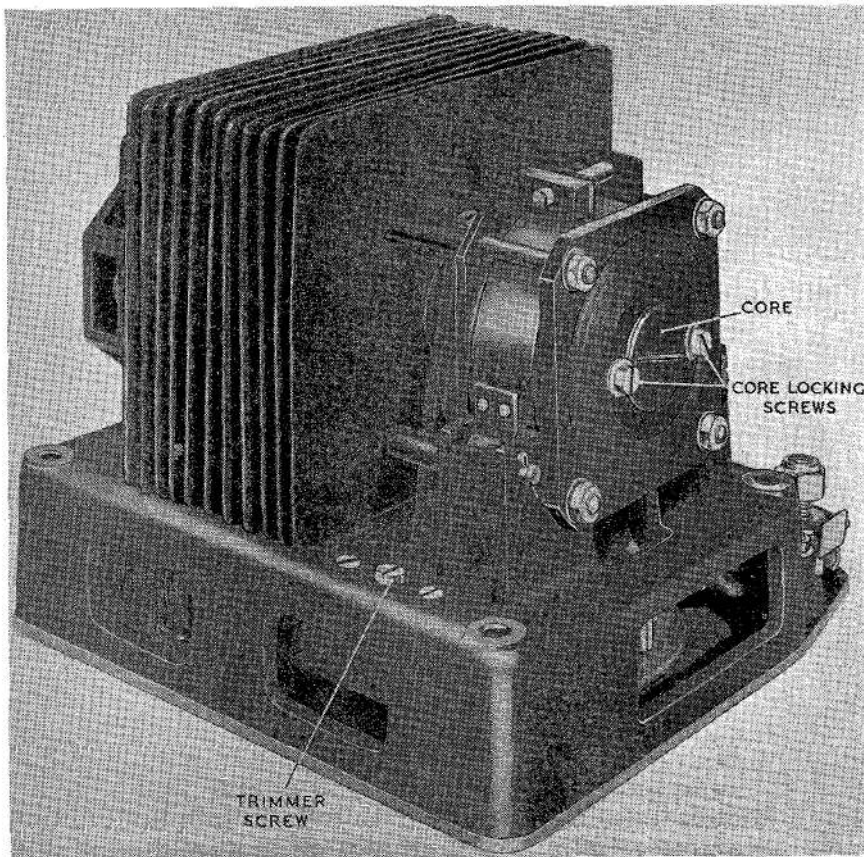


Fig. 1. Voltage regulator, Type 23

device and prevents hunting with rapid changes of speed and load. A coil of low resistance is connected in series with the pile element, and wound in the opposite sense to the shunt stabilizing winding, to counter-balance its effect under steady operating conditions.

5. The whole output of the generator is passed through a decompounding coil, which gives a falling volts/load characteristic of approximately 27 per cent from no load to full load of 200 amp. This falling volts/load ratio limits the circulating current to 25 amp. with a difference of one volt in the setting of individual generators. The embodiment of such a high dropping volts/load characteristic has necessitated the use of a master regulator to maintain the system approximately constant at 28 volts under all conditions of load and speed.

6. A blocking rectifier is connected in series with the main control winding on each

regulator so that, in the event of one or more of the generators failing when working in parallel, the master regulator resistance will still be effective.

#### INSTALLATION

7. The regulator may be mounted in an upright or an inverted position; for details of the cable connections reference should be made to the relevant Aircraft Handbook. Care must be taken to ensure that nothing is done to prevent free circulation of air round the regulator.

#### SERVICING

8. General servicing instructions for this type of regulator are given in A.P.4343, Vol. 1, Sect. 6, Chap. 1. That chapter describes the fitting of a new pile stack, and the preliminary mechanical adjustment for a regulator which is completely out of order. When any adjustment is made, the regulator must afterwards be subjected to full test.

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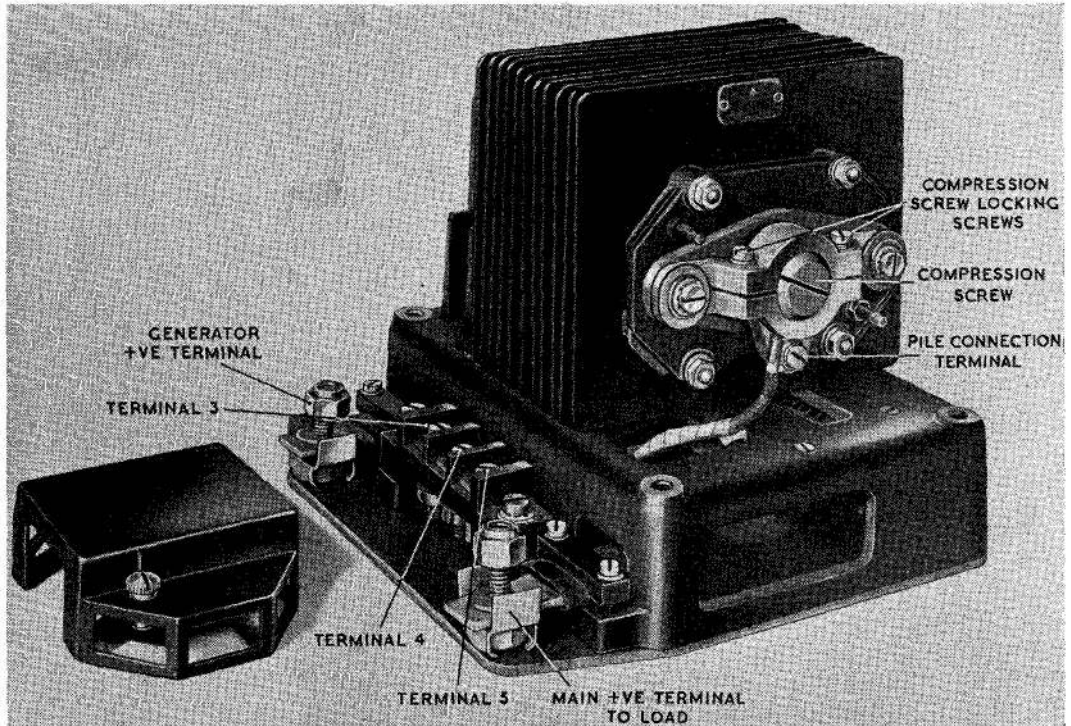


Fig. 2. View showing compression screw and terminal block

#### Testing of regulator

9. Connect the regulator in the test circuit shown in fig. 5; the generator used should be a Type P2 or P3. The adjustable arm of the trimmer resistor must be in the mid position for all tests.

10. To simulate the pile element of the master regulator, a fixed resistance of 5 ohms  $\pm 2\frac{1}{2}$  per cent must be connected in series with the voltage coil circuit as shown in fig. 5. The coil current should be 1.2 amp. measured at 20 deg C., when the line voltage is 28 volts.

#### Regulation test

11. Run the generator on no load at approximately 4,000 r.p.m., and adjust the diverter and series resistors so that the pile resistance, measured by the ratio  $V_2/A_2$ , does not exceed 1.0 ohms. Increase the pile resistance from 1.5 ohms to 20 ohms and decrease again to 1.5 ohms. During this cycle the controlled voltage measured on

voltmeter V1 must be maintained between 27 and 28.5 volts.

#### Note . . .

*The diverter resistor must be switched in and out of the circuit only when at maximum resistance.*

#### Stability tests

12. Switch the generator field on and off at least three times with the generator running at approximately 4,000 r.p.m. and the regulator pile adjusted to 20 ohms. Under these conditions the regulator must respond without any tendency to hunt.

13. Slacken the pile compression screw  $\frac{3}{8}$ th turn, lock in this position and repeat the above stability tests. Under this condition the regulator spring must respond and settle with not more than two oscillations.

14. Provided the regulator satisfies the test in para. 13, restore the original setting of the pile compression screw and repeat the regulation test.

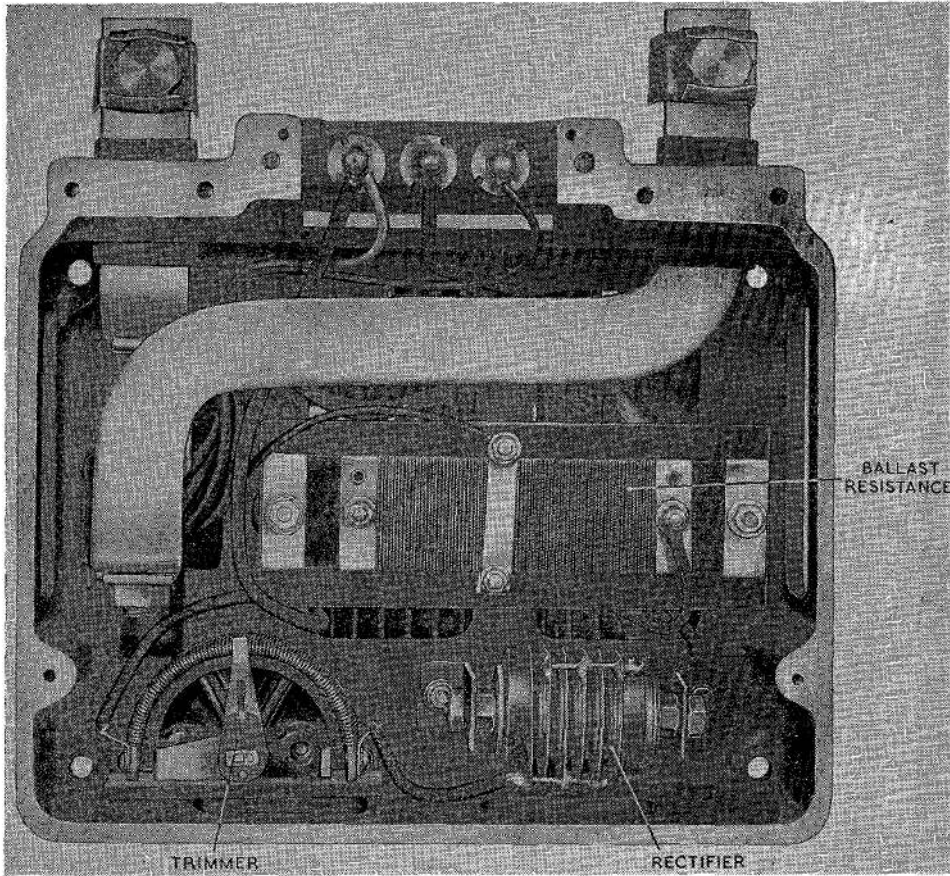


Fig. 3. Underside of regulator

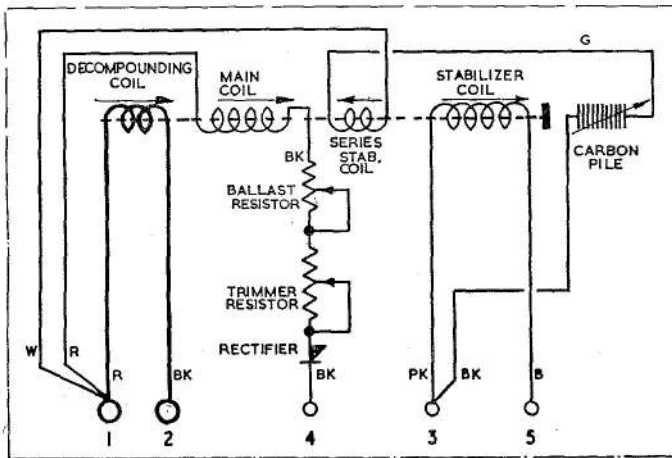
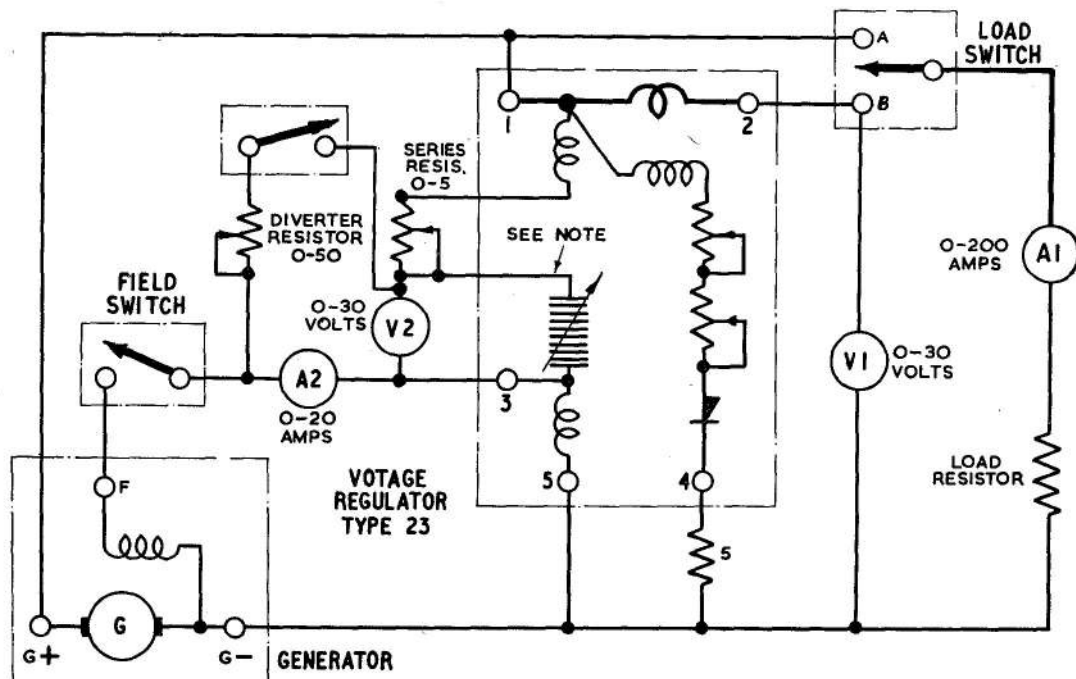


Fig. 4. Circuit diagram

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NOTE: TO ACCOMMODATE THE SERIES RESISTOR, THE CIRCUIT IS TO BE BROKEN AT THE JUNCTION OF THE PILE COMPRESSION SCREW BRACKET AND THE GREEN LEAD

Fig. 5. Test circuit diagram

#### Compounding test

15. With the generator running at approximately 4,000 r.p.m. and the load switch in position A, adjust the load resistor to carry 200 amp. at 28 volts. Switch the load switch to position B, to bring the compounding winding into the load circuit; under this condition the line voltage V1 must be

reduced from the no load value to between the limits of 21.7 and 23.0 volts.

#### Note . . .

During this test the series and diverter resistors in the regulator pile circuit must be short- and open-circuited respectively.

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