COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORDS 1961 No. 26

MACQUARIE ISLAND GEOPHYSICAL OBSERVATORY WORK, 1960

by

C.H. van Erkelens

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ILLUSTRATIONS

ABSTRACT

The author was in charge of geophysical work at Macquarie Island during 1960. This Record describes the operation of the seismic and magnetic observatories there during that year. Scientific results will be published later in separate reports.

1. INTRODUCTION

The seismic observatory at Macquarie Island has been in operation since 1950 and the magnetic observatory since 1951.

Hollingsworth (1960) has described the operation of the observatories during 1959. The author was in charge of the observatories during 1960, after which he was relieved by J. Milne.

Descriptions of the observatory buildings and equipment have been given in previous Records, e.g. by Turpie (1959).

2. MAINTENANCE

2.1 Normal maintenance was carried out in much the same way as in previous years.

Roofs of magnetic huts were painted with roofing paint and the seismic office roof was painted with a black bituminous paint. Walls and doors of both seismic and magnetic huts were re-painted. Where necessary more than one coat was applied.

2.2 Tools

No trouble was experienced with rusting tools this year as the heated boxed-in shadow board, constructed in 1959, proved to be entirely satisfactory.

2.3 Wireless Aerial

After a breakdown of the existing aerial a new one was erected between the seismic office and Camp Hill. No further breakdown occurred even in gale force winds.

2.4 Wireless Receiver

The A.W.A. receiver was tuned to maximum efficiency by the radio supervisor, and remained in excellent order for the rest of the year.

2.5 Batteries

The seismic battery was replaced by a new one. The magnetic battery remained in good order.

2.6 Darkroom Water Supply

A new soak was dug east of the seismic vault, in a high position, well above the tank level. From there, the water was brought in a one-inch plastic hose to the darkroom tank. The overflow from the tank was then taken through a smaller hose to the camp hot water supply tanks (see Plate 1). This ensured a continual storage of approximately 180 gallons at the darkroom and an additional camp supply of about 150 to 250 gallons daily.

The stainless steel washing dish was provided with a 3/8-inch copper overflow tube to which a plastic tube was attached. This allowed records to be washed in running water, by placing the dish under the tap and the end of the overflow hose into the sink.

2.7 Heating of Seismic Vault

A "Sunvic" thermostat was installed in the vault to control a 750-watt bar heater. The control relay and 240-volt main switch ware mounted on a switchboard in the office, with pilot lights for thermostat and heater.

3. MAGNETIC OBSERVATORY

3.1 Introduction

Early in the year an insensitive La Cour magnetograph was installed. This instrument was in addition to the existing normal-sensitivity La Cour magnetograph. Photographs of both sets of variometers are shown in Plate 5.

The approximate scale values for the new variometers are :

H 63 gammas per millimetre

Z 59 gammas per millimetre and

D 2.25 minutes of arc per millimetre or

9 gammas per millimetre.

Recording with the new instruments started at the end of April and satisfactory traces were obtained for the remainder of the year.

3.2 Control Board

As there was no provision on the existing control panel to connect a second magnetograph, a new board was constructed in Melbourne (see wiring diagram, Plate 2). On this board, connections were provided for both sets of magnetographs.

This control board was installed in January and the existing magnetograph was connected to it. It is in the same place as the old one.

The wiring diagram shown in Plate 2 includes a few modifications carried out during the year.

A new control panel was constructed in the absolute hut and two very heavy P.V.C.-covered cables were buried between the absolute and variometer huts. Instead of using the lead shield of the existing twin-cored cable as a third conductor, one of the new lines was used. Four conductors between the huts are necessary for the circuit now in use.

3.3 Orientation Tests

Orientation tests were carried out on both sets of variometers during the year. The method used is that described by Turpie (1959). The meridian used was 25°40' east of north.

The azimuth marks for this meridian are marked in red pencil on the slats fastened to the sides of the variometer hut. The cord can be suspended in the eight positions necessary for lining up the coils for scale-value and orientation tests.

The markings are as follows: H/P.V. (prime vertical) and H/S.V. (scale value), D/P.V. and D/S.V. for each set of variometers.

3.4 Scale Values

As a rule, scale values were determined four times each month. In some cases only three determinations were made, owing to magnetic disturbance. In March a 1000-ohm helical potentiometer was incorporated in the scale-value circuit as a fine current control (Plate 3). This improved the readings considerably. As these potentiometers are fully enclosed and cannot be cleaned it was found advisable to alter the D.C. supply voltage occasionally in order to use different parts of the winding.

To obtain greater deflections, the coil currents for the sensitive magnetograph were increased from 15 to 25 mA. For the insensitive magnetograph a current of 90 mA was used.

The temperature correction tables for milliameter No. VML 11386, used for measuring scale-value currents, were extended.

3.5 Baselines

Baseline control observations were carried out usually four times per month. Some baseline jumps occurred, but in most cases they were due to adjustments of baseline mirrors.

3.6 Magnetograph Optical System

After the orientation tests were carried out, an attempt was made to re-focus the optics of the normal-sensitivity magnetograph.

Considerable improvement was obtained in all baselines and in the H and Z traces. The D-trace could not be improved, and it is thought that the lack of sharpness of the D trace is due to a faulty lens-prism or a faulty mirror.

3.7 La Cour Clock

Little trouble was experienced with the La Cour clock during the year. Rapid temperature changes resulted in an erratic rate, but as a rule the clock settled down again to normal. The length of the pendulum had to be altered only a few times during the year.

3.8 Time Mark Relay

Some trouble was encountered with the transistor relay. The action did not seem positive enough and on occasions no proper contact was made, resulting in loss of time marks on the trace. However, after including an additional 4½-volt battery in the circuit (Plate 2) no more failures occurred.

3.9 La Cour Clockwork Drives

On only one occasion did a clockwork drive stop owing to mechanical failure. After restarting it no more trouble was experienced during the year.

3.10 Humidity

To counteract the influence of humidity, each morning after the records were changed the photographic paper to be used next day was put under a ventilated lightproof cover. This conditioned the paper to the humidity and temperature of the vault and also reduced shrinkage.

4. SEISMIC OBSERVATORY

4.1 General

Until the 5th November 1960 one short-period Grenet vertical-component seismometer and two Wood-Anderson seismometers for the E-W and N-S components were in use.

Microseisms were very prevalent and considerably obscured the records. Consequently, in most cases, teleseisms could not be accurately interpreted.

On the 5th November recording ceased and the instruments were packed for transport, the Grenet to be sent to Wilkes and the Wood-Anderson back to Australia.

The vault was cleaned and made ready for the installation of new Benioff seismometers in 1961.

4.2 Chronometer

The seismic chronometer functioned well during the year. At first it had a rate of 3 or 4 seconds daily but it was found later that by slightly tilting the chronometer the rate could be reduced to a few tenths of a second either gaining or losing.

5. ALL-SKY CAMERA

At the 1959-60 changeover an all-sky camera was installed by Australian National Antarctic Research Expedition technicians. The camera was operated and the films processed by A.N.A.R.E. technicians for that department. However, supervision of the work was entrusted to the author.

A copy of the Macquarie Island all-sky camera Report for 1960 is given in Appendix 1.

6. ACKNOWLEDGEMENTS

The writer wishes to thank all members of the 1960 Macquarie Island party for their co-operation during the year, in particular Mr. Oscar Ferguson for his invaluable help in setting up the Insensitive La Cour magnetograph.

Also Mr. Harold Wright for his work on the all-sky camera.

7. REFERENCES

HOLLINGSWORTH, R.J.S., 1960 Macquarie Island geophysical observatory work, 1959. Bur.Min.Resour.Aust.Rec. 1960/121.

TURPIE, A., 1959 Geophysical work at Macquarie Island 1958. Bur.Min.Resour.Aust.Rec. 1959/123.

APPENDIX 1.

ALL-SKY CAMERA GENERAL REPORT 1960

Although there has been continuous recording since the 23rd March there have been some difficulties resulting in poor quality of a few of the earliest films.

Electronic Timer

The camera and electronic timer were installed during the changeover by J. Nisbett and in the limited time for final testing he noticed that the time was occasionally erratic.

Adjustments were made to the cam operated micro switches and the unit was watched over several hours, during which time it functioned satisfactorily.

However, in subsequent months the fault persistently recurred and due to its intermittent nature some time elapsed before the trouble was finally cured.

Detailed reports of tests made will be found in the log book, but briefly the trouble seemed to be caused by arcing of relay contacts. Also the 50 volt supply voltage to the crystal controlled power supply is critical. The unit is at present functioning satisfactorily.

Camera

The camera operation and film processing was originally in the care of R. Levick, Radar Technician, the electronic timer in the care of H. Wright, Radio Supervisor, and the overall programme supervised by the geophysicist. At the end of March Wright took over camera and film processing as the radar was demanding all of Levick's time.

Mechanically the camera gave some trouble and a few of the earlier films are marred for this reason. The principal cause of bother was the recurrent breaking of small springs in the lever and shutter mechanism. After some experimenting slight modifications were made and satisfactory results obtained with trials over one night.

For the remainder of the year the mechanical operation of the camera has been satisfactory with only a few faults occurring from time to time. (For details see log book).

Films

The hours of recording given in the All Sky camera operating instructions were not strictly adhered to. Early in the year it was realised there would be a need to conserve film. Accordingly, times were set to record only from dusk to dawn and alterations noted in log book.

This action seems justified as at the changeover there will be one unexposed film left.

The exposed films have been replaced in the original cans with adhesive label showing date of commencement and conclusion of exposure. Also the actual films have been marked with black India ink on the emulsion side of the leader as follows "M.I." and date of start and finish of recording.

The film cans have been packed in four cartons marked in chronological sequence and the complete record for the year packed in box No. M 32 for return to Australia.

MACQUARIE ISLAND

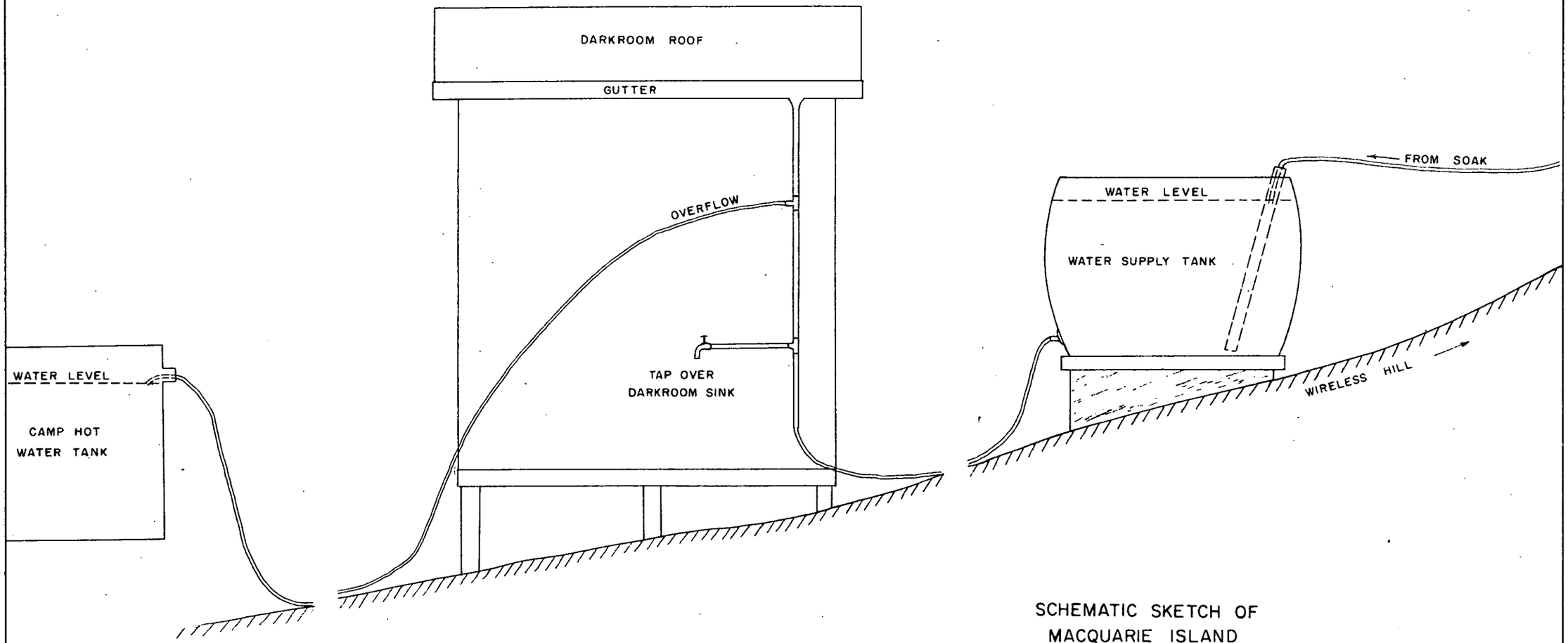
2nd December 1960

Technician

H. Wright
Radio Supervisor

Supervision

C.H. van Erkelens
Geophysicist



SCHEMATIC SKETCH OF
MACQUARIE ISLAND
DARKROOM WATER SUPPLY

To accompany Records 1961, No. 26

G 54-52

PLATE I

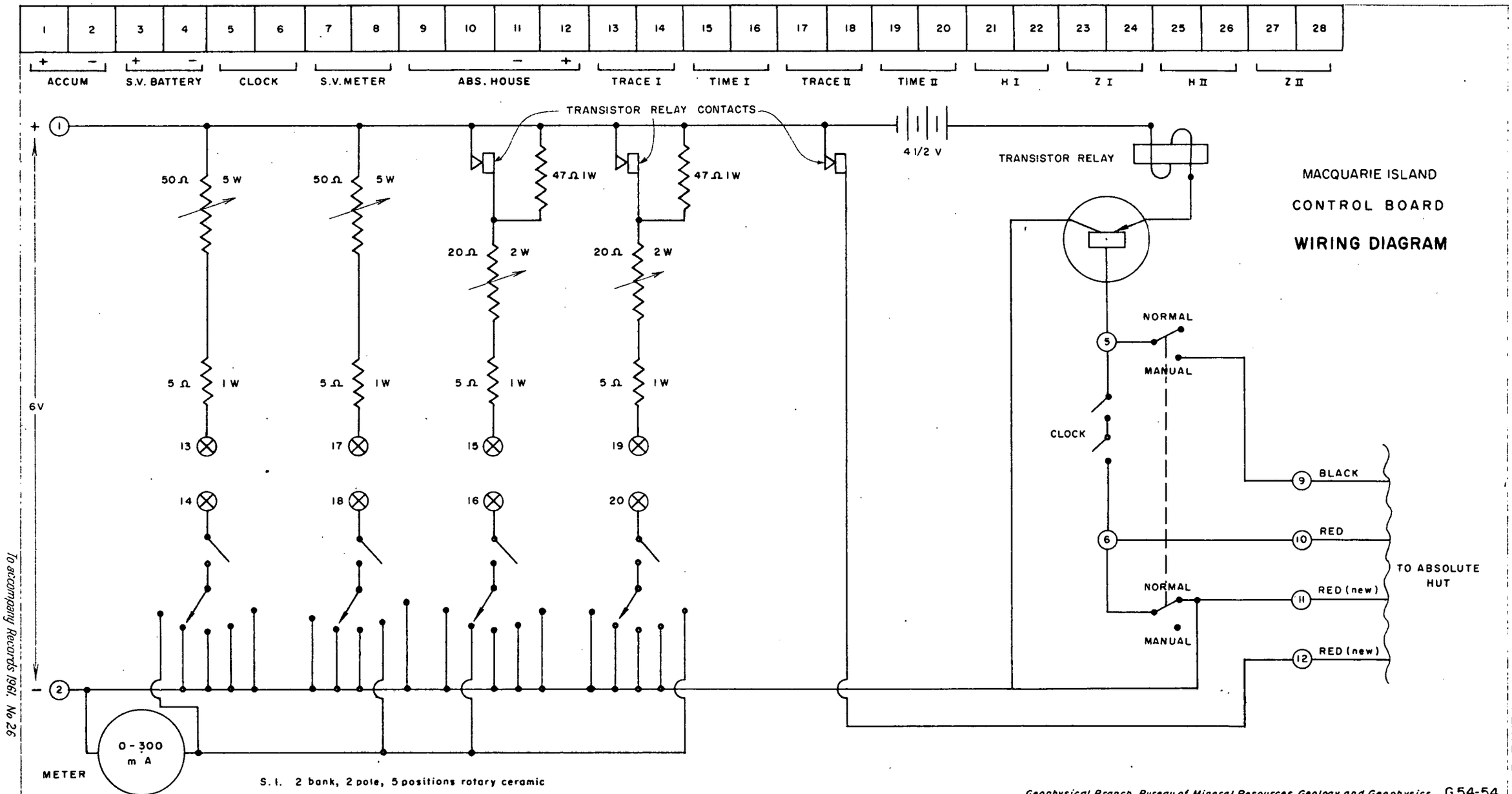


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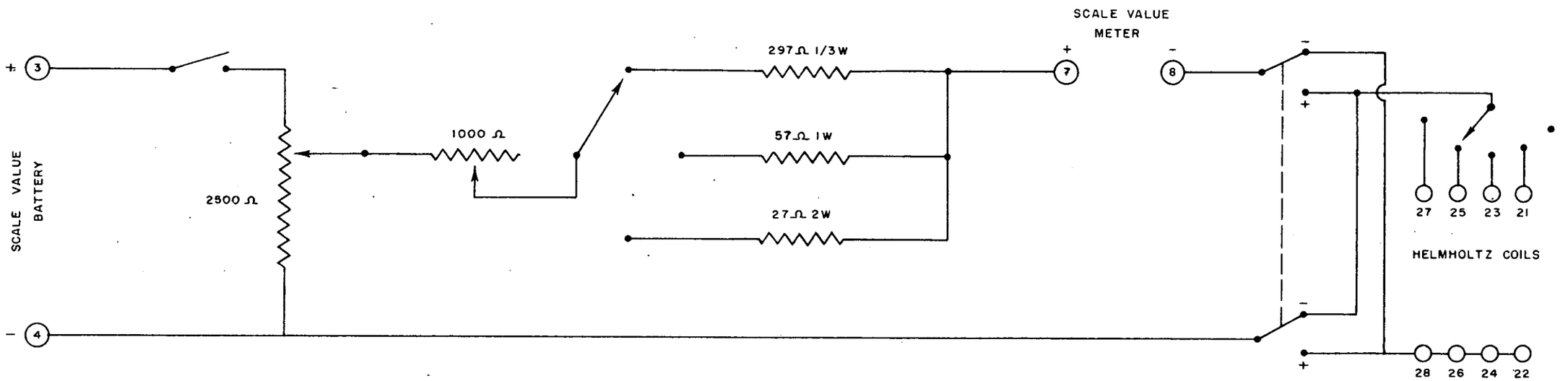
PLATE 2

To accompany Records 1961, No 26

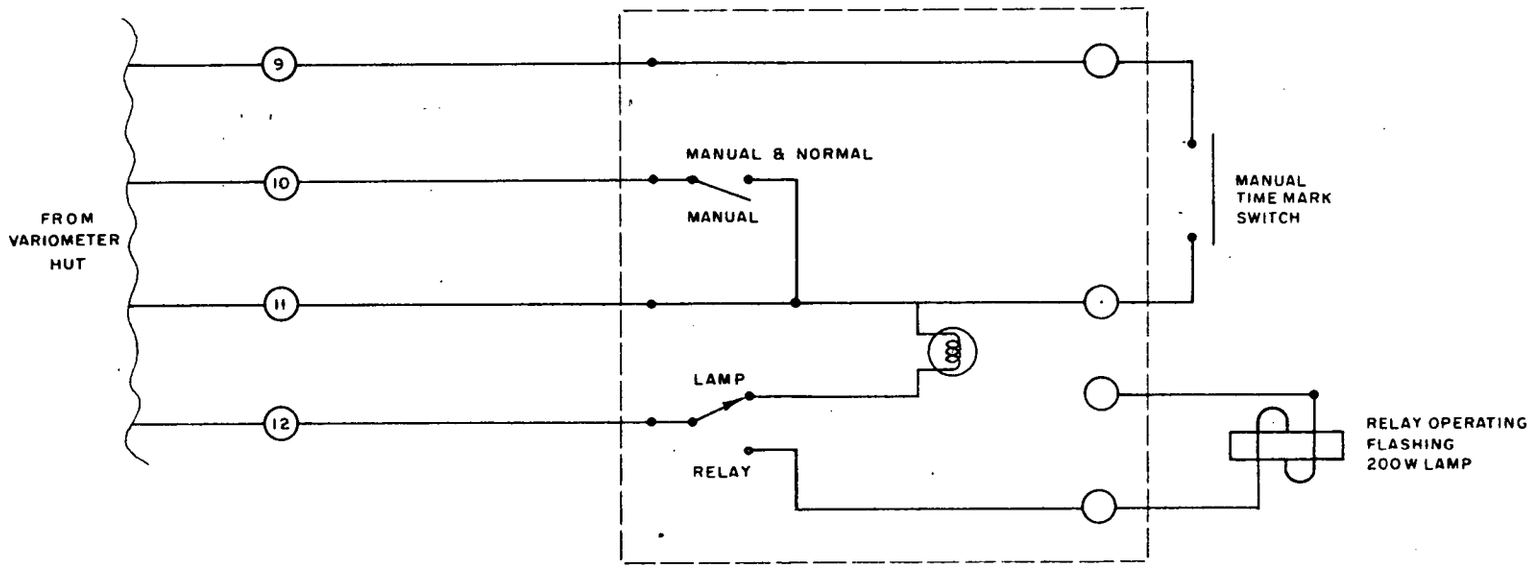


MACQUARIE ISLAND

SCALE VALUE CIRCUIT

PLATE 3

To accompany Records 1961, No. 26



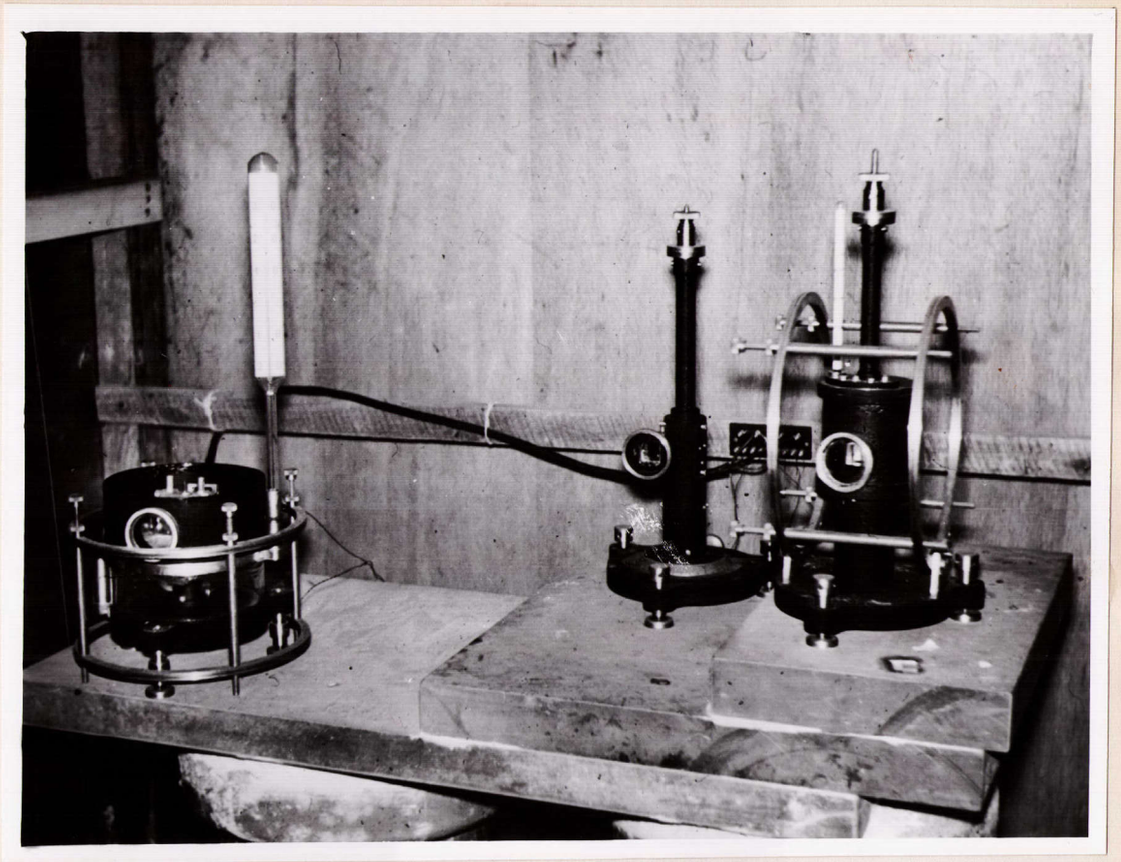
MACQUARIE ISLAND

ABSULUTE HUT CONTROL PANEL

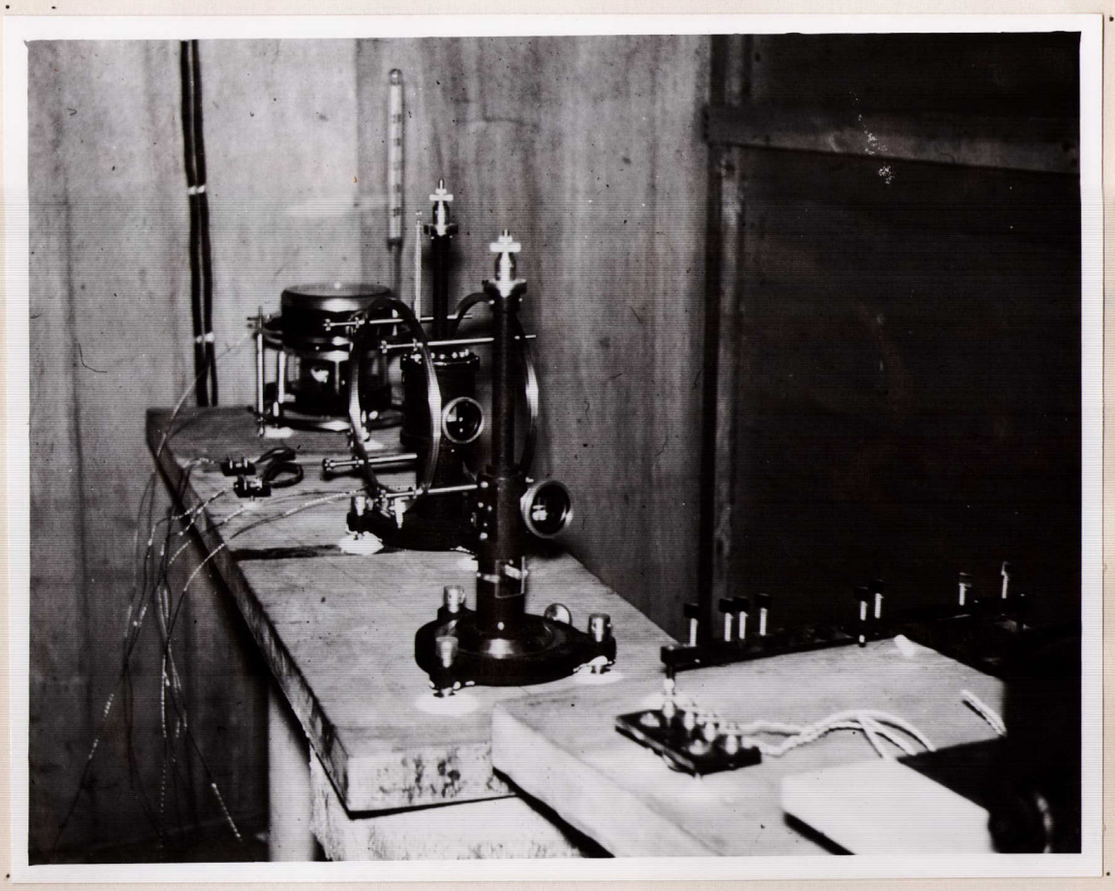
WIRING DIAGRAM

To accompany Records 1961, No.26

PLATE 4



(a) Normal sensitivity La Cour Magnetic Variometers.



(b) Insensitive La Cour Magnetic Variometers.