On November 28 and December 19, 1883, the first movement of the spot of light was observed, and on December 16, 17, and 19, the first appearance of the spot of light was noted after passing the screen fixed at 200 divisions to the left of zero, with the following results:—

	s.
November 28, 1883: First movement of spot observed, 66 signals noted; mean loss of time or personal equation	=·296
December 19, 1883: First movement of spot observed, 140 signals noted; mean loss of time or personal equation	=·306
Mean using weights proportionate to the number of observations in each case	=·302

In the following trials the first appearance of the spot of light was noted after passing the screen fixed at 200 divisions to the left of zero, and it will be seen that the loss of time was considerably more than in the first method:—

	s.
December 16, 67 signals; mean loss of time in receiving signals ...	=·443
" 17, 53 " " " ...	=·480
" 19, 114 " " " ...	=·432
Mean of the above values, using weights proportional to the number of observations in each case	=·446

Therefore, in computing the difference of longitude between Sydney and Wellington by signals going east, an allowance of ·302*s.* will have to be made for loss of time in noting the galvanometer signals received at Wellington on December 5, and an allowance of ·446*s.* will have to be made in regard to the signals received at Wellington on December 15, 16, and 18.

NOTE.—The following results were obtained in Sydney, and are recorded here for the sake of comparison, but have not been made use of:—

	s.
September 25, 1883: Mean of 43 observations by C. W. Adams ...	0·286
" 26, " " 50 " " ...	0·274
October 10, " " 39 " " ...	0·271
" 10, " " 40 " by H. C. Russell ...	0·271

With regard to Mr. Russell's personal equation in receiving signals, he informed me, by letter dated April 8, 1884, that he had determined it with the instruments as used for longitude and found it to be ·341*s.* from 58 signals.

In exchanging time-signals with Sydney the following arrangement was adopted:—

(1.) *Sydney to New Zealand.*—Mr. Russell sent the following signals by hand, viz., 1*s.*, 10*s.*, 20*s.*, 30*s.*, 40*s.*, 50*s.*, 1*s.*, &c., for 9 minutes, or 55 signals in all. These signals were all recorded on the Sydney chronograph. I received them at Wellington by reflecting galvanometer, but, instead of noting each signal by "eye and ear," I simply tapped the key and recorded each signal on my chronograph.

(2.) *New Zealand to Sydney.*—I sent time-signals by hand at the following intervals, viz., 60*s.*, 11*s.*, 21*s.*, 31*s.*, 41*s.*, 51*s.*, 60*s.*, &c., for 9 minutes, or 55 signals in all, each signal being recorded on the Mount Cook chronograph. Mr. Russell received the signals at Sydney by reflecting galvanometer, and made contact each time, by which means all signals received were recorded on the Sydney chronograph.

Two more sets, similar to the above, generally completed the exchanges for each night.

Owing to the manner of sending and receiving, it will be seen that there was no personal equation in sending signals, but only in receiving them.

Table 6 gives all the exchanges in detail with a summary of means at the end; also the probable error of each exchange, and the probable error of the mean of each night's exchanges.

These so-called "probable errors" have been obtained in the usual way, by means of the residuals, or differences of each exchange from the mean.

Table 7 gives the clock times of sending and receiving each set of time-signals, with all the necessary corrections.

In getting the final difference of longitude the weights for each night's work have been calculated by two different methods.

By the first method the probable errors have been found for each night's "clock slow" at Wellington and Sydney, and also the probable error of each night's exchange of time-signals. Then the probable error of each night's work has been assumed equal to the square root of the sum of the squares of the above probable errors, and the weight for each night's work has been made reciprocally proportional to the square of its probable error.

By the second method weights have been applied according to the number of clock stars observed on each exchange night at Sydney and Wellington. It will be seen that the results by each method are practically the same, and, taking the mean of the two results as the most probable value, we get for the difference of longitude between Sydney and Wellington 1*h.* 34*m.* 16·984*s.* ± ·020*s.*

The course of the electric current from Sydney to Wellington was as follows:—

		Miles.
Sydney Observatory to La Perouse (Botany Bay) ...	Land-line ...	9
La Perouse (Botany Bay) to Wakapuaka (N.Z.) ...	Cable ...	1,478
Wakapuaka to White's Bay	Land-line ...	75
White's Bay (South Island) to Lyall Bay (North Island)	Cable ...	51
Lyall Bay to Mount Cook Observatory, Wellington ...	Land-line ...	3
Total		1,616 miles.