or removing entirely delays caused by bad connections in the batteries and connecting wires, and it will be desirable to arrange the batteries and instruments in a similar manner at all other stations.

The connecting wires and fittings at the whole of the stations south of Selwyn, with the exception of the Bluff, require overhauling and renewing. Upon carrying out this renewal, those stations can be fitted up upon one uniform system.

Short circuiting switches have been supplied to all the new North Stations, and will also be supplied to all new stations upon opening, and to all old stations upon renewal of fittings. These switches have been introduced for the purpose of economising battery power, as by their use local batteries are only in operation during the reception of messages, and by their use the resistance of the line is considerably reduced (on the Christchurch–White's Bay line for instance, the reduction of the resistance would amount to one half).

Further precautions against damage by lightning, have been taken, by providing additional lightning protectors, putting two on each wire at all new stations, and I would suggest this being done at all the old stations, particularly on all lines radiating from White's Bay; within the last nine months no less than three lightning protectors have been destroyed by heavy discharges of atmospheric electricity, one at Invercargill, one at the Bluff, and one at Greymouth, at the latter place the same discharge damaged other instruments, and suspended communication; the fine wire coils of the relay and galvanometer were fused.

When the stations are supplied with new "earths" of copper sheet to replace those that are faulty, and the alterations alluded to above are all carried out, and when the whole of the stations are supplied with improved galvanometers (now being done by withdrawing the old instruments to Wellington where they are rewound with longer lengths of wire, and have the magnetized needles lightened, and are then returned to the stations), further improvement in the working will result.

A very great reduction of battery power has been made since my inspection of the lines in the Middle Island. The total reduction amounted to five hundred and twenty four cells, being considerably more than one-fifth of the whole number of cells then in use. The advantages of this and further reductions to be made when practicable, are—

1. Economy in consumption of zinc and sulphate of copper.
2. Less number of connecting screws (always a source of annoyance and trouble).
3. Economy of space, and
4. The diminished liability of interruptions from faulty cells, and bad connections between them.

In addition to the saving of expense and the other advantages obtained, the number of cells at all the stations on each circuit were *equalised*, an important point in the well working of a line.

The electrical condition of the Cook Straits Submarine Cable, is not so satisfactory as I could wish. The No. 2 wire which has never been in such perfect condition as the other two, is now falling considerably in insulation, as the following Table of the whole of the tests made by myself will show.

Date.	No. 1 Wire.	No. 2 Wire.	No. 3 Wire.
1867.—September 1	473	71	554
„ 30	634	102	634
October 14	547	179	620
November 1	598	32·6	667
„ 14	574	10·6	643
December 2	608	10·5	709
1868.—June 7	930	5·5	1,094

The three columns of figures represent "Megohms," or Millions of Ohmads (British Association units of resistance) per nautical mile, after two minutes electrification. The larger the number of Megohms per nautical mile the better the insulation. It will be seen by the above list that the No. 3 wire has always tested much higher than the other two, the No. 1 wire testing next best. The insulation of the Nos. 1 and 3 wires is in a highly satisfactory condition, while that of No. 2 is faulty. It must not be overlooked, however, that its insulation, even at that low figure, is above the insulation of an equal length of land wire on a wet day, consequently affecting its capability for working to but a slight extent.

The proportion or per centage of a given current passing through the No. 2 wire by the conductor is ninety-six, while four per cent. only is lost by the faulty insulation.

As the No. 2 wire is not particularly needed for business, and it being one of the properties of electric currents to diminish the resistance and so increase the loss or leakage on an indifferently insulated submarine wire, I deemed it prudent to advise its withdrawal from use with the view to preserve it as long as possible. It was, in November last, disconnected, and has not been in operation since. It may, whenever the increase of business calls for increased means of carrying it, be again made use of, should it not in the meanwhile deteriorate to an alarming extent; but I would most strongly advise that on no account be the cable disturbed, or attempts made to make good the present defects in the No. 2 wire.

The establishment of a learners' gallery at Wellington, in obedience to the instructions of the Honorable the Telegraph Commissioner, has been attended (although in operation but a short time) with satisfactory results, so far as the instruction of cadets in the routine of