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The International Seismological Summary for 1923 July, August, September.

FORMERLY THE BULLETIN OF THE
BRITISH ASSOCIATION SEISMOLOGY COMMITTEE.

In continuation of the policy adopted in the last number, a few notes on recent history are given here as well as an extended note on the great Japanese disasters of 1923 September 1 and 2, and their after-shocks.

Another matter may be mentioned, though it is not directly connected with the work of the Summary. Mr. J. J. Shaw, who has provided so many seismographs scattered over the world, has been attacked by sudden and severe illness, and by doctor's orders must be away from England for many months. But he has made arrangements for the work of constructing seismographs to be carried on at his home (Sunnyside, Birmingham Road, West Bromwich) during his absence. I feel sure that the sympathies of all seismologists will be extended to him in this unexpected trouble.

The Earthquake of 1926 October 26.

The Earthquake of 1926 October 26d. 3h. 44.7m. afforded a good example of the present difficulties in identifying an epicentre 120° distant without information from stations within 80° of the epicentre. The Oxford seismogram indicated a sharp beginning at 4h. 5m. 4s., which might be P, but was probably [P], since the interval to maximum indicated a remote origin. A telegram from Helwan gave $P=3h. 59m. 5s.$, $S-P=631sec.$; equivalent to $\Delta=85^\circ$, $T_0=3h.46m.17s.$ If this was correct the first movement at Oxford followed T_0 by 18m.47s., which, as [P], would give $\Delta=118^\circ$. The difference $118^\circ-85^\circ$ is, however, rather greater than that between Oxford and Helwan, and if we allow the maximum difference, the epicentre indicated seemed improbable. A telegram was therefore addressed to Mr. Bhaskaran, Director of the Hyderabad Observatory, asking for details, and his reply $P=3h.55m.10s.$, $S-P=508s.$, gave $\Delta=62^\circ.8$, $T_0=3h.44m.40s.$ Using this T_0 it appears that the Oxford initial movement must be PR_1 . It is too late for P or [P], and we learn that at this distance ($\Delta=120^\circ$) [P] has not yet appeared. As regards the Helwan observation the S is not S but $[\dot{S}]$ or S_cP_cS , the Gutenberg wave, and the distance not 85° but 105° . At this distance the adopted tables for P require a negative correction,

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which brings all the information into accord. The epicentre is near $1^{\circ}\text{S } 139^{\circ}\text{E}$; and a telegram from Riverviv, which appeared in the *Daily Mail* on October 28 afforded additional confirmation of this locality.

1923 April 5d.

Three notes were by an oversight omitted from the last Bulletin. They are copied from the *Bulletin Volcanologique* (published by the Volcanic Section of the G. and G. Union) for 1925, Nos. 3 and 4. It suggests some disturbance in (say) latitude 33°S ., long. 75°W ., but there is nothing to correspond in the seismographic information to hand.

“An account by the Captain of the steamer *Martha*, which has just returned to Coquimbo, Chile, from a lobster fishing expedition to the uninhabited Islands of San Ambrosio and San Felix, which lie in the Pacific Ocean, about 300 miles west of the town of Chanaral, says, according to a Reuter Message, that on March 4, when nearing San Felix, the *Martha* met a tidal wave 35 metres high (about 113 feet), which rose from a calm sea. Arriving at San Felix Capt. Campbell noticed that the island was much smaller than previously. Anchoring he found the water tepid and the rock bottom changed to sand. Heavy sulphur gases pervaded the air. On shore he found sea-fowl dead in their nests and thousands of dead fish covered the Island.”

1923 June 18d. 8h. 15m. 45s. Epicentre 18°S . 176°W .

The next refers to the shock for which the above details appear in the Summary.

Met. Log of Bque. *Garthgarry*, Capt. D. Roberts.

At 9 p.m., ship's time (on June 17), in lat. $20^{\circ}40'\text{S}$., long. $17^{\circ}22'\text{W}$., a violent tremor passed throughout the ship, lasting about 2 or 3 minutes, shaking masts and hull severely and causing all hands to rush on deck thinking the ship had struck.

The sensation was similar to that of grinding over a reef or some submerged object.

A cast was taken and gave no bottom at 90 fathoms, and the ship has made no water since the occurrence. A light to moderate W.S.W. breeze and smooth sea at the time.

Probably the tremor was caused by some subterranean disturbance.

Should there be any sign on the ship's bottom when she is dry docked advice will be sent to the M.O.

No notifications of any mark on the ship's bottom have been received.

The Great Earthquake of Sept. 1, 1923.

In approaching the records of the great and disastrous earthquake which destroyed Tokyo and Yokohama, and its many aftershocks, it is necessary to consider what policy to adopt. It is desirable to utilise the numerous records to obtain as precise a determination of the epicentre as possible, but for this an elaborate discussion is necessary, and it would delay the Summary too long to make it complete. The policy hitherto adopted has been to collect the data in such a form as to facilitate further discussion, without attempting finality, and in pursuance of this policy the epicentre $35^{\circ}0'N. 139^{\circ}5'E.$ was adopted from previous use on 1922 April 26. (Moreover this position is close to that selected by Imamura, viz., $34^{\circ}58'.6'N. 139^{\circ}21'.8'E.$). But this adopted position is to be regarded as provisional only. A discussion has been based on the residuals, and the main result seems to be that the focal depth on September 1 was normal, but changed on September 2 to a depth $+0.10$ rad. (=40 miles) below normal. The evidence is as follows. Consider first the shock of Sept. 1d.2h. Groups of stations were formed according to azimuth, and the residuals shown below were converted into equivalent increments of Δ on two suppositions, firstly that the focal depth was normal, and secondly that it was $+0.10$ rad., or 40 miles below normal as suggested by the Sept. 2 shock.

SOLUTIONS FOR SEPT. 1d. 2h.

No. Stns.	Mean Az.	Normal focus	$\delta\Delta$ Depth		Normal				Deep	
			+0.10	Sin Az.	Cos Az.	C_1	$O_1 - C_1$	C_2	$O_2 - C_2$	
3	12	0.0	0.0	+21x	+98y	-0.1	+0.1	+0.4	-0.4	
6	47	+0.5	+1.8	+73x	+68y	+0.4	+0.1	+0.4	+1.4	
2	108	+2.1	+3.2	+95x	-31y	+0.8	+1.3	+0.1	+3.1	
7	172	-0.7	+0.6	+14x	-99y	+0.4	-1.1	-0.3	+0.9	
3	223	-0.9	-0.1	-68x	-73y	-0.3	-0.6	-0.4	+0.3	
8	258	0.0	+0.3	-98x	-21y	-0.7	+0.7	-0.3	+0.6	
5	277	-0.9	-0.1	-99x	+12y	-0.8	-0.1	-0.2	+0.1	
10	320	-0.4	+1.0	-64x	+77y	-0.7	+0.3	+0.1	+0.9	
10	328	-1.2	+0.2	-53x	+85y	-0.6	-0.6	+0.2	0.0	
13	335	-1.2	+0.2	-42x	+91y	-0.6	-0.6	+0.2	0.0	

The equations for $x \sin Az. + y \cos Az.$ were solved by a summary process, and the solutions were:—

$$\begin{aligned} \text{Normal depth} & \quad x = +0^{\circ}.77 \quad y = -0^{\circ}.25 \\ +0.10 \text{ below normal} & \quad x = +0^{\circ}.24 \quad y = +0^{\circ}.35 \end{aligned}$$

The residuals are shown in the columns $O_1 - C_1$ and $O_2 - C_2$. In the former the sums of the positives and negatives are $+2^{\circ}.5$ and $-3^{\circ}.0$; in the latter the sums are $+7^{\circ}.2$ and $-0^{\circ}.4$. It would appear therefore that the hypothesis of deep focus on Sept. 1 is not supported by the evidence, and that the residuals can be satisfied by a change of epicentre from the adopted $35^{\circ}0'N. 139^{\circ}5'E.$ to $35^{\circ}.25'N. 138^{\circ}.56'E.$

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Turning next to the 2nd large shock of Sept. 2d. 2h. we get very similar groups yielding solutions as follows :—

$$\begin{aligned} \text{Normal depth} & \quad x = +0^{\circ}.81 \quad y = -0^{\circ}.72 \\ +.010 \text{ below normal} & \quad x = +0^{\circ}.49 \quad y = -0^{\circ}.33 \end{aligned}$$

These values differ sensibly from those for Sept. 1; but, what is more important, the sums of the positive and negative residuals (see table below) are :—

$$\begin{aligned} \text{Normal depth} & \quad +0^{\circ}.8 \text{ and } -9^{\circ}.4 \\ +.010 \text{ below} & \quad +2^{\circ}.2 \text{ and } -2^{\circ}.6 \end{aligned}$$

So that the lower depth now commends itself. If we adopt it we thus have

$$\begin{aligned} \text{For Sept. 1d. 2h.} & \quad x = +0^{\circ}.77 \quad y = -0^{\circ}.25 \text{ normal depth} \\ \text{For Sept. 2d. 2h.} & \quad x = +0^{\circ}.49 \quad y = -0^{\circ}.33 \text{ depth } +.010 \end{aligned}$$

So that the chief displacement is vertical rather than horizontal.

The minor shocks have also been discussed on these two suppositions, and the residuals may be exhibited thus, though the groups in azimuth vary a little.

RESIDUALS FOR THE VARIOUS SHOCKS.

Az.	Sept. 1d. 7h.		Sept. 2d. 2h.		Sept. 2d. 9h.		Sept. 2d. 13h.	
	Normal	Deep	Normal	Deep	Normal	Deep	Normal	Deep
12	-0.9	-0.8	+0.1	-0.2	+0.4	-0.3	+0.9	+0.2
47	—	—	-1.0	+0.2	-0.1	+0.7	—	—
108	—	—	-1.3	+0.1	-0.6	+0.6	—	—
172	—	—	-2.1	-0.3	-1.3	+0.7	—	—
223	-1.0	-1.3	-1.6	-0.8	-0.8	+0.4	—	—
258	-0.1	+0.7	+0.7	+0.7	+0.2	+0.5	+0.8	+0.3
277	+0.7	+1.4	-1.8	-1.3	+1.1	+1.6	—	—
320	-0.8	-1.2	-0.2	+0.8	-1.2	-0.5	+0.3	+0.2
328	+0.2	-0.4	-0.7	+0.2	-1.3	-0.6	-0.3	-0.2
335	—	—	-0.7	+0.2	—	—	—	—
	+0.9	+2.1	+0.8	+2.2	+1.7	+4.5	+2.0	+0.7
	-2.8	-3.7	-9.4	-2.6	-5.3	-1.4	-0.3	-0.2

It will be seen that on Sept. 1 the supposition of normal depth gives the smaller residuals, while on Sept. 2 the deep focus seems better. Each shock has been reduced with its own suggested corrections to epicentre, which are as follows :—

Sept.	d.	h.	Normal		Deep	
			x	y	x	y
			1	2	+0.8	-0.2
1	7	+0.9	-1.1	-0.1	-0.8	
2	2	+0.8	-0.7	+0.5	-0.3	
2	9	-0.5	-1.0	-0.7	-0.3	
2	13	+1.4	-1.0	+0.2	-0.1	

On Sept. 1d. 5h. there is scarcely sufficient material for a separate solution; but direct comparison with Sept. 1d. 2h. suggests that the conditions were the same. The material is also scanty on Sept. 2d. 13h., so that the residuals can be made small on either supposition.

The general suggestion (concentrating attention on the normal focus for Sept. 1 and the deeper focus for Sept. 2) is a small posi-

tive correction in x and a negative in y ; say $x = +0^{\circ}.8$, $y = -0^{\circ}.8$, moving the epicentre to $35^{\circ}.3N$. $138^{\circ}.5E$.

Let us now turn to the quite independent evidence supplied by many observatories near the epicentre which were not all provided with seismographs.

A valuable communication on this earthquake is contained in No. 6 of the Seismological Notes issued by the Imperial Earthquake Investigation Committee (Tokyo, July, 1924). In it Prof. Imamura gives (on p. 8) a list of a number of stations near the focus, arranged in order of their focal distance measured along the earth's surface (the focus being assumed close below the surface) with the times of arrival of P. A graph (Plate III, preceding p. 7) shows a sensibly linear relation between the distance and time as far as 1200 km. ($=10^{\circ}.8$). The evidence is thus in favour of a focus close to the surface, *except* for one important fact, viz., that the velocity indicated by the graph is 7.5 km./sec., which is quite different from that given for surface velocities by the Oppau explosion (Jeffreys and Wrinch, Geop. Supp. to Mon. Not I. 2), viz. 5.4 km./sec., well supported. The discrepancy is too large to be overlooked, and has already been noticed in a somewhat different connection, viz., as between the Oppau explosion and the velocity implied by the adopted tables, if they are regarded as suitable for surface shocks. It has been pointed out that if it is recognised that the average earthquake originates some 0.04 of the earth's radius below the surface, and the tables are then modified to fit this fact, the surface velocity will then be brought into line with that deduced from the Oppau explosion.

The question therefore arises whether the beautiful evidence collected by Prof. Imamura can be rearranged to fit the hypothesis of a deep focus. We have at disposal the position of the epicentre and the time of the shock, both of which are known approximately but not with precision. If x and y be the co-ordinates (in km.) East and North of Prof. Imamura's adopted epicentre which is

$$\phi = 34^{\circ}58'.6N. \quad \lambda = 139^{\circ}21'.8E. \quad \dots \quad (1)$$

then he finds

$$x^2 + y^2 = (7.5t)^2 \quad \dots \quad (2)$$

where t is measured from his adopted T_0 which is

$$T_0 = 2h. 58m. 30s. \text{ (Greenwich).}$$

Now we propose to substitute equations of the form

$$(x + x_0)^2 + (y + y_0)^2 + z_0^2 = V^2(t + t_0)^2 \quad \dots \quad (3)$$

and to see whether x_0 , y_0 , z_0 , t_0 can be found to suit a sensible value of z_0 , and a different velocity V . The velocity of transmission from F to a surface station S must vary, for the discrepancy

between Prof. Imamura's general result and the Oppau result can only be explained if the velocity increases as we go downwards. But as a crude approximation we may regard the *average* velocity along FS as being that at its middle point, which will be the velocity at half the depth of F and may be regarded as constant (to this approximation) for all rays from F, not too far away from FE. Since we know that the rays are not actually straight, but curved, the velocity in a curved path will remain large for a longer time than if the path were straight, and thus as we take points further and further from E, for which this curvature begins to have its effect, we may expect the average velocity to increase.

Putting this aside for the present we assume then equations of the form (3), which may be re-written

$$2x(x_0) + 2y(y_0) - 2t(V^2t_0) = V^2t^2 - (x^2 + y^2) + [V^2t_0^2 - x_0^2 - y_0^2 - z_0^2] \dots \dots \dots (4)$$

If we take x_0, y_0, V^2t_0 as unknowns, the left hand side will be of the same form for any assumed value of V. The [] is the only term that contains z_0 , and may be eliminated from the equations by subtracting the mean from each of them, the determination of z_0 being thus deferred to the end. We shall assume three values of V, viz. 8 km./sec., 7 km./sec., 6 km./sec., and the resulting values of the unknowns, deduced from observations at the 6 stations, Numadu, Tokyo, Kumagai, Tyosi, Mito, and Takayama, are as follows :—

	V = 8km./sec.	7km./sec.	6km./sec.
V^2t_0	-225	-40	+119
t_0	-3.5	-0.8	+5.5
y_0	+24	-12	-23
x_0	+21	+11	+17
z_0^2	-4572	+2800	+8771
z_0	—	+53	+94

The value of z_0^2 is thus negative for an assumed velocity 8km./sec., and the depth increases as the assumed mean velocity diminishes. For illustration let us take a solution midway between the 2nd and 3rd cases, viz. :—

$$V = 6.5 \text{ km./sec.}, t_0 = +8 \text{ sec.}, x_0 = +14 \text{ km.}, y_0 = -18 \text{ km.}, z = +74 \text{ km.}$$

Then the results for the half-dozen stations used for the solution are as follows :—

	$x+x_0$ km.	$y+y_0$ km.	z_0 km.	Δ' km.	$\Delta'/6.5$ s.	0+3s. s.	O-C s.	Imamura		
								Δ km.	$\Delta/7.5$ s.	O-C s.
Numadu	- 21	- 2	+74	77	11.9	12	+0.1	49	6.5	+2.5
Tokyo	+ 54	+ 65	+74	113	17.4	17	-0.4	92	12.3	+1.7
Kumagai	+ 26	+112	+74	137	21.1	24	+2.9	130	17.3	+3.7
Tyosi	+152	+ 68	+74	182	28.0	30	+2.0	162	21.6	+5.4
Mito	+ 93	+152	+74	193	29.7	29	-0.7	187	24.9	+1.1
Takayama	-176	+114	+74	222	34.2	36	+1.8	232	30.9	+2.1

In the last three columns are given the details of Imamura's solution—his distance Δ measured from his adopted epicentre along the surface; the division by his adopted velocity 7.5 km./sec., and the excess of the observed time reckoned from his T_0 (3 sec. less than the 7th column) over this calculated time. It will be seen that the suggested times from a deep focus give smaller residuals. We must now inquire how far this solution fits rather more distant stations, which have not been used to construct the solution. The corresponding details are as follows:—

	$x_0 + 14$ km.	$y_0 - 18$ km.	z_0 km.	Δ' km.	$\Delta/6.5$ s.	$0 + 3s.$ s.	O - C s.	O - C Imamura s.
Nagano	- 60	+ 195	74	217	33.4	29	- 4.4	- 2.8
Gihu	- 226	+ 24	74	239	36.8	35	- 1.8	- 0.5
Nūgata	+ 3	- 313	74	322	49.5	47	- 2.5	- 0.1
Yagi	- 336	- 53	74	348	53.5	54	+ 0.5	+ 4.3
Osaka	- 346	- 43	74	356	54.8	57	+ 2.2	+ 6.0
Kobe	- 372	- 18	74	380	58.5	59	+ 0.5	+ 4.5
Mizusawa	+ 181	+ 442	74	483	74.3	73	- 1.3	+ 4.8
Matuyama	- 584	- 178	74	615	94.6	91	- 3.6	+ 5.5
Hakodate	+ 147	+ 732	74	750	115.4	106	- 9.4	+ 1.5
Kagosima	- 768	- 470	74	903	138.9	129	- 9.9	+ 5.6
Nagasaki	- 882	- 176	74	903	138.9	123	- 15.9	- 1.4
Ootomari	+ 230	+ 1191	74	1215	186.9	173	- 13.9	+ 6.3
Naha	- 1198	- 868	74	1483	228.2	172	- 56.2	- 28.3

But this crude method is probably not applicable to the larger distances owing to

(1) The curvature of the earth's surface, which has been neglected.

(2) The curvature of and change of average velocity in the ray.

As regards (1), still assuming a straight ray, the length FS is given by

$$FS^2 = (R - z_0)^2 + R^2 - 2R(R - z_0) \cos ECS$$

where C is the earth's centre, R the earth's radius, and z_0 the depth of the focus as above. Substituting the approximate value of $\cos ECS$ we find that

$$FS^2 = (x^2 + y^2 + z^2) (1 - z_0/R).$$

Thus when $FS = 1000$ km., the correction is only 6 km. The residual for Nagasaki would be reduced from $-15.9s.$ to $-15.2s.$, which is in the right direction but too small to be important.

(2) As regards the curvature of the ray and change of velocity in it, we note that the average velocity in the ray does increase with distance as anticipated above. To reduce the Nagasaki residual to zero we must have an average velocity of

$$(903 - 6)/123 \text{sec.} = 7.8 \text{km./sec.}$$

instead of 6.5 km./sec.—not an excessive change.

It would be undesirable to pursue this elementary method further ; its chief importance is to illustrate two facts

(1) That there is no serious difficulty in supposing a moderate focal depth, say 100 km. ; though this elementary investigation does not encourage us to go beyond this.

(2) That the concomitant corrections to Imamura's epicentre are to the East ($x_0 = +17$ km.) and South ($y_0 = -23$ km.), whereas the epicentre to which the seismograph observations direct us is to the West and North. The signs of x and y in the solutions from seismograms

$$x = +0^{\circ}.5 \quad y = -0^{\circ}.3$$

agree with those of x_0 and y_0 , but are to be interpreted in the reverse directions. We have again a case where the macroseismic information seems to be inconsistent with the microseismic. For the present we can only call attention to the discrepancy.

The list of aftershocks is a long one and should afford a good test of the hypothesis that there is a periodicity near 21min. in recurrence. A few weeks before the study of these earthquakes presented itself in regular routine, some time had been spent in re-examining the Helwan series of 1919 September (I.S.S. 1919 p. 86), when it was found that a period near 20.80 min. gave good results. [Previous work had suggested a period close to 21.0 min ; but with scattered results such as earthquakes there is always the chance of mistaking the exact period]. Hence trial was made of 20.8 on the Japanese series as well as of the old value 21.0 min. In the first instance these trials were made, not on the series of minor aftershocks on September 1, but on the series of major repetitions given below. The first column O_1 gives the date in September ; the next N, the number of multiples of 20.8m. which give the calculated C_1 (minutes and tenths only ; days and hours as in the first column) in the next column ; the differences $O_1 - C_1$ were found to have a maximum at -8.5 m., as below : adding therefore $+8.5$ m. we get the next column, which may be called O_2 . With this is compared a column C_2 , which represents a suggested fluctuation in 9.5 units of 20.8min. or about 3 hours.

There is no need to give the individual comparisons with a periodicity of 21.0 min. exactly. But the result of harmonic analysis of them in twelve sub-divisions of 1.75 min. was found to be

First 20	$1.67 + 1.25 \sin \theta - 0.62 \cos \theta = 1.67 + 1.40 \cos (\theta - 116^{\circ})$
Next 17	$1.42 - 0.85 \sin \theta + 0.27 \cos \theta = 1.42 + 0.89 \cos (\theta - 288^{\circ})$
All 37	$3.09 + 0.40 \sin \theta - 0.85 \cos \theta = 3.09 + 0.53 \cos (\theta - 180^{\circ})$

It seems clear that the period 21.0m. does not suit the whole series, though it suits the first 20 very well (Sept. 1, 2, 3). If the

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long series of minor shocks had been included, September 1 would have been given overwhelming weight and the false period might have been supported strongly.

Shocks in September, 1923, near 35°N. 135°E.

d.	h.	O_1 m.	N	C_1 m.	$O_1 - C_1$ m.	+8.5m. m.	C_2 m.	$O_2 - C_2$ m.
1	2	58.5	0	60.0	- 1.5	+7.0	+3.0	+ 4.0
1	5	22.5	7	25.6	- 3.1	+5.4	-1.2	+ 6.6
1	7	38.0	13	30.4	+ 7.6	-4.7	-1.3	- 3.4
2	0	59.9	63	50.4	+ 9.5	-2.8	-2.7	- 0.1
2	2	46.7	69	55.2	- 8.5	0.0	+2.2	- 2.2
2	4	48.0	74	39.2	+ 8.8	-3.5	0.0	- 3.5
2	5	10.2	75	0.0	+10.2	-2.1	+1.7	- 3.8
2	6	32.5	79	23.2	+ 9.3	-3.0	-0.2	- 2.8
2	9	26.9	88	30.4	- 3.5	+5.0	+2.2	+ 2.8
2	9	48.8	89	51.2	- 2.4	+6.1	+0.8	+ 5.3
2	13	9.2	99	19.2	-10.0	-1.5	-0.2	- 1.3
2	14	16.5	102	21.6	- 5.1	+3.4	-2.7	+ 6.1
3	0	9.3	130	4.0	+ 5.3	-7.0	-2.8	- 4.2
3	0	40.3	132	45.8	- 5.5	+3.0	-1.5	+ 4.5
3	1	47.2	135	48.0	- 0.8	+7.7	+2.5	+ 5.2
3	5	21.6	145	16.0	+ 5.6	-6.7	+2.2	- 8.9
3	6	2.0	147	57.6	+ 4.4	-7.9	-1.3	- 6.6
3	8	13.7	154	23.2	- 9.5	-1.0	+3.0	- 4.0
3	9	23.9	157	25.6	- 1.7	+6.8	-0.2	+ 7.0
3	14	30.5	172	37.6	- 7.1	+1.4	+1.7	- 1.3
4	4	0.5	211	8.8	- 8.3	+0.2	+3.0	- 2.8
4	5	57.5	216	52.8	+ 4.7	-7.6	-3.0	- 4.6
4	10	10.6	228	2.4	+ 8.2	-4.1	0.0	- 4.1
4	15	24.7	243	14.4	+10.3	-2.0	-1.3	- 0.7
4	18	15.6	252	21.6	- 6.0	+2.5	+1.3	+ 1.2
4	22	22.8	264	31.2	- 8.4	+0.1	-2.5	+ 2.6
5	9	34.6	296	36.8	- 2.2	+6.3	+0.6	+ 5.7
5	11	12.6	301	20.8	- 8.2	+0.3	-1.3	+ 1.6
5	18	29.7	322	37.6	- 7.9	+0.6	-2.5	+ 3.1
5	18	46.1	322	37.6	+ 8.5	-3.8	-2.8	- 1.0
7	14	30.3	449	39.2	- 8.9	-0.4	-1.2	+ 0.8
7	15	16.8	451	20.8	- 4.0	+4.5	+2.2	+ 2.3
7	17	32.5	457	25.6	+ 6.9	-5.4	-1.5	- 3.9
7	23	39.5	475	40.0	- 0.5	+8.0	-2.5	+10.5
8	9	8.7	502	1.6	+ 7.1	-5.2	-1.9	- 3.3
9	17	11.0	595	16.0	- 5.0	+3.5	+3.0	+ 0.5
17	1	2.2	1102	1.6	+ 0.6	+9.1	+3.0	+ 6.1

When the series is computed with period 20.800 min as above the corresponding reductions are

- First 20 $1.67 + 0.23 \sin \theta + 0.68 \cos \theta = 1.67 + 0.72 \cos (\theta - 19^\circ)$
- Next 17 $1.42 + 0.22 \sin \theta + 0.75 \cos \theta = 1.42 + 0.78 \cos (\theta - 16^\circ)$
- All 37 $3.09 + 0.45 \sin \theta + 1.43 \cos \theta = 3.09 + 1.50 \cos (\theta - 18^\circ)$

Hence the period suits the whole series. [It may be recalled that it was not selected from *this* series but from study of the quite independent Helwan series.]

The computed value of the 12 terms thus varies from 4.59 to 1.59, a ratio of nearly 3 to 1. The actual numbers are

8 6 2 4 3 4 1 0 2 3 4 5

so that we can pick out four quarters with totals 8, 12, 11, 11.

Hence the most notable feature is a deficiency rather than an excess; and it is curious that the greatest shock (Sept. 1d. 2h.) has a residual so far from the maximum. The arbitrary zero in column C_1 was naturally taken near the time of this greatest shock; but the maximum value is found to be $-8.5m$. When this is adopted as a new zero in the fifth column the residual for the main shock appears as $+7.0$ min. Hence some secondary periodicity was suspected, and a period of about $9.5 \times 20.8m$. was found, as shown in column C_2 (amplitude $3.0m$). We then get the following corresponding figures:—

First 20 $1.67 + 0.32 \sin \theta - 0.67 \cos \theta = 1.67 + 0.74 \cos (\theta - 156^\circ)$
 Next 17 $1.42 + 0.37 \sin \theta - 1.38 \cos \theta = 1.42 + 1.43 \cos (\theta - 165^\circ)$
 All 37 $3.09 + 0.69 \sin \theta - 2.05 \cos \theta = 3.09 + 2.16 \cos (\theta - 161^\circ)$

The coefficient is nearly doubled in the second group, though the first is not much altered. The range in the whole set is now from 5.25 to 0.93 or nearly 6 to 1 . The twelve totals are

2 0 1 7 5 5 4 4 2 6 1 0

so that we can make four quarters with totals 2, 13, 13, 9; or we may note that 5 of the 12 have only 4 earthquakes and the remaining 7 have 33. The point deserves further attention.

Turning now to the long series of minor shocks on Sept. 1 given below, the corresponding analyses are

First 32 $2.67 - 0.15 \sin \theta + 0.30 \cos \theta = 2.67 + 0.34 \cos (\theta - 333^\circ)$
 Second 32 $2.67 - 1.32 \sin \theta + 0.45 \cos \theta = 2.67 + 1.40 \cos (\theta - 290^\circ)$
 All 64 $5.33 - 1.47 \sin \theta + 0.75 \cos \theta = 5.33 + 1.65 \cos (\theta - 297^\circ)$

The periodicity is thus not very well marked in the first group, but well marked in the second, except that the phase 297° is very different from the 18° shown by the larger shocks. Indeed since this difference is 81° , the two series would appear to have independent maxima. Possibly the fluctuation above suggested may modify this difference.

Minor Shocks on Sept. 1.

d.	h.	O_1 m.	N	C_1 m.	$O_1 - C_1$ m.	C_2 m.	$O_1 - C_2$ m.
1	3	24.3	1	20.8	+ 3.5	+2.5	+ 1.0
	3	34.1	2	41.6	- 7.5	+1.3	- 8.8
	3	39.5	2	41.6	- 2.1	+1.3	- 3.4
	3	40.5	2	41.6	- 1.1	+1.3	- 2.4
	3	48.2	2	41.6	+ 6.6	+1.3	+ 5.3
	4	11.0	3	2.4	+ 8.6	-0.2	+ 8.8
	4	13.5	4	23.2	- 9.7	-1.9	- 7.8
	4	20.3	4	23.2	- 2.9	-1.9	- 1.0
	4	27.0	4	23.2	+ 3.8	-1.9	+ 5.7
	4	31.0	4	23.2	+ 7.8	-1.9	+ 9.7
	4	45.3	5	44.0	+ 1.3	-3.0	+ 4.3
	4	58.7	6	64.8	- 6.1	-2.7	+ 3.4
	5	12.8	6	4.8	+ 8.0	-2.7	-10.1
	5	22.5	7	25.6	- 3.1	-1.2	- 1.9
	5	41.0	8	46.4	- 5.4	+0.6	- 6.0

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d.	h.	O ₁ m.	N	C ₁ m.	O ₁ -C ₁ m.	C ₂ m.	O ₂ -C ₂ m.
1	5	54.0	8	46.4	+ 7.6	+0.6	+ 7.0
	6	5.1	9	7.2	- 2.1	+2.2	- 4.3
	6	13.8	9	7.2	+ 6.6	+2.2	+ 4.4
	6	19.0	10	28.0	- 9.0	+3.0	+ 8.8
	6	40.0	11	48.8	- 8.8	+2.2	+ 9.8
	6	43.0	11	48.8	- 5.8	+2.2	- 8.0
	6	56.4	11	48.8	+ 7.6	+2.2	+ 5.4
	7	23.7	13	30.4	- 6.7	-1.3	- 5.4
	7	38.0	13	30.4	+ 7.6	-1.3	+ 8.9
	8	1.5	14	51.2	+10.3	-2.5	- 8.0
	8	11.3	15	12.0	- 0.7	-2.8	+ 2.1
	8	32.5	16	32.8	- 0.3	-1.5	+ 1.2
	9	0.0	17	53.6	+ 6.4	0.0	+ 6.4
	9	31.0	19	35.2	- 4.2	+3.0	- 7.2
	11	41.8	25	40.0	+ 1.8	-2.7	+ 4.5
	12	47.0	28	42.4	+ 4.6	+2.2	+ 2.4
	12	58.3	29	63.2	- 4.9	+3.0	- 7.9
	13	3.5	29	3.2	+ 0.3	+3.0	- 2.7
	13	22.4	30	24.0	- 1.8	+2.2	- 4.0
	13	33.7	30	24.0	+ 9.7	+2.2	+ 7.5
	13	39.4	31	44.8	- 5.4	+0.8	- 6.2
	13	52.3	31	44.8	+ 7.5	+0.8	+ 6.7
	14	30.0	33	26.4	+ 3.6	-2.5	+ 6.1
	15	0.5	35	8.0	- 7.5	-1.5	- 6.0
	15	40.5	37	49.6	- 9.1	+1.7	+10.0
	16	12.2	38	10.4	+ 1.8	+3.0	- 1.2
	16	35.8	39	31.2	+ 4.6	+2.5	+ 2.1
	16	52.5	40	52.0	+ 0.5	+1.3	- 0.8
	17	0.0	40	52.0	+ 8.0	+1.3	+ 6.7
	17	2.5	41	12.8	-10.3	-0.2	-10.1
	17	13.5	41	12.8	+ 0.7	-0.2	+ 0.9
	18	0.3	43	54.4	+ 5.9	-3.0	+ 8.9
	18	37.0	45	36.0	+ 1.0	-1.2	+ 2.2
	19	8.7	47	17.6	- 8.9	+2.2	+ 9.7
	19	14.0	47	17.6	- 3.6	+2.2	- 5.8
	20	14.8	50	20.0	- 5.2	+0.8	- 6.0
	21	8.7	52	1.6	+ 7.1	-2.5	+ 9.6
	21	12.0	53	22.4	-10.4	-2.8	- 7.6
	21	48.7	54	43.2	+ 5.5	-1.5	+ 7.0
	21	49.5	54	43.2	+ 6.3	-1.5	+ 7.8
	22	11.0	55	4.0	+ 7.0	0.0	+ 7.0
	22	11.7	55	4.0	+ 7.7	0.0	+ 7.7
	22	29.0	56	24.8	+ 4.2	+1.7	+ 2.5
	22	35.0	56	24.8	+10.2	+1.7	+ 8.5
	22	50.7	57	45.6	+ 5.1	+3.0	+ 2.1
	23	1.3	58	6.4	- 5.1	+2.5	- 7.6
	23	14.0	58	6.4	+ 7.6	+2.5	+ 5.1
	23	36.0	59	27.2	+ 8.8	+1.3	+ 7.5
	23	47.0	60	48.0	- 1.0	-0.2	- 0.8

The correction +8.5m. has not been applied since the maximum found is now so different; but the computed C₂ is shown, and the residuals O₂-C₂ now give results as follows:—

First 32 $2.67 - 0.52 \sin \theta + 0.62 \cos \theta = 2.67 + 0.81 \cos (\theta - 320^\circ)$

Second 32 $2.67 - 1.02 \sin \theta + 0.60 \cos \theta = 2.67 + 1.20 \cos (\theta - 301^\circ)$

All 64 $5.33 - 1.54 \sin \theta + 1.22 \cos \theta = 5.33 + 1.96 \cos (\theta - 309^\circ)$

The first half has a larger coefficient than before, the second a rather smaller; for the whole 64 the coefficient is distinctly larger.

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But the phase shows no better agreement with that for the larger shocks than before.

The individual groups are now

Without C_2	7	2	5	5	5	4	5	2	7	6	12	4
After C_2	3	7	6	2	4	4	3	7	4	7	8	9

Had the +8.5m. been applied as for the larger shocks these series would have begun at the dividing line. We can thus rewrite the final arrangement

7 4 7 8 9 3 7 6 2 4 4 3

for comparison with the totals for the larger shocks

2 0 1 7 5 5 4 4 2 6 1 0

The small numbers of the minor shocks come in the last four groups—distinctly earlier than for the large shocks. For a combined total we may fairly give the lower set double weight and obtain

11 4 9 22 19 13 15 14 6 16 6 3

the analysis of which gives $11.5 + 5.5 \cos(\theta - 143^\circ)$. Without the 9.5 year term the numbers would be

2 11 12 20 14 13 14 9 13 11 12 7

giving an analysis $11.5 + 3.6 \cos(\theta - 141^\circ)$.

To summarise the above discussion :—

(1) The observations of the series of earthquakes near Tokyo have been compared in the text with the *adopted* position

$35^\circ 0'N. 139^\circ 5'E.$ (as on 1922 April 26)

not far from Imamura's adopted position

$34^\circ 58'6''N. 139^\circ 21'8''E.$

without any intention to regard this position as final or best.

(2) Discussion of the residuals suggests moving the epicentre further *North* (say $0^\circ.3$ or $0^\circ.4$) and *West* (say 1° in longitude) to $35^\circ.3'E. 138^\circ.5'E.$ Further, that the severe shock on Sept. 2d. 2h., and those which followed it, were at a focal depth +.010 rad. (about 40 miles) below normal, while those on Sept. 1d. were at normal depth.

(3) Discussion of the times observed at the numerous Japanese observatories, collected by Prof. Imamura suggests further *East* (say 17km. or $0^\circ.15$) and *South* (say 23km. or $0^\circ.25$) in both cases in the opposite direction to that found above. It would be difficult to justify a depth greater than 100km. by an elementary analysis.

(4) The long series of aftershocks is found to be inconsistent with a periodicity near 21.0min., but is consistent with a periodicity of 20.8 min. which had been already inferred from the Helwan series on 1919 September. The zero point seems further to oscillate in a period of 9.5×20.8 min.

When allowance is made for this oscillation the number may be expressed as

$$11.5 + 5.5 \cos (\theta - 143^\circ)$$

where θ is an angle going through its period in 20.8 min. When no allowance is made the corresponding expression is

$$11.5 + 3.6 \cos (\theta - 141^\circ)$$

The literature relating to these disasters is considerable, but a few extracts may be given here from a letter written by Professor Imamura from the Seismological Institute at Tokyo on March 28, 1924, in reply to an expression of sympathy both on the great disaster and also on the death of Professor Omori.

“Unfortunately for the late Professor he was just attending the Pan-Pacific Scientific Conference in Australia, and at the very moment of the recent great shock he was watching the seismographs of Dr. Pigot near Sydney. He had felt some brain trouble after leaving Japan; his health became rapidly worse on the homeward journey, and he came back fatally ill. He was in bed for more than a month at the University Hospital near his Institute, and never saw the scene of ruin in Tokyo and Yokohama up to his last moment.

“My own fortune was very different. I was actually in our Institute at the time of the great shock, and within 30 minutes was able to give to two dozen newspaper editors brief information about the time of the occurrence, position of the epicentre, and other details which I find now not to be seriously in error. Soon after the first shock fire broke out in two places in the University, and after an hour and a half the heat in our Institute was overwhelming. The tiles of the roof had been shaken off by the shock, and the wooden shingles began to smoke and three times burst into flame. There followed a desperate fight against the fire without water or outside help; we carried out the more important things into safe places. It was 10 o'clock in the night when I found our Institute quite safe, and then we had meal and water for the first time since the shock. All the seismographs were wrecked except the E.W. Component of my own design.”

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The following paragraphs are from *The Times* (Annual Financial and Commercial Summary for 1923):—

“The destruction and loss of life were appalling. Government buildings suffered severely; the Home Department, the Ministry of Finance, the Ministries of Education, of Agriculture and Commerce, and of Railways, the Metropolitan Police Bureau, the Printing Bureau, the Monopoly Bureau, the Patent Bureau, all were destroyed by fire. The head offices of the principal banks were similarly affected, with the exception of the Bank of Japan, the Industrial Bank of Japan, the Hypothec Bank of Japan, and the Mitsubishi Bank. The Tokyo Stock Exchange building was also burnt down. In Yokohama the damage was even more serious. Practically all the buildings were demolished by the earthquake and the subsequent fire.

“Fortunately the damaged zones did not include the principal districts which produce goods for export, nor did the earthquake greatly affect the centres concerned in the export of the main products of the country. In these circumstances the position was not as bad as was at first feared, and Japan, with her usual resourcefulness, her skill, and the energy of her nationals, tackled and continues to tackle the problems arising in a manner deserving of the admiration of the world.”

The Earthquake of 1923 Sept. 30d. 1h. 20m. 35s., in 54° 5N. 33° 0W.

This earthquake was felt by two vessels which happened to be in the neighbourhood of the epicentre, the *Manchester Brigade* and the *Lady Brenda*. Their reports have been taken from the Bull. Volcan. above quoted (1925 Nos. 3 and 4).

The report of the *Manchester Brigade* is as follows:—

“On Sept. 30d. at 1.20 G.M.T. the vessel began to vibrate heavily from stern to stem for about 20 sec. Thinking we had struck some submerged wreckage I was just on the point of stopping when the vessel began to vibrate again, more heavily than the first shock. This lasted for about 30 sec.; then I put it down to earth vibrations or earthquake shock.

“While working out position to send out by wireless we got a message from the steamship *Lady Brenda*: ‘Fear struck submerged wreckage.’ Sent out my message, ‘1.29 G.M.T. 52°42’N. 85°5’W., felt two severe shocks, causing ship to vibrate heavily, think must be earthquake shock. Stott.’

“Received another message from steamship *Lady Brenda*: ‘1.20 G.M.T., lat. 52°10’N., long. 83°30’W., felt two distinct shocks, making vessel vibrate heavily for periods of 30 and 10 sec. respectively, which resembled contact with submerged wreckage, but

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must have been earthquake shock, as ships in vicinity also report similar experience. At 2.07 G.M.T. had another shock, causing ship to vibrate heavily, but only for a few seconds. Again at 11.18 a.m. G.M.T., Sept. 30 had another shock, causing ship to vibrate for about 10 sec., position then being 53°28'N. 31°53'W.'

"The distance between the ships when first shocks were felt was about 70 miles. A little to the north of our position at 1.20 G.M.T. are three peaks, with 630, 730, and 833 fathoms of water over them. One of these may have been in eruption. The depth of sounding around the peaks are from 1,300 to 2,200 fathoms. See chart 2,060A North Atlantic Ocean, Eastern portion."

The report from Capt. W. Young, of the s.s. *Brenda*, gives the G.M.T. as Sept. 29d. 13h. 20m., which has been altered into the time from midnight [1h. 20m.].

"At 1h. 20m. Greenwich time in lat. 52°10'N., long. 33°30'W., I experienced two severe quakes, one of 30 seconds duration and another of 10 sec., with an interval between of 30 sec.

"These shocks were of such a nature that they shook the vessel violently, causing everybody who was asleep at the time to rush on deck immediately. My first impression was that we had struck some submerged wreckage, and I sent out a wireless signal as follows, 'Fear that we have struck submerged wreckage, lat. . . . long. . . .'

"The steamer *Manchester Brigade*, which was in the vicinity at the time, also experienced similar shocks, and on receipt of my signal was in a position to understand what was happening. He reported later that the shocks had been very severe, and caused his vessel to vibrate heavily.

"The prevailing weather conditions at the time of the shocks were as follows:—

Wind S.W. force 3
Sea slight with moderate N.E. swell
Barometer 1022.7 mbs (30, 20ins.) rising
Thermometer 55°
Sea 52°

"During the shocks there was no apparent disturbance of the sea or in the conditions generally."

The present number of the Summary deals with 174 epicentres, 67 of which are new and 107 repetitions from old epicentres, of which 37 are credited to the epicentre adopted for the great Japanese disasters of September 1 and 2. But in addition

to these last for which details are given fully, there were 64 minor repetitions on September 1, presumably from that epicentre. The three months represent therefore unusual seismic agitation, for even if we omit the whole 37+64 Japanese earthquakes there remain 67 new and 70 old epicentres, the corresponding averages for the five years 1918-1922 being 30 and 47. The extra work involved has led to a little delay in completion of this number.

As regards abnormal focus, beyond the four cases in September suggested for the Japanese epicentre, there is only one other on August 8d. $10^{\circ}6N$. $65^{\circ}6W$., focal depth +0.025 (below normal).

There are special notes for July 4d. 8h. (possible earlier shock).

Observations are now so numerous that good determinations of T_0 , with its probable error are becoming common. Thus on July 18d. we have two shocks which furnish the following residuals (in seconds) for T_0 :—

I. +19, +16, +12, +9, +8, +5, +2, +1, 0, 0, 0,
-1, -2, -1, -3, -3, -3, -8, -14, -20

II. +17, +10, +9, +8, +7, +6, +5, +5, +3, +1,
0, 0, -1, -3, -9, -9, -9, -11, -13

The probable error of a single determination is thus about $\pm 6s$. (between +6s. and -6s. there are 21 residuals out of 39), and for a set of about 20, as here, cannot much exceed 1 sec. On July 13d. however the scattering is larger, the residuals being

+47, +33, +17, +12, +12, +12, +11, +10, +6, +4,
+4, +4, +3, 0, -1, -1, -2, -3, -3, -7, -7, -8,
-8, -10, -11, -15, -17, -23, -23, -25, -28

The probable error of one determination is here about 9 sec., and of the series of 30 about 1.6 sec.

At the end of the introductory note to the last summary attention was called to a series of shocks from the epicentre $36^{\circ}0N$. $142^{\circ}0E$., for which the periodicity 20.882 min. was suggested. On trying the period 20.800 min. above considered, it is found to show a sensible coefficient, though not so large as that for 20.882 min. The whole matter is under further investigation.

H. H. TURNER.

University Observatory, Oxford.
1926 December 19.

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1923 JULY, AUGUST, & SEPTEMBER.

July 1d. 7h. 54m. 55s. Epicentre 22°-0N. 100°-5E.

A = -169, B = +912, C = +375; D = +983, E = +182;
G = -068, H = +368, K = -927.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Calcutta	E.	11.3	275	4 57	?S	(4 57)	- 5	—	—
Taihoku		19.5	77	—	—	e 8 9	- 4	—	—
Zi-ka-wei		20.8	59	e 8 27	?S	(e 8 27)	-13	(e 10.4)	11.4
Manila		20.8	107	—	—	(8 45?)	+ 5	—	—
Simla	E.	22.7	299	—	—	e 9 23	+ 4	14.4	—
	N.	22.7	299	—	—	e 9 41	+22	13.1	—
Kodaikanal		25.0	246	9 47	?S	(9 47)	-16	—	—
Colombo		25.0	236	10 41	?S	(10 41)	+38	16.3	17.4
Bombay		26.1	268	10 47	?S	(10 47)	+23	16.0	16.6
Batavia		28.9	167	e 6 14	- 3	—	—	i 16.9	—
Osaka		33.1	62	17 56	?L	—	—	19.2	20.0
Pulkovo		61.2	330	i 10 19	- 1	18 34	- 4	31.1	37.8
Upsala	N.	67.6	329	—	—	—	—	e 32.1	—
Vienna	Z.	70.0	316	11 16	- 1	—	—	—	—
Zagreb		70.7	313	e 11 21	0	—	—	e 34.5	—
Hamburg		72.8	322	—	—	—	—	e 36.1	—
Rocca di Papa	E.	74.0	309	e 11 41	- 1	e 19 17	-117	e 43.1	52.1
	N.	74.0	309	i 11 45	+ 3	e 21 53	+39	—	—
De Bilt	E.Z.	76.0	321	11 55	0	21 37	0	e 41.1	48.1
	N.	76.0	321	—	—	—	—	e 38.1	42.4
Moncalieri		76.5	313	e 13 45	+107	—	—	41.3	—
Uccle		76.8	320	—	—	e 21 47	0	e 39.1	42.5
Paris		78.6	318	—	—	—	—	e 45.1	—
Victoria	E.	99.4	28	—	—	—	—	e 49.5	57.7
Ottawa		112.5	357	—	—	—	—	e 54.1	—
Toronto	E.	114.3	0	—	—	—	—	e 59.3	—

Additional readings and notes: Calcutta PN = +4m.55s. Zi-ka-wei MN = +11.3m. S is given as P and L as S. Bombay S = +14m.13s. Osaka MN = +20.2m. Pulkovo MN = +34.9m. Victoria LN = +49.2m. Ottawa L = +60.1m. Toronto e = 7h.49m.3s. and 7h.50m.32s., LN = +68.3m.

July 1d. Readings also at 4h. (La Paz), 7h. (Nagoya and near Mizusawa), 9h. (Wellington), 12h. (Bergen, La Plata, and near La Paz), 16h. (near Tortosa), 17h. (Nagasaki).

July 2d. 2h. 31m. 55s. Epicentre 25°-0N. 121°-5E. (as on 1923 April 5d.).

A = -472, B = +773, C = +423; D = +853, E = +522;
G = -221, H = +360, K = -906.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Taihoku		0.1	22	0 39	+37	—	—	1.2	2.4
Hokoto		2.6	231	0 15	-26	—	—	e 0.9	—
Zi-ka-wei		6.2	359	1 40	+ 5	e 3 40	?L	(e 3.7)	6.3
Manila		10.4	183	e 2 0	-36	—	—	—	—
Nagasaki		10.7	42	e 2 42	+ 2	—	—	e 6.0	—
Kobe		15.3	48	3 48	+ 5	7 18	+39	9.8	14.0
Osaka		15.5	48	4 10	+24	7 36	+52	11.3	14.2
Nagoya		16.8	49	3 56	- 6	—	—	—	—
Mizusawa	E.	21.8	45	4 56	- 7	8 58	- 3	12.7	—
Calcutta	E.	30.3	273	11 59	?S	(11 59)	+20	—	—
Batavia		34.3	207	16 33	-34	—	—	21.7	—
Malabar		35.0	205	16 42	-31	—	—	—	—
Simla		39.2	290	9 35	+107	(14 5)	+11	25.4	—
Colombo		43.6	254	11 35	?PR,	—	—	27.3	30.1
Kodaikanal		44.2	260	18 5	?SR,	—	—	26.3	31.7
Bombay		45.2	273	15 21	?S	(15 21)	+ 3	20.1	29.6
Ekaterinburg		53.4	324	(10 45)	+76	10 45	?P	20.1	—
Riverview		65.4	153	—	—	e 19 23	- 7	e 29.2	31.2
Pulkovo		69.1	328	i 11 20	+ 8	e 20 22	+ 7	35.1	38.7
Honolulu	E.	72.9	75	9 58	-97	1 20 43	-18	33.6	35.9
Upsala	E.	75.1	330	e 12 6	+16	e 21 46	+19	e 37.1	43.1
	N.	75.1	330	—	—	—	—	e 35.1	43.2

Continued on next page.

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Belgrade	79.9	315	e 22 38	?S	(e 22 38)	+16	e 47.4	—
Vienna	80.8	320	12 25	+1	22 46	+13	e 42.1	57.1
Hamburg	81.8	327	e 12 30	+1	e 23 2	+18	e 42.1	47.1
Zagreb	82.2	318	e 12 33	+2	e 22 52	+4	40.1	55.1
Innsbruck	84.2	321	—	—	—	—	e 44.1	—
De Bilt	E. 85.0	327	—	—	23 12	-7	e 40.1	50.9
N.	85.0	327	—	—	23 13	-6	—	48.5
Z.	85.0	327	12 45	-3	—	—	—	56.0
Strasbourg	85.6	323	12 50	-1	e 23 37	+11	e 46.1	51.1
Uccle	86.1	326	e 12 53	-1	e 23 18	-13	e 39.1	47.2
Rocca di Papa	86.3	315	e 12 50	-5	23 17	-16	e 49.0	61.6
Edinburgh	86.4	333	e 13 0	+5	23 17	-17	42.1	49.6
Victoria	E. 86.6	37	12 56	-1	23 21	-16	43.9	56.0
N.	86.6	37	13 6	+9	23 45	+8	47.8	65.2
Besançon	87.4	323	—	—	—	—	—	59.1
Stonyhurst	87.5	330	e 23 35	?S	(e 23 35)	-12	—	53.1
Moncalieri	87.6	320	e 13 3	0	23 44	-4	45.6	58.2
Kew	88.0	329	48 5	?L	—	—	(48.1)	57.1
Paris	88.3	325	e 13 4	-3	e 23 32	-23	42.1	59.1
Barcelona	92.9	320	e 17 5	?PR ₁	—	—	e 36.1	—
Tortosa	E. 94.3	321	—	—	24 56	-3	—	59.3
N.	94.3	321	17 24	?PR ₁	24 6	[+13]	45.5	64.1
Algiers	95.2	316	—	—	e 24 8	[+10]	52.1	58.1
Toledo	97.6	322	e 15 24	+86	e 25 32	0	e 49.1	66.3
Granada	99.1	319	e 15 17	+71	i 25 18	-29	e 55.1	63.1
Coimbra	99.8	325	e 15 11	+61	e 18 5	?PR ₁	46.1	56.6
Rio Tinto	100.5	321	47 35	?L	—	—	(47.6)	66.1
San Fernando	101.1	320	e 18 41	?PR ₁	e 32 5	?SR ₁	54.1	61.1
Ottawa	107.9	13	e 25 12	?[S]	(e 25 12)	[+11]	e 49.6	—
Chicago	108.0	22	e 19 7	?PR ₁	—	—	e 53.4	—
Toronto	E. 108.7	15	(19 5)	?PR ₁	—	—	e 58.1	—
N.	108.7	15	(e 19 17)	?PR ₁	—	—	e 58.7	—
Ann Arbor	108.8	20	—	—	—	—	e 55.1	—
Rio de Janeiro	165.7	275	e 26 35	?PR ₁	—	—	80.6	—

Additional readings and notes: Zi-ka-wei gives also MN = +5.9m. Kobe MN = +15.0m. Osaka MN = +12.6m. Mizusawa SN = +8m.59s. Calcutta PN = +12m.21s. Simla LN = +22.9m. Bombay S = +18m.21s. Riverview MN = +34.4m. Pulkovo PR₂ = +15m.41s., IS = +20m.36s., SR₁ = +26m.5s., SR₂ = +29m.5s. Belgrade eS = +36m.40s., L = +50.3m. Readings given for 1d. Vienna PS = +23m.41s. Hamburg MN = +46.2m., MZ = +55.2m. Zagreb ePR₁E = +15m.50s., MNW = +56.2m. De Bilt PR₂Z = +16m.17s. Strasbourg eP = +13m.5s., MN = +49.9m. Uccle PR₂ = +16m.5s., SR₁ = +29m.5s., MN = +48.9m. Rocca di Papa ePN = +13m.17s., S = +23m.41s. Paris MN = +50.1m. Toledo MNW = +63.2m. Granada i = +17m.53s., e = +27m.47s., MN = +73.1m. Coimbra LN = +48.1m. San Fernando MN = +64.1m. Ottawa eS = +34m.29s., L = +58.1m. Chicago L = +62.1m. Toronto gives all its phases as L.

July 2d. Readings also at 3h. (Taihoku), 4h. (Florence), 6h. (Nagoya), 11h. (La Plata and La Paz), 13h. (Manila, Zi-ka-wei, La Paz, and Taihoku), 15h. (Ekaterinburg, Taihoku, Manila, Zi-ka-wei, and De Bilt), 16h. (Ekaterinburg, Zi-ka-wei, De Bilt, Pulkovo, Ottawa, and Toronto), 17h. (Ekaterinburg), 18h. (Ekaterinburg, La Paz, Nagasaki, and near Mizusawa), 19h. (Nagoya and near Osaka and Kobe), 23h. (Eskdalemuir).

July 3d. 6h. 25m. 45s. Epicentre 37°-0N. 20°-5E. (as on 1923 Jan. 21d.).

A = +.748, B = +.280, C = +.602; D = +.350, E = -.937;
G = +.564, H = +.211, K = -.799.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	2.8	69	e 0 46	+2	1 17	0	1.4	2.1
Pompeii	5.9	311	e 3 25	?L	—	—	(e 3.4)	—
Rocca di Papa	7.6	311	i 2 51	+56	e 2 59	-27	e 4.6	5.2
Belgrade	7.8	0	e 2 3	+5	e 2 52	-39	—	4.8
Moncalieri	12.4	314	—	—	e 5 24	-5	7.6	—
Uccle	18.0	325	—	—	—	—	e 10.2	—
De Bilt	18.5	330	—	—	e 7 43	-8	e 10.2	—

Additional readings and notes: Zante ($\Delta = 1^{\circ}.6$) gives simply 6h.20m. Athens gives also iP = +52s., MN = +1.5m. Rocca di Papa MN = +5.0m.

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July 3d. Readings also at 1h. (Batavia), 15h. (Lick), 18h. (La Paz, Ottawa, and Apia), 19h. (La Plata).

July 4d. 5h. 29m. 28s. (I) } Epicentre 1°-8N. 82°-3W.
8h. 15m. 12s. (II) }

A = +.134, B = -.991, C = +.031; D = -.991, E = -.134;
G = +.004, H = -.031, K = -1.000.

It seems possible that some of the observations entered for II refer to a separate shock. See note at end.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
I La Paz	23.0	143	5 16	- 1	i 9 23	- 2	13.1	20.8
II Georgetown N.	23.0	143	5 18	+ 1	9 23	- 2	13.5	17.8
II Pillar	37.5	7	e 5 48	-106	—	—	—	—
II Chicago	37.8	153	12 12	?S	(12 12)	-83	25.1	31.2
II Chicago	40.3	355	(7 57)	0	7 57	?P	e 26.5	—
II Toronto	40.3	355	6 9	-108	—	-60	e 21.8	—
II Toronto	E. 42.0	4	—	—	e 14 32	- 3	17.6	—
I Toronto	N. 42.0	4	8 13	+ 2	i 14 39	+ 4	22.7	—
II Toronto	E. 42.0	4	—	—	e 14 11	-24	e 23.8	—
II Toronto	N. 42.0	4	—	—	e 14 8	-27	e 29.0	—
II Cipolletti	42.8	164	6 12	-125	—	—	13.6	16.5
II Ottawa	44.0	8	—	—	e 15 2	0	—	—
II Ottawa	44.0	8	e 7 5	-81	i 14 51	-11	e 24.3	—
II Rio de Janeiro N.	45.4	126	e 14 40	?S	(e 14 40)	-40	23.2	28.2
II Rio de Janeiro	45.4	126	—	—	e 27 41	?L	32.0	—
I Victoria	E. 58.4	330	10 50	+49	—	—	—	18.9
I Victoria	N. 58.4	330	10 39	+38	(18 40)	+36	18.7	19.2
II Victoria	E. 58.4	330	10 29	+28	14 55	?PR ₁	21.6	28.1
II Victoria	N. 58.4	330	10 26	+25	14 48	?PR ₁	21.6	27.7
II Honolulu	E. 76.1	292	21 52	?S	(21 52)	+14	28.7	34.8
II Honolulu	N. 76.1	292	21 49	?S	(21 49)	+11	29.1	31.6
II Paris	85.3	41	—	—	—	—	e 48.8	—
I Uccle	86.6	40	—	—	(e 23 32)	- 5	e 23.5	—
II Uccle	86.6	40	—	—	—	—	e 47.8	—
II De Bilt	87.0	39	e 13 0	+ 1	e 23 43	+ 2	e 45.5	—
II De Bilt	87.0	39	—	—	—	—	e 42.8	54.3
II Strasbourg	88.7	42	—	—	—	—	e 49.8	—
I Hamburg	89.9	36	—	—	e 23 32	-41	—	—
II Ekaterinburg	114.2	21	—	—	—	—	57.8	71.3
II Zi-ka-wel	140.0	328	e 25 22	?PR ₁	—	—	—	59.3

Additional readings: Chicago I gives also e = +1m.55s. Ottawa I e f = +13m.2s., II L = +29.8m. Rio de Janeiro I S = +13m.40s. Honolulu II SN = +26m.41s. De Bilt I eLN = +41.5m., II eLE = +47.8m.

It seems possible that II was preceded by a separate shock some 2min. 34sec. earlier, as indicated by the P and S for Chicago and Ottawa. The following observations would accord with this view (La Paz being inserted for comparison):—

July 4d. 8h. 12m. 38s. Epicentre 2°-6S. 105°-8W.

A = -.272, B = -.961, C = -.045; D = -.962, E = +.272;
G = +.012, H = +.044, K = -.999.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
La Paz	39.5	112	7 50	- 1	11 57	-122	—	—
Chicago	47.3	20	8 43	- 6	15 45	0	e 24.4	—
Georgetown	49.2	30	e 8 22	-39	—	—	—	—
Cipolletti	50.0	141	8 46	-21	(16 10)	- 9	16.2	19.1
Toronto	E. 51.9	24	—	—	18 45	+ 2	e 26.4	—
Toronto	N. 51.9	24	—	—	i 16 42	- 1	31.6	—
Ottawa	54.9	25	e 9 39	+ 1	i 17 25	+ 5	e 26.8	—

But there are two serious objections to this hypothesis. The first is that this presumed earlier shock was not certainly recorded at La Paz, only 38°-6 away; the two La Paz readings are inserted for comparison. We should expect at least an earlier P (which may have been overlooked, or the epicentre may be correspondingly in error); the S may more easily have been overlooked. The second is that the epicentre indicated is in a quite unfamiliar neighbourhood.

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July 4d. 16h. 3m. 40s. Epicentre 43°·0N. 44°·0E. (as on 1922 Mar. 2d.).

A = +·526, B = +·508, C = +·682; D = +·695, E = -·719;
G = +·491, H = +·474, K = -·731.

	Δ	Az.	P.	O-C.	S.	O-C.	L.
	°	°	m. s.	s.	m. s.	s.	m.
Tiflis	1·4	156	e 0 19	- 2	0 41	+ 2	—
Ekaterinburg	17·4	32	i 4 10	0	7 30	+ 3	11·3
Pulkovo	18·7	338	i 4 20	- 5	10 12	?L	13·3
Upsala N.	23·2	326	—	—	—	—	e 12·8
Hamburg	24·7	307	—	—	—	—	e 11·3
De Bilt	27·4	303	—	—	—	—	e 15·3

No additional readings.

July 4d. 16h. 49m. 35s. Epicentre 13°·0S. 66°·0W. (as on 1921 Oct. 20d.).

A = +·387, B = -·869, C = -·309; D = -·914, E = -·407;
G = -·126, H = +·282, K = -·951.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
La Paz	2·5	306	i 1 32	+53	i 2 9	+60	2·3	2·5
La Quiaca	4·2	176	1 7	+ 2	—	—	1·6	1·8
	4·2	176	1 37	+32	—	—	2·5	3·0
Pilar	13·8	172	3 19	- 4	—	—	7·4	8·5
Mendoza	15·0	187	6 1	?S	(6 1)	-31	7·6	8·0
Cipolletti	21·0	184	8 49	?S	(8 49)	+ 5	11·7	12·4
Rio de Janeiro	21·9	107	e 5 17	+13	9 25	+22	15·2	16·0
Toronto	62·8	350	—	—	i 19 17	+19	—	—
Victoria	83·7	327	—	—	(23 5)	- 1	23·1	23·1
	83·7	327	—	—	(23 9)	+ 3	23·2	24·1
Uccle	92·1	37	—	—	e 24 0	[+19]	—	—
De Bilt	93·2	36	—	—	e 24·6	[+19]	—	—
Hamburg	96·4	36	—	—	e 22 25	[-100]	—	—
Pulkovo	108·6	30	19 24	?PR ₁	25 14	[+10]	28·7	—
Ekaterinburg	124·7	30	e 19 12	[+ 7]	i 21 24	?PR ₁	65·4	—

Additional readings and notes: La Paz is apparently 1min. in error. Cipolletti readings have been increased by 10min. Toronto gives also iE = +20m.14s., iN = +20m.16s. Pulkovo S appears to be ScPcS. Ekaterinburg i = +22m.29s.

July 4d. 22h. 54m. 55s. Epicentre 28°·0S. 163°·5W.

A = -·846, B = -·251, C = -·469; D = -·284, E = +·959;
G = +·450, H = +·133, K = -·883.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Apia	16·1	330	—	—	—	—	e 8·1	—
Wellington	22·2	227	1 5 5	- 2	1 9 5	- 4	—	10·1
Riverview	39·0	250	—	—	—	—	e 19·3	21·0
Sydney	39·0	250	—	—	13 53	+ 1	19·4	21·1
Honolulu	49·6	7	—	—	—	—	e 24·4	—
Victoria	84·4	25	—	—	—	—	28·8	—
Toronto	105·0	47	—	—	—	—	56·1	—
Ottawa	108·0	47	—	—	—	—	e 60·1	—
Ekaterinburg	137·7	325	—	—	e 48 20	?	67·1	77·6
Pulkovo	146·9	347	—	—	e 28 11	?	71·1	83·2
De Bilt	154·4	16	e 25 8	?PR ₁	—	—	e 88·1	—
Strasbourg	158·3	16	e 25 5	?PR ₁	—	—	—	—
Rocca di Papa	165·9	12	e 25 41	?PR ₁	—	—	e 86·2	—

Additional readings: Riverview gives also MN = +22·2m. Honolulu eN = +24m.45s. Toronto eLE = +62·6m. Ottawa L = +70·1m. De Bilt eLN = +86·1m. Rocca di Papa eP = +25m.53s., ePE = +26m.35s.

July 4d. Readings also at 2h. (Batavia), 7h. (Barcelona), 9h. (Honolulu), 11h. (Manila, Ekaterinburg, Hong Kong, and Zi-ka-wai), 12h. (De Bilt, Strasbourg, Uccle, and near Athens), 21h. (Algiers).

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July 5d. Readings at 0h. (Strasbourg), 1h. (Taihoku, Manila (2), Zi-ka-wei, Mendoza, Cipolletti, Pilar, and La Paz), 2h. (Rio de Janeiro, Pulkovo, Eskdalemuir, and De Bilt), 5h. (Nagasaki), 6h. (Sydney), 8h. (Apia), 13h. (Nagasaki), 14h. (Apia), 16h. (Toronto, Ottawa, De Bilt, and La Paz), 17h. (Ekaterinburg), 18h. (near Osaka, Kobe, and Nagoya).

July 6d. Readings at 3h. (Nagasaki), 6h. (Ottawa, Ekaterinburg, and Toronto), 8h. (near Athens), 9h. (near Manila), 10h. (near La Paz), 16h. (Rio de Janeiro), 20h. (Zi-ka-wei and Manila), 23h. (Batavia).

July 7d. 6h. 9m. 54s. Epicentre 52°·0N. 142°·5W.

A = -·488, B = -·375, C = +·788 ; D = -·609, E = +·793 ;
G = -·625, H = -·480, K = -·616.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Sitka		6·5	36	1 38	- 1	—	—	—	2·3
Victoria	E.	12·7	100	3 11	+ 2	5 36	- 1	7·8	8·9
	N.	12·7	100	3 11	+ 2	5 46	+ 9	7·8	9·3
Chicago		37·9	84	e 9 19	?PR ₁	13 24	-13	e 24·1	—
Ann Arbor		39·9	80	—	—	—	—	e 20·1	—
Toronto		41·8	77	—	—	e 15 40	+68	28·6	—
Ottawa		43·0	71	—	—	e 14 51	+ 3	30·1	—
Georgetown		46·0	80	—	—	e 22 2	?L	e 25·6	—
Washington		46·0	80	—	—	—	—	e 21·4	—
Ekaterinburg		69·5	343	—	—	—	—	68·1	—
De Bilt		72·4	20	—	—	—	—	e 36·1	—
Strasbourg		76·3	20	—	—	—	—	e 43·1	—

Additional readings and notes : Sitka gives also eE = +1m.52s. Chicago readings have been diminished by 5min. Ann Arbor L = +30·1m. Toronto eN = +18m.32s., eE = +18m.47s., iN = +19m.26s., iE = +19m.39s. Ottawa e = +19m.46s.

July 7d. 12h. 46m. 40s. Epicentre 42°·5S. 174°·0E.

A = -·733, B = +·077, C = -·676 ; D = +·105, E = +·995 ;
G = +·672, H = -·071, K = -·737.

Doubtful.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Wellington		1·4	25	i 0 20	- 1	i 0 38	- 1	—	1·3
Riverview		19·8	288	e 4 38	- 1	—	—	e 11·8	14·0
Apia		31·2	28	—	—	e 12 20	+26	—	15·3
Honolulu		68·9	28	12 44	+94	16 2	?PR ₁	17·5	17·8
Zi-ka-wei		88·1	317	e 13 14	+ 8	—	—	—	—
Victoria	E.	106·3	37	—	—	—	—	37·0	48·6
	N.	106·3	37	—	—	—	—	33·8	43·1
Toronto	E.	128·2	61	—	—	—	—	e 51·6	—
Ottawa		131·3	60	—	—	—	—	66·3	—
Ekaterinburg		136·5	313	17 40	?	e 27 43	?	48·3	64·6
Vienna	Z.	163·4	298	17 17	?	—	—	—	—
De Bilt		167·8	326	e 17 13	?	—	—	e 64·3	82·7
Strasbourg		168·7	307	e 16 20	?	—	—	e 73·3	—
Paris		171·4	320	e 17 22	?	—	—	82·3	—

Additional readings and notes : Riverview gives also MN = +12·7m. Apia readings have been increased by 10min. Toronto eN = +51m.47s. Ottawa eL = +53·3m., L = +59·3m. Ekaterinburg readings have been increased by 1h.

July 7d. Readings also at 3h. (Manila, Zi-ka-wei, Taihoku, and Hokoto), 4h. (Edinburgh, De Bilt, and Strasbourg), 5h. (Ekaterinburg), 6h. (Kodakanal and near Mostar), 7h. (Zi-ka-wei, Manila, and near Taihoku), 12h. (Wellington), 14h. (near Mizusawa), 19h. (Colombo, Kodakanal, and Ekaterinburg), 20h. (Zi-ka-wei).

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July 8d. 7h. 2m. 56s. Epicentre 19°·5N. 120°·0E. (as on 1922 June 1d.).

A = -·471, B = +·816, C = +·334; D = +·866, E = +·500;
G = -·167, H = +·289, K = -·943.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	5·0	169	e 1 17	0	(2 13)	- 4	2·2	2·5
Hong Kong	6·1	299	1 39	+ 6	—	—	3·9	4·5
Colombo	40·9	260	14 10	?S	(14 10)	-10	—	26·1
Pulkovo	73·1	330	e 21 4	?S	(e 21 4)	+ 1	36·1	45·8
Upsala	79·2	331	—	—	—	—	e 50·1	—
Hamburg	85·6	327	—	—	—	—	e 52·1	—
De Bilt	88·8	326	—	—	—	—	e 48·1	57·5
Strasbourg	89·2	322	—	—	—	—	e 50·1	57·1
Uccle	89·9	325	—	—	—	—	e 48·1	—
Edinburgh	90·7	332	—	—	—	—	e 47·1	58·1

Additional readings: Manila gives also MN = +2·8m. Pulkovo MN = +44·9m., MZ = +46·8m.

July 8d. 8h. 38m. 30s. Epicentre 40°·0N. 20°·0E. (as on 1922 Dec. 18d.).

A = +·720, B = +·262, C = +·643; D = +·342, E = -·940;
G = +·604, H = +·220, K = -·766.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Sarajevo	4·1	344	e 1 34	+30	e 2 33	+40	(e 2·5)	2·6
Pompeii	4·2	281	e 1 10	+ 5	—	—	—	—
Belgrade	4·8	4	e 1 34	+20	e 3 5	+54	—	—
Rocca di Papa	5·8	291	e 1 24	- 6	(2 48)	+ 9	—	3·3
Zagreb N.E.	6·5	335	e 1 44	+ 5	e 2 51	- 6	—	—
Zagreb N.W.	6·5	335	e 1 38	- 1	e 2 45	-12	—	—
Vienna z.	8·6	344	e 4 44	?L	—	—	(e 4·7)	—
Moncalieri	10·3	303	e 1 23	-71	6 6	?L	(6·1)	—
Strasbourg	12·2	318	—	—	(e 5 30)	+ 6	e 5·5	—
Uccle	15·3	320	—	—	—	—	e 11·6	—
De Bilt z.	15·8	325	—	—	—	—	e 10·5	—

Additional readings: Sarajevo gives also eP = +1m.40s. Rocca di Papa E = +2m.53s., MN = +3·6m. Zagreb ePNW = +1m.59s., ePNE = +2m.4s., eSNW = +2m.9s. De Bilt 1Z = +11m.28s. (?1LZ).

July 8d. Readings also at 1h. (Nagasaki), 3h. (near Osaka), 8h. (Zi-ka-wei and Zagreb), 9h. (Ekaterinburg), 12h. and 17h. (near La Paz).

July 9d. 15h. 31m. 6s. Epicentre 35°·5N. 5°·5W.

A = +·810, B = -·078, C = +·581; D = -·096, E = -·995;
G = +·578, H = -·056, K = -·814.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
San Fernando	1·1	330	0 36	+19	0 56	+25	1·9	5·9
Granada	2·2	42	10 43	+ 9	11 0	0	1·1	1·8
Rio Tinto	2·4	338	-3 6	?	—	—	—	-0·1
Toledo	4·5	15	11 16	+ 6	12 18	+14	12·5	3·0
Coimbra E.	5·2	335	1 40	+20	2 40	+18	3·8	4·1
Coimbra N.	5·2	335	—	—	2 42	+20	4·0	4·5
Algiers	7·0	77	1 33	-13	3 33	+23	4·2	4·4
Tortosa E.	7·1	40	1 46	- 2	3 12	- 1	3·4	5·4
Tortosa N.	7·1	40	1 46	- 2	3 11	- 2	3·5	4·3
Barcelona	8·4	43	—	—	(e 3 43)	- 4	e 3·7	5·1
Marseilles	11·4	44	—	—	—	—	e 6·4	6·9
Puy de Dôme	12·1	36	e 3 11	+11	—	—	e 6·4	7·9
Moncalieri	13·8	43	e 3 21	- 2	—	—	6·8	8·1
Besançon	14·5	33	—	—	7 56	?L	(7·9)	8·9

Continued on next page.

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Paris	14.5	21	—	—	e 5 55	-25	7.9	8.9
Florence	15.3	52	3 46	+ 3	—	—	—	12.4
Rocca di Papa	15.5	61	3 36	-10	—	—	11.4	—
Strasbourg	16.3	33	e 4 9	+13	—	—	8.7	9.4
Oxford	16.5	9	4 10	+11	7 31	+24	—	—
Uccle	16.8	22	e 4 0	-2	e 7 18	+ 5	e 7.9	9.6
Innsbruck	17.2	42	e 4 6	- 1	—	—	e 7.9	—
De Bilt	18.2	21	4 20	+ 1	7 45	+ 1	e 8.9	10.5
Zagreb	19.2	51	e 4 22	- 9	e 7 50	-16	8.9	12.9
Edinburgh	20.4	4	—	—	i 8 42	+10	—	12.3
Vienna	20.5	45	e 4 48	+ 1	e 8 18	-16	e 11.9	12.4
Hamburg	21.1	26	e 4 54	0	e 8 42	- 4	e 11.3	12.7
Upsala	28.6	24	—	—	e 11 54	+44	e 14.9	19.1
Pulkovo	33.4	32	(e 6 54)	- 6	—	—	e 6.9	19.6
Ekaterinburg	48.2	42	18 49	?SR ₁	—	—	22.9	30.1

Additional readings: San Fernando gives also MN = +2.9m. Granada
 i = +48s., MN = +1.4m. Toledo iNW = +1m.36s., iNE = +1m.37s.,
 MNW = +3.5m. Florence P = +4m.9s. Uccle MN = +9.8m. Inns-
 bruck readings are given as for 16h. De Bilt MNZ = +12.4m. Zagreb
 ePNW = +4m.29s. Hamburg MN = +12.4m., MZ = +14.2m.

July 9d. Readings also at 0h. (near Athens), 8h. (Simla, Pulkovo, and Ekaterin-
 burg), 9h. (Upsala, Hamburg, De Bilt, and Uccle), 11h. (Algiers), 16h.
 (near Athens), 21h. (Ekaterinburg and Pulkovo), 22h. (near Hakodate,
 Mizusawa, and Sapporo), 23h. (Colombo).

July 10d. 0h. 28m. 54s. Epicentre 30°-5S. 73°-0W.

A = +252, B = -824, C = -508; D = -956, E = -292;
 G = -148, H = +485, K = -862.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Mendoza	4.6	123	0 30	-41	—	—	1.4	5.2
Pilar	7.9	101	2 0	0	—	—	3.7	5.1
Cipolletti	9.3	156	0 54	-86	—	—	2.7	4.1
La Quiaca	10.6	40	—	—	—	—	6.1	6.7
La Plata	13.4	113	i 3 20	+ 2	6 0	+ 7	7.0	9.5
La Paz	14.7	19	i 3 37	+ 2	i 6 24	- 1	7.6	12.2
Rio de Janeiro	27.6	82	15 59	- 5	10 44	- 8	14.8	17.4
Georgetown	69.5	358	e 11 22	+ 8	20 26	+ 6	—	—
Washington	69.5	358	—	—	e 19 6	-75	—	—
Ann Arbor	73.5	354	e 13 6	+87	21 6	- 2	e 32.1	—
Toronto	74.1	356	11 48	+ 5	21 13	- 2	30.4	—
Toronto N.	74.6	123	21 36	?S	(21 36)	+15	—	—
Cape Town	75.9	359	e 12 6	+12	i 21 38	+ 2	e 31.6	—
Ottawa	90.8	330	13 34	+14	24 12	-10	44.0	56.9
Victoria	90.8	330	13 27	+ 7	24 10	-12	43.9	65.7
San Fernando	91.8	49	e 13 58	+32	—	—	—	60.1
Colmbra	92.7	44	—	—	e 23 56	-46	45.1	52.2
Toledo	95.0	47	—	—	(e 23 6)	-120	e 23.1	55.3
Honolulu	96.6	291	24 30	?[S]	(24 30)	[+24]	45.1	—
Honolulu N.	96.6	291	25 30	?S	(25 30)	+ 8	45.5	—
Algiers	97.9	53	—	—	e 46.1	—	59.1	—
Tortosa	98.4	48	—	—	24 29	[+14]	39.3	59.1
Marselles	102.8	48	—	—	—	—	e 57.1	—
Oxford	103.4	39	—	—	i 24 50	[+10]	—	68.8
Kew	103.7	39	59 6	?L	—	—	(59.1)	63.1
Stonyhurst	104.0	37	e 25 12	?[S]	(e 25 12)	[+29]	—	61.6
Eskdalemuir	104.4	34	e 14 17	-15	—	—	45.1	58.8
Edinburgh	104.7	35	e 17 6	+153	i 24 56	[+10]	—	64.1
Moncalieri	105.1	47	e 18 2	?PR ₁	28 48	+125	47.0	64.6
Uccle	105.9	41	—	—	e 25 6	[+14]	e 48.1	—
Rocca di Papa	106.8	51	—	—	(e 24 36)	[-20]	e 24.6	69.7
Strasbourg	106.8	44	(e 21 6)	?PR ₁	—	—	e 21.1	66.2
De Bilt	107.0	40	—	—	e 25 12	[+15]	e 50.1	65.0
De Bilt N.	107.0	40	—	—	e 28 12	+71	e 49.1	67.7
De Bilt Z.	107.0	40	e 14 28	-16	—	—	—	65.0

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Hamburg	110.2	40	—	—	e 27 6	-24	e 60.1	—
Zagreb	110.7	48	e 18 53	?PR ₁	—	—	—	60.1
Vienna	111.9	45	e 19 21	?PR ₁	29 8	+83	—	66.1
Helwan	115.9	70	e 20 9	?PR ₁	29 43	+86	—	71.8
Uppsala	E. 116.3	34	—	—	—	—	e 62.1	—
Pulkovo	122.6	35	e 20 19	?PR ₁	e 28 37	-32	—	71.7
Ekaterinburg	138.6	37	e 19 34	[-3]	—	—	44.1	83.2
Kodaikanal	145.8	120	77 30	?L	—	—	(77.5)	—
Manila	159.6	222	e 25 6	?PR ₁	—	—	—	—

Additional readings and notes: Mendoza readings are given for 7d. Pilar gives also MN = +4.1m. La Quiaca MN = +7.6m. La Plata iPN = +3m.22s., N = +3m.37s., +5m.41s., and +6m.31s., MN = +8.5m. T₀ = 0h.28m.53s. Rio de Janeiro SR₁E = +11m.59s., SR₁N = +12m.44s., LN = +14.6m. T₀ = 0h.28m.53s. Toronto LE = +33.8m. and +55.8m., LN = +33.6m. Eskdalemuir eN = +18m.10s., eS₁N = +25m.0s., e = +27m.44s. Ottawa L = +56.1m. Coimbra eE = +10m.36s., eN = +12m.6s., MN = +52.1m. Honolulu SE = +32m.6s., SN = +32m.16s., LE = +40.0m. Tortosa SE? = +24m.30s., ME = +62.6m. Moncalieri MN = +62.2m. Uccle e = +28m.0s. Strasbourg MN = +66.6m. De Bilt ePR₁Z = +18m.48s. Pulkovo MN = +60.5m. Ekaterinburg iP = +19m.44s., I = +23m.13s., e = +32m.30s.

July 10d. 5h. 31m. 12s. (I) } Epicentre 42° 8N. 1° 0W.
7h. 6m. 48s. (II) }

A = +.734, B = -.013, C = +.679; D = -.017, E = -1.000;
G = +.679, H = -.012, K = -.734.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
I Tortosa	2.3	159	0 35	- 1	—	—	1.1	—
II	2.3	159	0 33	- 3	0 58	- 5	—	—
I Barcelona	2.7	119	10 44	+ 2	11 15	+ 1	i 1.4	1.7
II	2.7	119	0 45	+ 3	1 12	- 2	1.4	—
I Toledo	3.7	219	10 55	- 3	11 41	- 1	e 1.8	2.4
II	3.7	219	11 3	+ 5	11 48	+ 6	i 2.1	2.9
I Puy de Dôme	4.2	41	1 9	+ 4	—	—	—	2.3
I Alicante	4.4	176	1 4	- 4	—	—	—	—
I Marseilles	4.7	82	e 1 24	+11	e 2 14	+ 5	—	2.8
I Granada	5.9	200	11 29	- 2	i 2 37	- 4	2.8	4.0
II	5.9	200	11 53	+22	i 3 7	+26	3.2	3.2
I Almeria	6.0	191	2 38	?S	(2 38)	- 6	—	—
I Coimbra	E. 6.1	248	e 1 35	+ 2	2 41	- 5	—	3.6
I Malaga	6.6	205	1 40	- 1	—	—	—	—
I Paris	6.6	21	11 39	- 2	e 2 56	- 4	3.6	4.8
II	6.6	21	e 1 34	- 7	e 2 44	-16	—	4.2
I Besançon	6.6	46	1 43	+ 2	3 10	+10	—	3.8
I Moncalieri	6.7	68	1 45	+ 3	3 13	+11	—	4.6
I Algiers	6.7	151	1 39	- 3	3 17	+15	3.5	6.1
I San Fernando	7.5	214	0 50	-64	2 10	-74	3.3	4.8
I Zurich	8.2	52	e 2 2	- 2	i 3 43	+ 1	—	5.4
I Strasbourg	8.4	44	2 5	- 2	3 44	- 3	3.8	5.7
II	8.4	44	—	—	—	—	e 4.7	—
I Uccle	8.8	23	e 2 9	- 4	e 3 46	-12	e 4.4	6.1
II	8.8	23	e 3 48	?S	(e 3 48)	-10	—	—
I Oxford	9.0	359	12 16	- 0	i 3 48	-15	5.1	5.8
I Florence	9.0	79	2 13	- 3	—	—	—	6.0
I West Bromwich	9.8	356	2 29	+ 2	4 14	- 9	—	—
I Innsbruck	9.8	58	i 2 28	+ 1	i 4 16	- 7	(5.6)	6.5
I Rocca di Papa	10.2	91	e 2 30	- 3	e 4 24	-11	5.7	7.3
I De Bilt	10.2	22	2 29	- 4	4 24	-11	6.0	7.2
II	10.2	22	—	—	e 4 12	-23	—	7.2
I Stonyhurst	11.1	356	i 6 30	?L	—	—	(i 6.5)	7.1
I Pompeii	11.8	95	e 5 27	?S	(e 5 27)	+13	—	—
I Zagreb	N.E. 12.5	70	e 3 2	- 4	e 5 59	+27	e 7.0	7.4
I	N.W. 12.5	70	e 3 4	- 2	e 5 35	+ 3	—	8.7
I Hamburg	13.0	30	e 3 14	+ 1	i 6 0	+16	7.2	9.6
I Edinburgh	13.2	355	—	—	e 6 14	+25	i 7.6	8.5
I Vienna	13.3	60	e 3 12	- 5	5 39	-12	—	9.0

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
I Budapest	14.9	65	2 7	-91	—	—	—	—
I Belgrade	15.6	75	e 3 50	+ 3	e 9 9	?	e 11.9	—
I Lemberg	18.6	59	e 4 18	- 6	—	—	e 12.1	13.3
I Uppsala	20.5	27	e 4 45	- 2	e 8 37	+ 3	e 11.6	15.4
I Pulkovo	25.5	37	i 5 28	-15	i 10 15	+ 2	14.8	17.4
I Ekaterinburg	40.6	49	i 7 49	-11	—	—	22.8	26.4
I Ottawa	51.8	300	—	—	e 16 48	+ 7	e 28.8	—
I Toronto	N. 54.8	300	—	—	e 17 18	- 1	—	—

Additional readings: Toledo I gives also $PR_1 = +1m.11s.$, $PR_2NW = +1m.16s.$, $PR_3NE = +1m.23s.$, $PR_3NW = +1m.33s.$, $MNW = +2.9m.$, $II PR_1 = +1m.34s.$, $MNW = +2.7m.$ Granada I $i = +1m.32s.$, $1m.54s.$, and $2m.0s.$, $MN = +4.2m.$, $II i = +1m.55s.$, $+2m.7s.$, $MN = +3.4m.$ Coimbra I $iSN = +2m.37s.$ Paris I $MN = +3.8m.$ Moncalieri $MN = +4.2m.$ Strasbourg I $P = +2m.9s.$, $MN = +6.1m.$ Uccle I $MZ = +6.4m.$ Florence I $P = +53s.$ Innsbruck I L is given as SR_1NE . All readings given as at 6h. Rocca di Papa I $P = +2m.36s.$ De Bilt I $MZ = +7.3m.$, $MN = +7.6m.$ Pompeii I $eS = 5h.46m.29s.$, $L = 6h.35m.0s.$ Zagreb I $eNW = +3m.19s.$ and $+3m.30s.$, $eNE = +3m.25s.$ Hamburg I $MZ = +9.1m.$, $MN = +10.2m.$ Vienna I $iPNE = +3m.13s.$, $iPZ = +3m.14s.$, $iNE = +3m.27s.$, $PR_1 = +4m.8s.$, $iN = +6m.28s.$, $iE = +6m.42s.$, $SR_1? = +7m.18s.$, $MNZ = +9.1m.$ Belgrade I $L = +12.8m.$ Uppsala I $MN = +15.6m.$ Ekaterinburg I $i = +9m.21s.$ and $+17m.6s.$ Ottawa I $L = +38.8m.$ Toronto I $eE = +17m.28s.$

July 10d. Readings also at 0h. (Toronto and Lick), 2h. (Innsbruck and near Mizusawa), 4h. (Kingston), 5h. (Barcelona), 8h. (Apia, La Paz, and near San Fernando), 9h. (Florence and near Tortosa), 10h. (Wellington and near Granada), 12h. (near Toledo, Granada, Barcelona, and Tortosa), 13h. (Uccle and near Toledo, Barcelona, Granada, and Tortosa), 16h. (Victoria), 17h. (La Paz), 18h. (La Paz, La Plata, and Vienna), 21h. (Rio Tinto).

July 11d. Readings at 0h. (Colombo and near Granada), 1h. (Zi-ka-wei and Nagasaki), 3h. (Apia), 6h. and 10h. (Nagasaki), 11h. (Georgetown), 13h. (Ekaterinburg), 16h. (Zi-ka-wei), 17h. (near Manila), 18h. and 19h. (2) (near Athens), 22h. (Ekaterinburg).

1923. July 12d. 3h. 15m. 30s. Epicentre 16°5S. 180°0.

(as on 1921 July 3d.).

A = -0.959, B = -0.000, C = -0.284; D = -0.000, E = +1.000;
G = +0.284, H = -0.000, K = -0.959.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Apia	8.4	73	e 2 30	+23	—	—	—	5.5
Wellington	25.2	189	e 5 42	+ 2	e 10 6	- 1	i 11.7	14.7
Riverview	31.2	230	i 6 35	- 5	i 11 28	-26	e 13.7	16.0
Sydney	31.2	230	e 6 30	-10	11 42	-12	14.3	17.6
Adelaide	41.3	236	—	—	e 14 30	+ 5	e 20.5	25.0
Honolulu	E. 43.5	31	17 59	-23	i 14 30	-25	i 18.6	20.0
	N. 43.5	31	—	—	—	—	19.5	21.4
Perth	59.7	242	17 48	?S	(17 48)	-31	e 35.8	39.1
Manila	66.1	295	e 10 57	+ 5	—	—	—	—
Taihoku	70.5	307	—	—	e 20 30	- 2	—	—
Batavia	72.1	270	i 11 31	0	—	—	—	—
Zi-ka-wei	73.7	312	e 11 37	- 3	—	—	—	—
Hong Kong	75.2	300	10 47	-63	20 40	-48	34.5	39.0
Berkeley	76.7	44	11 57	- 2	—	—	e 34.6	—
Victoria	E. 82.1	35	12 25	- 6	22 38	- 9	37.2	43.6
	N. 82.1	35	12 28	- 3	22 38	- 9	37.2	43.3
	E. 82.4	23	—	—	e 31 17	?	e 36.4	—
Sitka	105.2	114	18 35	?PR ₁	e 31 30	?SR ₁	62.5	65.0
La Paz	105.6	50	—	—	—	—	e 44.5	—
Ann Arbor	108.9	48	e 18 53	?PR ₁	28 14	+56	e 51.3	—
Toronto	N. 108.9	48	—	—	e 26 32	-46	55.1	—
Georgetown	110.1	54	—	—	—	—	e 49.5	—
Washington	110.1	54	—	—	—	—	e 54.5	—
Ottawa	111.7	47	e 17 28	+142	1 28 47	+64	e 51.0	—
Ekaterinburg	119.6	327	e 17 55	+135	1 29 3	+17	46.5	72.4
Pulkovo	131.5	340	1 19 18	[- 4]	—	—	56.5	81.7

Continued on next page.

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	Δ	Az.	P.		O-C.		S.	O-C.		L.	M.
			m.	s.	s.	s.		m.	m.		
Upsala	134.8	348	e 22	30	?	PR ₁	—	—	—	e 67.5	—
Edinburgh	140.5	2	e 21	30	?	PR ₁	—	—	—	67.5	79.5
Hamburg	142.1	350	e 19	40	[- 3]	—	—	—	—	68.5	—
Stonyhurst	142.6	2	e 41	30	?	SR ₁	—	—	—	—	82.0
De Bilt	144.2	354	19	40	[- 7]	e 41 31	?	SR ₁	e 67.5	—	89.9
Oxford	144.7	2	19	42	[- 6]	—	—	—	—	—	86.5
Uccle	145.5	356	e 19	42	[- 7]	e 47 18	?	SR ₁	—	—	—
Vienna	145.5	340	e 19	44	[- 5]	—	—	—	—	—	93.5
Belgrade	146.9	332	i 19	30	[- 21]	e 28 46	?	—	?	88.7	—
Strasbourg	147.3	349	19	47	[- 5]	—	—	—	—	61.5	89.0
Paris	147.6	357	e 19	52	[- 0]	—	—	—	—	67.5	78.5
Zagreb	147.8	339	e 19	50	[- 3]	—	—	—	—	66.5	74.5
Moncalieri	150.8	349	e 19	53	[- 4]	31 46	?	—	e 61.8	—	—
Florence	151.1	343	19	55	[- 2]	—	—	—	—	—	95.7
Rocca di Papa	152.5	339	e 19	48	[- 11]	—	—	—	—	e 84.5	89.5
Marselles	152.8	352	e 19	42	[- 18]	—	—	—	—	e 74.5	83.1
Coimbra	155.2	16	e 20	26	[+ 24]	e 36 36	?	—	—	e 72.5	91.8
Tortosa	E. 155.7	359	—	—	—	—	—	—	—	e 65.5	85.8
	N. 155.7	359	—	—	—	—	—	—	—	—	—
Toledo	156.4	8	20	16	[+ 12]	—	—	—	—	—	—
Granada	159.1	8	e 20	36	[+ 29]	33 55	?	—	e 74.5	80.0	—
San Fernando	159.3	14	e 17	30	[?]	20 42	?	—	?	—	89.0
Algiers	159.5	353	e 20	15	[+ 7]	e 30 49	?	—	e 75.5	88.5	—

Additional readings and notes: Wellington gives also e = +7m.30s., i = +13m.42s. T₀ = 3h.15m.35s. Riverview ePR₁ = +7m.32s., SR₁ = +12m.42s. and +12m.52s., MN = +14.5m., MZ = +16.5m. T₀ = 3h.15m.55s. Honolulu iLE = +17.8m., LN = +18.3m. T₀ = 3h.15m.14s. Perth S = +25m.23s., SR₁ = +29m.57s. Sitka LN = +36.8m. Colombo (Δ = 101° 6 Az. = 273°) gives simply 3h. Toronto iE = +25m.15s., eN = +34m.19s., eE = +34m.30s., LE = +38.9m., LN = +46.9m. Georgetown LE = +57.5m., LN = +61.5m. Washington reading has been increased by 1h. Ottawa i = +19m.14s., SR₁ = +35m.7s., L = +54.5m. T₀ = 3h.19m.40s. Ekaterinburg e = +20m.5s., i = +28m.15s., e = +30m.11s., i = +36m.41s., MN = +57.2m., MZ = +72.1m. De Bilt MN = +84.0m., MZ = +83.8m. Uccle e = +41m.54s. Vienna iPZ = +19m.46s. Belgrade PR₁ = +20m.26s., +21m.25s., and +22m.24s. Readings given for 13d. Strasbourg P = +19m.48s., MN = +76.8m. Rocca di Papa iP = +20m.3s. (O-C = [+4s.]). Coimbra eL = +84.5m. Toledo reading has been increased by 1h. Granada i = +29m.13s.

July 12d. 9h. 13m. 40s. Epicentre 16° 5S. 180° 0 (as at 3h.).

	Δ	Az.	P.		O-C.		S.	O-C.		L.	M.
			m.	s.	s.	s.		m.	m.		
Wellington	25.2	189	—	—	—	e 9 38	-29	11 7	12.3	—	—
Christchurch	27.8	191	—	—	—	—	—	—	16.2	23.4	—
Riverview	31.2	230	—	—	—	e 11 26	-28	13.7	16.4	—	—
Sydney	31.2	230	—	—	—	10 38	-76	16.3	17.6	—	—
Adelaide	41.3	236	—	—	—	e 14 20	-5	21.3	25.3	—	—
Honolulu	E. 43.5	31	—	—	—	114 22	-33	18.4	20.3	—	—
	N. 43.5	31	—	—	—	—	—	18.5	21.8	—	—
Hong Kong	75.2	300	—	—	—	—	—	—	39.8	—	—
Victoria	E. 82.1	35	13 10	+39	22 55	+8	36.3	46.5	—	—	—
	N. 82.1	35	12 46	+15	22 32	-15	37.0	49.9	—	—	—
La Paz	105.2	114	—	—	—	—	—	61.3	—	—	—
Toronto	E. 108.9	48	—	—	—	128 20	+62	53.2	—	—	—
Georgetown	N. 110.1	54	—	—	—	e 25 18	[+ 8]	—	—	—	—
Ottawa	111.7	47	—	—	—	e 28 27	+44	e 52.3	—	—	—
Pulkovo	131.5	340	e 22	49	?	PR ₁	—	—	59.8	75.4	—
Edinburgh	140.5	2	—	—	—	—	—	e 70.3	—	—	—
Eskdalemuir	141.1	2	—	—	—	—	—	e 66.3	—	—	—
Uccle	145.5	356	e 20	2	[+ 13]	—	—	e 66.3	—	—	—
Strasbourg	147.3	349	e 19	45	[- 7]	—	—	e 71.3	—	—	—
Paris	147.6	357	—	—	—	—	—	e 77.3	—	—	—
Moncalieri	150.8	349	e 20	19	[+ 22]	—	—	e 75.8	—	—	—
Florence	151.1	343	19	20	[- 37]	—	—	—	—	—	—
Rocca di Papa	N. 152.5	339	19	47	[- 13]	—	—	—	—	—	—
Coimbra	155.2	16	—	—	—	e 41 15	?	SR ₁	75.3	—	—
Tortosa	N. 155.7	359	—	—	—	—	—	—	e 80.3	86.6	—
San Fernando	159.3	14	e 76	32	?	L	e 80 20	?	L (e 80.3)	89.3	—

Additional readings and notes: Christchurch gives also PR₁ = +12m.26s. Riverview MN = +14.5m. Toronto eE = +34m.24s., LE = +55.9m. Ottawa eS = +35m.0s., L = +59.3m. Pulkovo MZ = +75.7m. Rocca di Papa ePE = +19m.59s. Coimbra eE = +52m.3s., eN = +55m.20s. San Fernando MN = +87.9m.

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July 12d. Readings also at 1h. (Apia), 3h. (near Wellington), 4h. (Kodaikanal), 5h. and 6h. (Tucson), 7h. (Manila, Osaka, La Paz, and Ekaterinburg), 8h. (La Plata), 9h. (near Wellington), 10h. (Apia), 11h. (Ekaterinburg), 12h. (2) and 14h. (La Paz), 15h. (near Athens), 16h. (Ekaterinburg and near Mizusawa), 19h. (Florence and Rocca di Papa), 20h. (Rocca di Papa (2), Pompeii, and Florence), 23h. (Ekaterinburg).

1923. July 13d. 11h. 13m. 33s. Epicentre 31°5N. 130°0E.

(as on 1923 Jan. 11d.).

A = -548, B = +653, C = +522; D = +766, E = +643;

G = -336, H = +400, K = -353.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Nagasaki	1.3	356	0 34	+14	—	—	1.1	1.6
Kobe	5.3	52	1 19	-3	2 32	+7	2.9	3.2
Osaka	5.6	53	1 26	-1	—	—	2.9	4.1
Nagoya	6.8	56	1 40	-4	(2 55)	-10	2.9	5.3
Zi-ka-wei	7.3	268	i 2 3	+12	e 3 35	+17	—	5.9
Taihoku	9.8	231	2 34	+7	(4 43)	+20	4.7	7.0
Mizusawa	E. 11.8	47	2 54	-2	7 14	+120	—	—
	N. 11.8	47	2 52	-4	7 17	+123	—	—
Hokoto	12.2	232	i 3 27	+25	(e 5 43)	+19	e 5.7	—
Hakodate	13.4	37	3 22	+4	—	—	—	4.5
Sapporo	14.7	34	3 36	+1	(6 32)	+7	6.5	—
Hong Kong	16.8	241	3 55	-7	—	—	—	—
Otomari	18.1	29	4 35	+17	(8 4)	+22	8.1	11.9
Manila	18.8	208	e 4 23	-4	7 18	-40	8.1	9.6
Calcutta	N. 37.9	269	7 37	0	14 41	+64	21.8	23.9
Batavia	43.7	216	8 8	-16	i 14 36	-22	26.3	27.9
Dehra Dun	44.2	282	8 4	-23	13 28	-97	18.1	29.2
Simla	E. 44.7	283	8 27	-4	19 9	?	26.6	29.0
	N. 44.7	283	7 15	-76	18 39	?	24.6	25.6
Bombay	52.6	271	9 26	+2	17 17	+26	e 29.1	33.1
Columbo	52.7	255	9 51	+27	17 3	+11	33.0	36.4
Kodaikanal	52.9	260	8 45	-40	—	—	26.8	38.4
Ekaterinburg	53.0	321	i 9 35	+9	i 17 8	+14	24.4	35.8
Honolulu	E. 64.1	80	10 42	+3	i 19 11	-3	35.8	30.1
	N. 64.1	80	—	—	—	—	26.5	29.5
Perth	64.8	194	—	—	—	—	42.5	—
Sitka	E. 66.4	37	—	—	19 42	0	35.7	—
	N. 66.4	37	10 46	-8	19 28	-14	—	40.8
Tiflis	66.4	307	e 11 45	+51	e 19 57	+15	—	43.2
Adelaide	66.9	173	—	—	e 20 27	+38	32.0	43.8
Pulkovo	67.8	329	i 11 7	+4	20 15	+15	31.4	44.0
Riverview	68.3	162	e 11 0	-6	e 19 47	-19	e 29.6	37.2
Sydney	68.3	162	19 39	?	(19 39)	-27	31.8	34.4
Apia	71.8	120	—	—	—	—	40.4	—
Upsala	73.3	331	e 11 45	+7	e 21 15	+9	e 37.4	47.8
Lemberg	75.6	320	e 11 51	-2	e 22 15	+42	e 42.6	51.4
Victoria	76.8	41	11 47	-13	21 42	-5	40.4	48.8
Bergen	77.4	336	—	—	e 22 27	+34	37.4	51.4
Budapest	79.4	321	i 12 51	+36	i 23 25	+69	e 30.1	—
Hamburg	80.4	329	i 12 23	+2	i 22 56	+28	40.9	52.4
Belgrade	80.4	318	e 12 22	+1	e 22 20	-8	e 45.8	51.9
Vienna	80.6	323	i 12 24	+1	e 22 52	+22	43.0	56.0
Halwan	81.5	300	i 12 37	-1	22 45	+4	—	53.1
Zagreb	N.E. 82.3	320	i 12 32	—	e 22 57	+8	e 45.3	55.6
	N.W. 82.3	320	—	—	e 22 54	+5	e 44.8	53.6
Athens	82.4	311	—	—	e 21 57	-53	—	—
Berkeley	N. 83.3	50	i 22 52	?	(i 22 52)	-8	e 35.2	—
De Bilt	83.5	330	i 12 37	-2	23 2	-1	e 42.4	54.6
Wellington	83.6	148	e 12 33	-7	i 22 30	-26	e 40.0	—
Innsbruck	83.8	324	e 12 41	0	23 8	+1	e 41.4	57.4
Edinburgh	84.0	336	i 12 41	-1	23 9	+1	41.4	55.2
Eskdalemuir	84.4	336	i 12 43	-1	23 7	-5	40.4	53.2
Uccle	84.8	330	i 12 42	-5	23 9	-8	e 40.4	56.4
Strasbourg	84.8	326	i 12 46	-1	23 29	+12	e 39.4	56.4
Zurich	85.2	325	e 12 48	-1	23 11	-10	e 55.4	—
Stonyhurst	85.3	334	12 45	-5	23 15	-7	46.0	57.4

Continued on next page.

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
West Bromwich	86.1	333	12 52?	- 2	23 18	-13	—	59.4
Florence	86.2	321	6 57	?	23 37	+ 5	—	51.1
Kew	86.2	332	12 27	-27	—	—	—	61.4
Pompeii	86.3	318	e 13 8	+13	e 23 23	-10	35.4	51.4
Oxford	86.5	332	12 52	- 4	23 18	-18	43.7	50.8
Besançon	86.6	326	—	—	23 31	- 6	—	44.4
Rocca di Papa	86.8	319	i 12 55	- 3	24 37	+58	e 38.4	56.4
	86.8	319	e 13 3	+ 5	e 23 57	+18	e 48.8	62.0
Paris	87.0	329	i 12 57	- 2	i 23 24	-17	47.4	56.4
Moncalieri	87.3	324	i 12 56	- 5	23 18	-26	30.9	59.2
Puy de Dôme	89.1	326	e 13 4	- 7	—	—	47.4	—
Marseilles	89.7	324	e 13 27?	+13	e 23 27?	-44	50.4	51.4
Barcelona	92.7	324	e 13 49	+18	—	—	e 31.4	61.4
Tortosa	E. 93.9	325	17 20	?PR ₁	—	—	45.4	62.4
	N. 93.9	325	17 14	?PR ₁	26 14	+79	—	62.4
Algiers	95.6	320	—	—	—	—	e 40.4	57.4
Toledo	96.9	326	i 13 36	-18	124 38	[+31]	e 32.2	66.2
Coimbra	E. 98.6	329	e 14 19	+16	24 47	[+31]	48.4	65.1
	N. 98.6	329	e 13 49	-14	e 24 27	[+11]	50.4	63.8
Granada	98.8	325	e 12 1	-123	e 25 48	+ 4	46.4	56.8
Chicago	99.0	27	17 27	?PR ₁	24 17	[- 2]	57.4	—
Ottawa	99.6	19	13 51	-18	24 27	[+ 5]	52.4	62.4
Rio Tinto	99.8	327	18 27	?PR ₁	—	—	—	67.4
Ann Arbor	100.0	24	e 17 57	?PR ₁	24 57	[+33]	58.4	—
Toronto	E. 100.2	21	14 1	-11	24 28	[+ 3]	48.6	60.2
	N. 100.2	21	e 13 55	-17	24 27	[+ 2]	47.1	64.4
San Fernando	100.7	325	14 7	- 7	24 39	[+12]	55.4	70.4
Northfield	101.6	16	—	—	—	—	e 56.4	—
Ithaca	102.2	20	—	—	—	—	e 45.4	—
Washington	105.2	22	18 37	?PR ₁	—	—	e 51.4	—
Accra	119.9	299	—	—	—	—	46.4	51.7
Capetown	123.5	248	62 37	?L	—	—	(62.6)	—
La Paz	157.7	52	i 20 6	[0]	34 21	?	78.4	113.8
Mendoza	164.5	100	22 3	?	—	—	36.2	36.8
Rio de Janeiro	169.5	323	—	—	e 31 42	?	50.4	96.1

Additional readings and notes: Osaka gives also MN = +3.4m. Zi-ka-wel MN = +5.2m. Taihoku MN = +5.8m. Hakodate MN = +3.8m. Manila MN = +9.4m. Ekaterinburg PR₁ = +10m.54s., PR₂ = +13m.2s., MN = +31.9m., MZ = +37.9m. Honolulu LE = +28.3m. T₁ = 11h.13m.47s. Sitka PSN = +19m.56s., LE = +37.2m. T₁ = 11h.13m.38s. Tiffis eE = +16m.14s., eN = +20m.17s., eE = +21m.1s., and +25m.40s., MN = +40.4m. Adelaide eSR₁ = +25m.27s., eSR₂ = +28m.9s. Pulkovo PR₁ = +13m.51s., iPR₂ = +15m.26s., iPR₃ = +15m.52s., PS = +20m.57s., SR₁ = +25m.3s., SR₂ = +28m.3s. Riverview eS = +19m.43s., i = +20m.55s. and +21m.4s., MN = +37.9m., MZ = +40.0m. T₁ = 11h.13m.46s., Sydney S = +25m.15s., L = +36.4m. and +40.0m. Uppsala MN = +48.0m. Victoria SN = +21m.43s. Hamburg SR₁ = +32m.7s., MN = +52.5m., MZ = +51.4m. Belgrade PR₁ = +15m.2s., L = +54.4m. Vienna PR₁ = +15m.41s., PR₂ = +18m.45s., iE = +23m.0s., M = +53.0m. Zagreb eE = +22m.4s. Travnik ($\Delta = 83^\circ 0'$) eP = 11h.5m.0s. Berkeley ePE = +23m.2s., iN = +23m.10s., eN = +67m.1s. De Bilt PR₁ = +15m.52s., SR₁ = +29m.3s., MNZ = +54.8m. Wellington ePR₁ = +16m.21s., iSR₁ = +28m.15s. Innsbruck MNW = +53.8m. Edin-burgh PR₁ = +15m.57s., SR₁ = +29m.15s., SR₂ = +32m.55s. Eskdale-muir PR₁ = +16m.4s., SR₁ = +29m.57s. Uccle PR₁ = +16m.3s., PR₂ = +18m.3s., PR₃ = +19m.34s., SR₁ = +29m.15s., SR₂ = +33m.27s., MN = +55.8m., MZ = +55.9m. Strasbourg F = +12m.47s., PR₁ = +16m.6s., SE = +22m.40s., MN = +55.6m. Rocca di Papa SE = +24m.43s. Paris PR₁ = +16m.27s. Moncalieri MN = +58.3m. Algiers ePR = +17m.30s. Toledo PR₁ = +17m.40s., SR₁NE = +27m.0s., SR₁NW = +27m.7s., MNW = +66.6m. Coimbra PS = +26m.5s. Granada i = +14m.24s., PR₁ = +18m.15s., MN = +62.8m. Chicago L = +31.4m. Ottawa PR₁ = +17m.52s., eL = +44.4m. T₁ = 11h.14m.45s. Ann Arbor L = +37.0m. and +61.4m. Toronto eE = +16m.44s., PR₁N = +16m.0s., PR₁E = +18m.2s., iN = +24m.33s., LEN = +44.4m. San Fernando PR₁? = +18m.17s., S = +37m.39s. S is given as PR₁. Ithaca L = +59.4m. and +105.4m. Washington L = +61.4m. La Paz eSN = +34m.16s., MN = +92.6m. T₁ = 11h.13m.26s. Rio de Janeiro L = +91.1m.

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July 13d. 18h. 36m. 25s. Epicentre 17°·3N. 120°·5E. (as on 1919 Sept. 26d.).

A = -·485, B = +·823, C = +·297; D = +·862, E = +·508;
G = -·151, H = +·256, K = -·955.

	Δ	Az.	P.	O-C.	S.	O-C.	L.
	°	°	m. s.	s.	m. s.	s.	m.
Manila	2·8	170	1 0 35	- 9	—	—	—
Zi-ka-wei	14·0	3	1 4 1	+35	e 6 11	+ 3	—
Batavia	27·1	211	e 5 52	- 7	1 10 33	-10	—
Ekaterinburg	59·3	327	1 10 22	+15	1 18 34	+19	29·6
Pulkovo	75·3	350	1 11 55	+ 4	21 27	- 2	40·6
De Bilt	91·0	326	—	—	—	—	e 48·6
Strasbourg	91·3	322	—	—	—	—	48·6
La Paz	171·6	86	20 7	[- 9]	—	—	—

Manila reading is given as at 16h.

Batavia gives also $i = +9m.33s.$

July 13d. 23h. 56m. 15s. Epicentre 31°·5N. 130°·0E. (as at 11h.).

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Nagasaki	1·3	356	0 35	+15	—	—	1·1	1·7
Kobe	5·3	52	1 24	+ 2	2 29	+ 4	3·1	4·6
Osaka	5·6	53	1 32	+ 5	—	—	2·9	6·0
Nagoya	6·8	56	1 42	- 2	2 56	- 9	3·8	4·1
Zi-ka-wei	7·3	268	1 2 1	+10	e 3 41	?L	(3·7)	6·0
Taihoku	9·8	231	e 2 43	+16	—	—	5·0	—
Mizusawa	11·8	47	2 54	- 2	5 21	+ 7	8·0	—
Hakodate	13·4	37	3 16	- 2	—	—	—	—
Hong Kong	16·8	241	4 1	- 1	—	—	8·8	11·8
Manila	18·8	208	e 4 20	- 7	(8 1)	+ 3	8·0	—
Colombo	52·7	255	33 45	?L	—	—	(33·8)	—
Kodalkanal	52·9	260	31 9	?L	—	—	(31·2)	—
Ekaterinburg	53·0	321	1 9 34	+ 8	1 17 6	+10	27·8	34·8
Honolulu	64·1	80	10 45	+ 6	19 5	- 9	29·4	—
Pulkovo	67·8	329	1 11 1	- 2	20 9	+ 9	34·8	47·9
Riverview	68·3	162	—	—	—	—	e 31·0	37·2
Upsala	73·3	331	—	—	—	—	e 34·8	47·9
Victoria E.	76·8	41	11 53	- 7	21 43	- 4	38·8	47·8
Budapest	79·4	321	—	—	—	—	e 38·9	—
Hamburg	80·4	329	e 12 18	- 3	—	—	e 37·8	51·8
Vienna	80·6	323	e 12 19	- 4	22 48	+18	—	52·8
De Bilt	83·5	330	12 33	- 6	22 55	- 8	e 41·8	54·8
Edinburgh	84·0	336	—	—	1 23 21	+13	41·8	57·8
Eskdalemuir	84·4	336	e 12 45	+ 1	23 18	+ 6	39·8	51·8
Uccle	84·8	330	e 12 42	- 5	e 24 21	+64	e 41·8	55·8
Strasbourg	84·8	326	e 12 45	- 2	e 24 30	+73	40·8	57·0
Kew	86·2	332	—	—	—	—	—	57·8
Oxford	86·5	332	—	—	—	—	45·9	51·8
Rocca di Papa	86·8	319	12 57	- 1	1 20 39	-180	e 49·6	58·6
Paris	87·0	329	—	—	—	—	e 42·8	—
Moncalieri	87·3	324	12 55	- 6	24 52	+68	49·2	58·7
Puy de Dôme	89·1	326	—	—	—	—	e 50·7	—
Barcelona	92·7	324	—	—	—	—	e 51·9	55·6
Tortosa	93·9	325	—	—	—	—	e 47·5	62·2
Algiers	95·6	320	—	—	—	—	e 52·8	63·8
Toledo	96·9	326	—	—	—	—	47·8	—
Coimbra E.	98·6	329	—	—	e 20 15	?	48·8	65·6
N.	98·6	329	—	—	e 31 15	?SR ₁	e 52·8	63·4
Granada	98·8	325	—	—	—	—	e 56·2	62·0
Chicago	99·0	27	—	—	—	—	e 50·8	—
Ottawa	99·6	19	—	—	e 24 25	[+ 3]	e 45·8	—
Rio Tinto	99·8	327	55 45	?L	—	—	(55·8)	67·2
Ann Arbor	100·0	24	—	—	—	—	e 63·8	—
Toronto E.	100·2	21	e 6 35	?	—	—	48·5	—
San Fernando	100·7	325	e 46 15	?	51 33	?	59·8	67·8
La Paz	157·7	52	e 20 9	[+ 3]	—	—	—	—

Additional readings and notes: Kobe gives also MN = +4·4m. Osaka
MN = +6·3m. Zi-ka-wei MN = +5·6m. Mizusawa SN = +5m.19s.
Ekaterinburg PR₁ = +11m.39s., PR₂ = +12m.55s., SR₁ = +21m.2s., MZ =
+34·9m., MN = +41·9m. Honolulu LN = +28·4m. T₁ = 23h.56m.42s.

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Pulkovo PR₁ = +13m.55s., PR₂ = +15m.18s., SR₁ = +24m.51s., SR₂ = +28m.27s., MZ = +44.9m. Riverview MN = +37.6m. Puy de Dôme eL = +56.8m. De Bilt PR₁Z = +15m.52s., MN = +54.1m., MZ = +54.6m. Uccle PR₁ = +16m.2s., SR₁ = +29m.21s. Strasbourg MN = +55.4m. Rocca di Papa PN = +13m.0s. Paris L = +49.8m. Moncalieri MN = +58.5m. Tortosa eN = +49m.45s., LN = +53.1m. Chicago L = +61.8m. Ottawa e = +34m.25s. Toronto eN = +49m.15s., LN = +49.6m.

July 13d. Readings also at 0h. (La Paz and near Nagasaki), 2h. (Rocca di Papa and Ekaterinburg), 4h. (Ekaterinburg), 6h. (Mostar (2) and Ekaterinburg (2)), 7h. (Mostar), 9h. (Zi-ka-wei and Ekaterinburg), 10h. (Rocca di Papa, Florence, and near Mostar), 11h. (Travnik), 12h. (Rio de Janeiro and near Belgrade), 13h. (near Tortosa, Taihoku, and Belgrade), 14h. (near Algiers), 15h. (Sydney), 16h. (Honolulu, Riverview, Ottawa, Apia, Adelaide, Ekaterinburg, and De Bilt), 17h. (near Algiers and near Mizusawa), 19h. (near Balboa Heights), 20h. (near Mostar), 22h. (near Batavia and Malabar).

July 14d. Readings also at 1h. (near Kobe), 2h. (Belgrade), 4h. (Taihoku (2), Ekaterinburg, Zi-ka-wei, Manila, and Hong Kong), 5h. (Batavia, Malabar, Strasbourg, Uccle, and De Bilt), 6h. (Toledo, Manila, Zi-ka-wei, and near Taihoku), 7h. (near Wellington), 8h. (Ekaterinburg and near La Paz), 9h. (Strasbourg), 10h. (De Bilt), 12h. (Ekaterinburg), 13h. (La Paz and near Balboa Heights), 15h. (Zi-ka-wei), 16h. (Ekaterinburg), 18h. (Ekaterinburg, Zi-ka-wei, and Rio Tinto), 20h. (Moncalieri), 21h. (near Tortosa), 22h. (Zi-ka-wei), 23h. (Moncalieri (2)).

July 15d. Readings at 0h. (Christchurch and Ekaterinburg), 1h. (near Victoria), 3h. (Toronto), 4h. (Victoria), 10h. (De Bilt), 13h. (Ekaterinburg), 15h. (Granada), 16h. (Strasbourg), 17h. (Apia), 22h. (Rio Tinto).

July 16d. 13h. 23m. 36s. Epicentre 37°-5N. 70°-5E. (as on 1917 April 21d.).

A = +.265, B = +.748, C = +.609; D = +.943, E = -.334;
G = +.203, H = +.574, K = -.793.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Simla	8.4	137	3 0	+53	(4 36)	+49	e 6.8	—
Ekaterinburg	20.4	345	14 52	+6	18 36	+4	9.9	11.4
Calcutta N.	21.4	129	8 57	?8	(8 57)	+4	—	—
Pulkovo	33.8	324	e 6 48	-15	12 14	-24	16.4	20.6
Uppsala N.	39.9	323	—	—	—	—	e 20.4	23.4
Vienna	40.2	306	—	—	e 17 24	?	27.4	—
Zagreb	40.8	300	e 7 47	-14	e 9 24	?PR ₁	e 25.3	27.9
Zi-ka-wei	42.0	83	e 8 14	+3	e 14 20	-15	—	—
Hamburg	43.8	313	—	—	—	—	e 22.9	29.6
Strasbourg	45.9	307	e 8 24	-15	—	—	—	18.4
Moncalieri	46.6	300	e 12 28	?	—	—	28.6	—
De Bilt	46.8	310	e 8 47	+1	—	—	e 25.4	31.2
Oxford	50.8	311	—	—	—	—	—	35.8
Edinburgh	51.0	316	e 6 54	?	—	—	—	36.4

Additional readings: Ekaterinburg gives also MN = +12.7m. Uppsala ME = +27.1m. Hamburg e = +17m.24s., MN = +28.6m., l = +37m.59s. De Bilt ePR₁Z = +10m.34s., MN = +29.1m.

July 16d. 13h. 38m. 25s. Epicentre 16°-0S. 168°-0E. (as on 1920 Jan. 22d.).

A = -.940, B = +.200, C = -.276; D = +.208, E = +.978;
G = +.270, H = -.057, K = -.961.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.	
	°	°	m. s.	s.	m. s.	s.	m.	m.	
Riverview	23.4	210	15 20	-1	19 51	+18	e 11.5	13.2	
Sydney	23.4	210	5 29?	+8	9 59?	+26	12.9	14.1	
Christchurch	27.8	173	—	—	11 11	+16	14.7	17.2	
Adelaide	32.4	229	e 6 35?	-17	12 11	-3	16.3	20.3	
Perth	49.8	241	10 27	+81	17 28	+72	30.0	32.3	
Honolulu	50.1	43	e 9 3	-5	16 18	-2	—	24.8	
	N.	50.1	43	8 56	-12	16 8	-12	22.4	22.8

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	55.6	301	e 9 45	+ 2	—	—	—	—
Batavia	60.6	271	e 10 23	+ 7	—	—	e 35.4	—
Zi-ka-wei	65.0	317	e 10 47	+ 2	—	—	—	34.1
Berkeley	84.6	48	—	—	e 23 4	-11	e 39.6	—
Victoria	88.5	38	12 55	-13	23 35	-23	40.8	56.9
Chicago	111.2	51	—	—	34 40	?	52.2	—
Ekaterinburg	112.8	325	—	—	i 29 11	+79	47.6	65.9
Ann Arbor	114.1	49	—	—	—	—	e 51.6	—
La Paz	115.8	118	20 4	?PR ₁	—	—	—	—
Toronto	E. 117.2	49	e 19 57	?PR ₁	29 35	+67	e 55.1	—
	N. 117.2	49	—	—	29 45	+77	52.0	—
Ottawa	119.7	45	e 20 11	?PR ₁	e 36 33	?SR ₁	e 57.6	—
Pulkovo	126.6	335	—	—	—	—	57.6	69.2
Upsala	131.2	340	—	—	—	—	e 75.6	—
Hamburg	138.7	340	—	—	—	—	e 70.6	—
Belgrade	140.3	323	e 18 44	[-56]	e 30 42	?	—	—
De Bilt	E. 141.4	343	—	—	—	—	e 73.6	79.0
	N. 141.4	343	—	—	—	—	e 71.6	78.0
	Z. 141.4	343	i 19 39	[- 3]	i 22 42	?PR ₁	—	79.2
Zagreb	142.1	350	e 19 41	[- 2]	e 23 19	?PR ₁	e 69.6	—
Uccle	142.8	343	e 19 35	[-10]	—	—	—	—
Strasbourg	143.7	358	i 19 42	[- 4]	i 22 53	?PR ₁	e 41.6	—
Florence	145.9	350	e 19 44	[- 6]	—	—	—	—
Pompeii	146.3	322	e 19 53	[+ 3]	e 32 58	?	—	—
Rocca di Papa	146.7	328	i 19 46	[- 5]	—	—	e 79.5	—
Tortosa	N. 152.9	359	20 3	[+ 3]	31 19	?	e 67.6	97.2
Toledo	155.2	343	e 19 35	[-27]	—	—	—	—
Algiers	155.3	350	e 19 56	[- 6]	e 27 25	?PR ₁	e 83.6	108.6
Coimbra	155.6	354	e 19 52	[-11]	e 28 22	?	e 61.6	—
Granada	157.5	342	e 19 59	[- 7]	e 31 32	?	—	—
San Fernando	158.9	347	20 11	[+ 4]	32 56	?	—	—

Additional readings and notes: Riverview gives also MN = +13.5m. T₀ = 13h.38m.2s. Christchurch PR₁? = +6m.41s. Honolulu SR₁E = +20m.0s., SR₁N = +20m.27s. T₀ = 13h.38m.18s. Batavia iE = +17m.50s. All readings increased by 1h. Victoria SN = +12m.33s. Chicago L₁ = +55.6m. Ekaterinburg MN = +56.5m. La Paz reading has been increased by 1h. Toronto iE = +25m.42s., eN = +27m.55s., LE = +36.5m., iSN = +36m.37s., LN = +67.6m. Ottawa i = +25m.50s., +27m.11s., +30m.4s., and +31m.55s., L₁ = +59.6m. Pulkovo MZ = +73.2m. Belgrade PR₁ = +20m.53s. and +26m.31s. Coimbra eLN = +65.5m. Granada eP = +20m.7s., i = +20m.34s., PR₁ = +25m.32s., e = +31m.48s., SR₁ = +33m.34s. San Fernando PR₁ = +23m.35s., MN = +46.6m.

July 16d. Readings also at 0h. (Cheltenham), 2h. (Ekaterinburg), 3h. (Apia and La Paz), 5h. (near Batavia and Malabar), 9h. (Ekaterinburg), 10h. and 11h. (near Mostar), 14h. (Capetown, Kodaikanal, and near Manila), 16h. (Georgetown and near Manila), 17h. (Zagreb), 18h. (Ekaterinburg and Pulkovo), 21h. (Ekaterinburg), 23h. (Georgetown).

July 17d. 0h. 20m. 35s. Epicentre 8°-0S. 127°-5E. (as on 1921 Mar. 23d.).

A = -603, B = +786, C = -139; D = +793, E = +609;
G = +085, H = -110, K = -990.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Batavia	20.6	274	e 4 53	+ 5	—	—	—	—
Manila	23.5	344	e 5 15	- 8	(9 20)	-15	9.3	—
Riverview	33.8	142	e 7 1	- 2	e 12 41	+ 3	e 16.1	19.7
Zi-ka-wei	Z. 39.6	352	e 7 25	-26	—	—	—	—
Ekaterinburg	84.5	330	12 45	0	23 7	- 7	41.4	—
Pulkovo	100.5	330	e 13 3	-70	24 13	[-13]	41.4	—
Vienna	109.9	318	e 52 28	?L	—	—	(e 52.5)	71.4
De Bilt	E. 115.8	322	e 19 25	?PR ₁	—	—	e 59.4	61.2
	N.Z. 115.8	322	e 29 25	?S	(e 29 25)	+69	e 60.4	61.9
La Paz	151.0	148	20 3	[+ 6]	—	—	—	—

Additional readings and notes: Riverview gives also PS = +13m.5s., SR₁ = +14m.30s., MN = +16.4m., T₀ = 0h.25m.23s. Riverview readings have been diminished by 5m. Pulkovo ePR₁ = +16m.57s.

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July 17d. 1h. 2m. 10s. Epicentre 63°0N. 144°0W.

A = -·367, B = -·267, C = +·891 ; D = -·588, E = +·809 ;
G = -·721, H = -·524, K = -·454.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Sitka		7·3	141	—	—	—	—	e 4·9	6·6
Victoria	E.	18·5	132	4 28	+ 5	8 15	+24	11·8	12·2
	N.	18·5	132	4 30	+ 7	8 20	+29	12·0	13·7
Berkeley		28·3	142	i 0 53	?	—	—	—	—
Chicago		38·6	98	—	—	17 18	?SR ₁	—	—
Ann Arbor		40·0	92	—	—	—	—	e 20·8	—
Toronto	E.	40·9	87	—	—	i 14 31	+11	20·9	—
	N.	40·9	87	—	—	e 16 52	?SR ₁	i 23·3	—
Ottawa		41·2	83	e 8 5	0	e 14 33	+ 9	e 21·4	—
Honolulu	E.	42·7	200	—	—	—	—	e 21·6	—
Georgetown		45·7	89	e 8 39	+ 1	—	—	e 25·1	—
Washington		45·7	89	—	—	—	—	e 25·2	—
Pulkovo		57·2	4	9 44	- 9	17 30	-19	—	—
Ekaterinburg		58·7	346	e 10 3	0	18 8	+ 1	27·8	—
De Bilt	Z.	62·4	20	e 10 28	0	—	—	—	—
Zi-ka-wei	Z.	64·5	290	—	—	—	—	e 32·4	—
Granada	Z.	74·9	32	i 11 48	0	21 49	+24	—	—

Additional readings: Sitka gives also MN = +6·7m. Toronto iE =
+17m.58s., iN = +26m.6s. Ottawa e = +17m.50s. Honolulu eN =
+21·4m.

July 17d. Readings also at 3h. (Granada), 4h. (near Athens), 5h. (Ekaterinburg and Zi-ka-wei), 11h. (near Athens), 12h. (Nagasaki and Ekaterinburg), 16h. (Zi-ka-wei and near Nagasaki), 17h. (Ekaterinburg), 20h. (near Barcelona).

July 18d. 1h. 5m. 50s. (I) } Epicentre 43°·2N. 29°·5W.
6h. 2m. 4s. (II)

A = +·635, B = -·359, C = +·685 ; D = -·492, E = -·870 ;
G = +·596, H = -·337, K = -·729.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
I Azores		6·2	151	2 10	+35	—	—	—	3·1
II		6·2	151	2 8	+33	—	—	—	3·2
I Coimbra	E.	16·0	93	3 54	+ 2	e 6 40	-15	7·6	9·0
I	N.	16·0	93	—	—	i 7 10	+15	7·4	7·9
II	E.	16·0	93	3 57	+ 5	e 6 39	-16	7·8	8·4
II	N.	16·0	93	—	—	i 7 13	+18	7·5	8·1
I Rio Tinto		18·2	100	5 10	+51	—	—	—	11·7
II		18·2	100	10 56	?L	—	—	(10·9)	10·9
I San Fernando		19·0	103	4 44	+15	8 19	+17	11·2	11·2
II		19·0	103	4 41	+12	8 31	+29	10·4	10·9
I Toledo		19·3	91	4 34	+ 1	8 26	+18	e 9·1	10·1
II		19·3	91	4 38	+ 5	8 27	+19	e 9·1	10·1
I Granada		20·6	99	i 4 53	+ 5	i 8 45	+ 9	i 11·4	13·0
II		20·6	99	i 4 57	+ 9	8 48	+12	—	—
I Oxford		20·7	56	4 58	+ 9	i 8 39	+ 1	—	12·9
II		20·7	56	i 4 53	+ 4	e 8 46	+ 8	—	—
I Edinburgh		21·1	44	e 6 0	+66	i 8 52	+ 6	—	12·3
II		21·1	44	e 4 56	+ 2	i 10 20	+94	—	11·4
I Tortosa	E.	22·3	89	5 12	+ 3	9 17	+ 6	—	11·7
II	N.	22·3	89	5 12	+ 3	9 14	+ 3	10·3	11·6
I	E.	22·3	89	5 11	+ 2	9 25	+14	10·6	12·0
II	N.	22·3	89	5 10	+ 1	9 19	+ 8	10·5	11·5
I Paris		22·8	64	e 5 18	+ 1	e 9 23	+ 2	11·5	12·2
II		22·8	64	i 5 18	+ 3	i 9 24	+ 3	11·6	15·9
I Puy de Dôme		23·1	72	e 5 41	+23	e 10 11	+44	e 12·2	—
II		23·1	72	e 5 27	+ 9	9 37	+10	e 11·9	—

Continued on next page.

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
I Barcelona	23.3	83	5 23	+ 3	e 9 37	+ 6	e 11.2	13.1
II	23.3	83	e 5 28	+ 8	9 40	+ 9	e 12.4	14.2
I Uccle	24.1	60	e 5 25	- 4	9 41	- 5	e 11.5	—
II	24.1	60	e 5 28	- 1	9 44	- 2	e 12.2	—
I De Bilt	24.7	57	5 32	- 3	9 54	- 3	e 11.9	14.7
II	24.7	57	5 35	0	9 57	0	—	14.7
I Besançon	25.1	68	5 42	+ 3	—	—	—	13.2
II	25.1	68	5 38?	- 1	10 9	+ 4	—	—
I Algiers	25.6	93	e 5 42	- 2	10 17	+ 5	12.8	13.7
II	25.6	93	e 5 42	- 2	10 19	+ 5	12.4	13.4
I Strasbourg	26.2	64	5 49	- 1	10 26	0	13.2	14.3
II	26.2	64	e 5 49	- 1	e 10 17	- 9	12.9	14.5
I Moncalieri	26.6	73	5 50	- 4	10 22	- 11	14.0	—
II	26.6	73	e 6 14	+ 20	10 27	- 6	13.7	—
I Hamburg	27.8	54	e 6 0	- 6	—	—	e 15.0	18.2
II	27.8	54	e 6 3	- 3	e 10 49	- 6	e 14.9	17.9
I Rocca di Papa	30.8	78	e 6 22	- 14	(11 34)	- 14	11.6	19.7
II	30.8	78	e 6 38	+ 2	(11 38)	- 10	11.6	18.5
I Vienna	31.9	64	6 39	- 7	11 46	- 19	—	18.2
II	31.9	64	6 41	- 5	—	—	—	17.9
I Zagreb	32.1	70	e 6 40	- 8	e 11 55	- 15	e 15.5	16.0
II	32.1	70	e 6 44	- 4	e 12 10	0	e 16.0	17.7
I Upsala	32.7	43	—	—	—	—	e 19.2	—
II	32.7	43	—	—	—	—	e 19.9	—
I Ottawa	32.7	290	6 53	- 1	12 17	- 2	e 16.2	—
II	32.7	290	6 56	+ 2	12 18	- 1	e 16.4	—
I Georgetown N.	35.7	280	—	—	e 12 57	- 9	—	—
I Toronto E.	35.7	289	7 16	- 3	13 2	- 4	16.5	—
I N.	35.7	289	—	—	e 13 3	- 3	e 18.6	—
II E.	35.7	289	7 18	- 1	i 13 4	- 2	17.9	—
II N.	35.7	289	7 15	- 4	i 13 6	0	16.6	—
I Pulkovo	39.1	44	7 38	- 9	13 40	- 13	19.2	25.6
II	39.1	44	7 42	- 5	13 45	- 8	19.9	—
II Ann Arbor	39.1	288	—	—	(e 13 56)	+ 3	e 13.9	—
II Chicago	42.0	289	8 11	0	14 31	- 4	20.5	—
I Ekaterinburg	55.1	43	9 57	+ 17	17 40	+ 18	25.2	—
II	55.1	43	—	—	—	—	25.9	38.1
I Victoria E.	61.4	313	—	—	—	—	31.1	36.3
II N.	61.4	313	—	—	—	—	14.3	34.8
I La Paz	69.5	221	11 19	+ 5	—	—	—	—
II	69.5	221	e 11 28	+ 14	—	—	—	—

Additional readings and notes : Oxford gives also for IPR₁ = +5m.50s. Paris II MN = +11.9m. Barcelona I MN = +12.0m., II MN = +11.9m. De Bilt I MN = +14.4m., MZ = +15.9m., II MN = +14.5m., MZ = +15.9m. Strasbourg I P = +5m.53s., MN = +14.1m., II eP = +5m.51s., MN = +14.0m. Moncalieri I i = +7m.13s. Hamburg I MN = +16.2m. Rocca di Papa II eN = +5m.56s., ePN = +6m.14s., ePE = +6m.32s. Toronto I PR₁EN = +8m.38s., eLE = +18.8m., eLN = +19.4m., II PR₁EN = +8m.41s., eLN = +18.4m. Pulkovo I PR₁ = +9m.6s. Ann Arbor II e₁ = 5h.57m.48s. Ekaterinburg e = +59m.24s. and +61m.18s. Victoria I LN = +32.5m., II ME = +32.4m. La Paz I P = +11m.42s.

July 18d. 2h. 41m. 46s. Epicentre 9°.5N. 128°.8E. (as on 1913 April 25d.).

A = -.618, B = +.769, C = +.165 ; D = +.779, E = +.627 ; G = -.103, H = +.129, K = -.986.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	9.2	305	—	—	—	—	—	—
Taihoku	17.0	337	e 2 21	+ 2	—	—	5.6	6.1
Zi-ka-wei	23.5	344	e 5 46	+ 23	e 7 14	- 4	—	—
Batavia	27.0	235	1 5 51	- 7	9 18	- 17	—	—
Ekaterinburg	70.2	328	e 11 17	- 1	20 28	0	36.2	43.5
Pulkovo	86.0	330	e 13 34	+ 41	e 23 38	+ 8	33.2	54.9
De Bilt	101.9	329	18 14	†PR ₁	e 40 14	—	e 54.2	—
Strasbourg	102.3	325	—	—	—	—	e 56.2	—
Uccle	103.0	329	—	—	—	—	—	55.2

Additional readings : Manila MN = +7.5m. Ekaterinburg MZ = +45.9m.

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July 18d. Readings also at 0h. (Manila, Riverview, and La Paz), 3h. (Manila), 4h. (De Bilt), 5h. (Nagasaki), 6h. (near Belgrade and Zagreb), 7h. (Pulkovo and Ekaterinburg (2)), 8h. (near Athens), 10h. (near Mostar), 12h. (Moncalieri), 13h. (Nagasaki), 15h. (Rio Tinto, Zi-ka-wei, and near Taihoku), 16h. (Apia and near Lick), 17h. and 20h. (Ekaterinburg).

July 19d. 7h. 13m. 30s. Epicentre 12°-5N. 124°-5E. (as on 1922 April 23d.).

A = -553, B = +805, C = +216; D = +824, E = +566;
G = -123, H = +178, K = -976.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	4.0	302	e 1 17	+15	—	—	2.3	3.2
Zi-ka-wei	18.9	352	e 4 26	-2	e 7 52	-8	—	17.3
Batavia	25.6	224	e 5 21	-23	i 9 29	-45	—	—
Ekaterinburg	65.4	328	11 20	+33	e 19 51	+21	31.5	—
Pulkovo	81.4	330	—	—	—	—	39.5	51.2
De Bilt	97.1	327	—	—	—	—	e 49.5	—

Additional readings: Manila gives also MN = +2.8m. Pulkovo e = +17m.51s. (?PR₁), MN = +46.2m., MZ = +51.7m.

July 19d. Readings also at 0h. (Lick), 1h. (La Paz), 7h. (near Mostar), 9h. (Ekaterinburg), 11h. (Ekaterinburg and near Algiers), 16h. (Ekaterinburg), 18h. (near Athens).

July 20d. 4h. 46m. 48s. Epicentre 28°-5S. 71°-5W. (as on 1923 May 27d.).

A = +279, B = -833, C = -477; D = -948, E = -317;
G = -151, H = +453, K = -879.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Mendoza	5.2	150	4 12	+172	—	—	5.3	6.4
Pilar	E. 7.3	117	3 36	?S	(3 36)	+18	5.3	5.6
Cipolletti	10.8	166	5 35	?L	—	—	6.1	7.3
La Paz	12.4	15	3 3	-2	i 5 31	+2	6.4	8.7
La Plata	E. 13.2	122	3 22	+6	5 55	+6	7.1	9.1
	N. 13.2	122	i 3 19	+3	5 50	+1	7.2	9.5
Rio de Janeiro	N. 26.1	84	e 5 50	+1	10 27	+3	14.4	16.6
Toronto	E. 72.6	355	—	—	i 20 50	-7	e 30.6	—
	N. 72.6	355	—	—	e 20 57	0	30.7	—
Ottawa	74.0	359	—	—	i 19 12	-122	e 33.2	—
Edinburgh	102.3	33	—	—	—	—	e 61.2	—
Uccle	103.6	39	—	—	—	—	—	64.2
Strasbourg	104.4	43	—	—	—	—	e 55.2	62.2
Rocca di Papa	104.5	51	—	—	—	—	e 41.6	42.7
De Bilt	104.6	38	—	—	—	—	e 31.2	65.2
Pulkovo	120.2	36	e 18 17	[-36]	e 28 2	-49	63.2	68.9
Zi-ka-wei	168.5	286	e 20 17	[+3]	e 25 3	?PR ₁	—	—

Additional readings and notes: Pilar gives also LN = +4.6m., MN = +4.8m.
La Plata SN = +5m.58s., T₀ = 4h.46m.56s. Rio de Janeiro LE = +14.2m.
De Bilt MZ = +65.9m., MN = +66.3m. Zi-ka-wei readings have been increased by 1h.

1923. July 20d. 15h. 2m. 33s. Epicentre 1°-5S. 13°-4W.

A = +973, B = -228, C = -026; D = -228, E = -973;
G = -025, H = +006, K = -1.000.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Accra	14.8	62	1 27	?	—	—	—	5.0
San Fernando	38.5	10	18 19	+37	i 13 25	-20	17.4	21.0
Rio Tinto	39.7	9	11 57	?	—	—	—	23.4
Azores	40.9	346	16 15	?L	—	—	(16.2)	22.2
Algiers	41.1	21	7 52	-12	14 4	-18	21.0	22.0
Coimbra	E. 41.9	6	7 57	-13	14 13	-21	20.1	24.5
	N. 41.9	6	—	—	—	—	20.8	24.4

Continued on next page.

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Toledo	42.2	11	8 1	-11	14 21	-17	e 20.9	22.6
Cape Town	43.9	141	14 57	?S	(14 57)	-4	-	24.5
Tortosa	44.1	15	8 17	-10	14 45	-18	e 22.0	-
Barcelona	45.1	17	8 24	-10	15 3	-13	e 22.6	24.0
Marseilles	47.8	19	e 8 51	-2	e 15 55	+4	e 24.4	25.4
Rocca di Papa	49.2	27	i 9 0	-1	i 16 6	-3	i 26.0	28.0
Pompeii	49.2	29	e 9 7	+6	e 15 47	-22	e 27.4	-
Puy de Dôme	49.4	15	e 9 13	+10	e 16 7	-4	e 24.4	-
Moncalieri	50.0	20	9 5	-2	i 16 15	-4	e 24.7	28.0
Florence	50.3	23	-	-	-	-	-	88.0
Besangon	51.5	17	-	-	-	-	e 27.4	-
Paris	52.1	13	e 9 22	+1	e 16 41	-4	e 25.4	28.4
Athens	52.1	38	e 9 20	-1	e 16 42	-3	e 28.3	36.2
	52.1	38	e 9 22	+1	e 16 44	-1	-	-
Helwan	52.8	50	i 9 31	+6	i 16 57	+3	-	33.6
Strasbourg	53.2	17	9 27	0	17 3	+4	e 25.4	30.0
Innsbruck	53.3	21	e 9 17	-11	e 16 57	-3	e 26.4	-
Zagreb	53.8	25	e 9 32	0	e 17 4	-2	e 27.8	23.6
	53.8	25	-	-	e 17 6	-0	e 26.0	21.9
Uccle	54.4	14	e 9 33	-2	17 9	-5	e 22.4	30.8
La Quiaca	55.0	243	16 51	?S	(16 51)	-30	e 32.6	40.2
	55.0	243	16 51	?S	(16 51)	-30	e 30.8	33.4
Belgrade	55.1	30	e 9 46	+6	e 14 32	-170	e 22.6	-
De Bilt	55.8	14	-	-	-	-	e 24.4	29.5
	55.8	14	-	-	17 31	0	e 25.4	31.5
	55.8	14	9 45	0	17 33	+2	-	32.5
Vienna	56.0	24	9 50	+4	17 39	+5	e 31.4	36.0
La Paz	56.1	251	9 45	-2	i 17 34	-1	e 24.0	28.6
Stonyhurst	56.1	8	17 45	?S	(17 45)	+10	e 29.4	30.8
Pilar	56.4	232	20 33	?	-	-	e 29.0	32.4
	56.4	232	20 33	?	-	-	e 28.6	41.8
Budapest	56.5	26	10 20	+31	i 18 13	+33	e 29.6	-
Andalgalá	57.0	237	13 21	?PR ₁	(17 39)	-7	e 17.6	18.6
Edinburgh	57.9	7	-	-	i 18 0	+2	-	32.0
Hamburg	58.4	15	e 10 1	0	e 17 58	-6	e 28.4	35.4
Mendoza	60.4	233	20 33	?S	(20 33)	+125	e 31.2	41.8
Cipolletti	62.4	227	17 9	?	-	-	e 28.2	35.0
Bergen	63.5	10	-	-	-	-	e 27.4	-
Upsala	65.9	17	e 10 58	+8	e 19 37	+1	-	37.1
Pulkovo	69.9	22	11 19	+3	20 21	-4	e 27.4	40.6
Georgetown	70.9	314	e 13 27	+125	e 20 40	+3	-	-
Washington	70.9	314	11 27	+5	20 37	0	-	-
Ottawa	72.2	321	e 11 27	-4	i 21 12	+20	e 33.4	-
Toronto	74.1	318	-	-	(21 27)	+12	e 34.0	-
	74.1	318	-	-	(e 21 5)	-10	e 30.0	-
Chicago	79.4	315	12 12	-3	22 0	-16	e 36.1	-
Ekaterinburg	87.7	32	i 12 47	-16	(i 23 51)	+2	e 40.4	52.4
Kodaikanal	90.9	80	-	-	-	-	e 49.0	55.2
Victoria	104.4	321	26 22	?S	(26 22)	-15	e 41.4	52.3
Zi-ka-wei	127.9	50	21 25	?PR ₁	e 33 3	?	-	82.7
Adelaide	135.0	147	-	-	-	-	-	75.4

Additional readings and notes: San Fernando gives also MN = +21.4m. Algiers PR₁ = +9m.26s. Coimbra PR₁N = +9m.34s., SR₁E = +16m.47s., T₀ = 15h.2m.35s., Toledo PR₁ = +9m.45s., SR₁ = +17m.20s., MNW = +22.7m. Tortosa SE = +14m.47s., LE = +22.4m. Barcelona PR₁ = +10m.11s., SR₁ = +18m.1s., MN = +27.4m. Rocca di Papa eP = +9m.4s. Moncalieri MN = +29.7m. Athens ePR₁EN = +11m.22s. Strasbourg PEN = +9m.30s., MN = +32.0m. Uccle SR₁ = +21m.15s., MN = +29.4m. Belgrade PR₁ = +11m.47s. and PR₂ = +12m.45s. Vienna i = +10m.51s. and +14m.56s., SR₁ = +21m.46s. La Paz eS = +16m.45s., T₀ = 15h.2m.25s. Stonyhurst S = +23m.51s. Hamburg MZ = +35.6m., MN = +36.3m. Upsala MN = +39.3m. Pulkovo PR₁ = +16m.18s., PS = +21m.20s., SR₁ = +24m.51s., MN = +38.8, MZ = +41.4m. Ottawa eL = +28.4m. Toronto gives all its readings as L's. Ekaterinburg PR₁ = +15m.59s., PR₂ = +19m.7s., iS = +22m.59s., which agrees well with [S] true S is given as iPS. Victoria S = +33m.38s., MN = +47.6m.

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July 20d. 16h. 49m. 42s. Epicentre 38°·5N. 135°·0E.

A = -·553, B = +·553, C = +·623 ; D = +·707, E = +·707 ;
G = -·440, H = +·440, K = -·783.

Very rough.

	Δ	Az.	P.		O-C.		S.	O-C.		L.	M.
			m. s.	s.	m. s.	s.		m. s.	m.		
Nagoya	3·7	155	0	50	-	8	—	—	—	1·7	—
Osaka	3·9	175	1	12	+11	—	—	—	—	1·9	2·6
Kobe	3·9	178	1	3	+ 2	—	—	—	—	1·9	1·9
Mizusawa	4·8	80	1	46	+32	—	3 2	+51	—	—	—
Hakodate	5·4	51	2	24	?S	—	(2 24)	- 4	—	4·0	4·3
Sapporo	6·6	44	2	30	?S	—	(2 30)	-30	—	4·5	4·6
Nagasaki	7·1	218	1	34	-14	—	—	—	—	2·1	—
Zi-ka-wei	13·3	241	e 3	2	-15	—	e 5 28	-23	—	—	7·0
Manila	27·0	211	e 5	59	+ 1	—	—	—	—	—	—
Ekaterinburg	50·4	317	i 9	24	+15	—	16 44	+20	—	22·3	—
Pulkovo	64·0	327	i 10	37	- 1	—	19 20	+ 7	—	36·3	—
Vienna	z. 77·6	323	11	50	-15	—	—	—	—	—	—

Additional readings and notes : Osaka gives also MN = +2·3m. Kobe MN = +2·8m. Mizusawa PN = +1m.45s. Ekaterinburg PR₁ = +11m.33s. Pulkovo PR₁ = +13m.18s., PR₂ = +14m.58s., SR₁ = +23m.56s.

July 20d. 21h. 40m. 50s. Epicentre 42°·0N. 142°·0E.

A = -·586, B = +·458, C = +·669 ; D = +·616, E = +·788 ;
G = -·527, H = +·412, K = -·743.

	Δ	Az.	P.		O-C.		S.	O-C.		L.	M.
			m. s.	s.	m. s.	s.		m. s.	m.		
Hakodate	1·0	256	0	16	+ 1	—	—	—	—	0·5	1·1
Sapporo	1·2	336	0	21	+ 3	—	—	—	—	0·6	—
Mizusawa E.	2·9	193	0	40	- 5	—	1 6	-14	—	—	—
Ekaterinburg	51·6	318	—	—	—	—	—	—	—	31·2	—
Pulkovo	64·0	330	—	—	—	—	—	—	—	e 26·0	—
Budapest	77·3	324	22	19	?S	—	(22 19)	+27	—	—	—
Vienna	77·8	327	e 22	35	?S	—	(e 22 35)	+37	—	—	24·2
De Bilt	78·8	335	—	—	—	—	—	—	—	e 27·2	27·8

Additional readings : Hakodate gives also MN = +0·8m. Mizusawa SN = +1m.9s.

July 20d. Readings also at 2h. (near Tortosa), 4h. (Zi-ka-wei), 5h. (Granada), 6h. (La Paz and Mostar), 7h. (Ekaterinburg), 8h. (La Paz), 12h. (Nagasaki, Manila, and Mostar), 15h. (Tortosa), 16h. (near Manila and near Port au Prince), 19h. (near Mizusawa), 20h. and 21h. (near Athens), 22h. (Zagreb), 23h. (Apia).

July 21d. 8h. 30m. 40s. Epicentre 36°·0N. 142°·0E. (as on 1923 June 19d.).

A = -·638, B = +·498, C = +·588 ; D = +·616, E = +·788 ;
G = -·463, H = +·362, K = -·809.

	Δ	Az.	P.		O-C.		S.	O-C.		L.	M.
			m. s.	s.	m. s.	s.		m. s.	m.		
Mizusawa E.	3·2	348	0	52	+ 2	—	1 33	+ 5	—	—	—
N.	3·2	348	0	50	0	—	1 31	+ 3	—	—	—
Nagoya	4·2	260	1	27	+22	—	—	—	—	—	—
Osaka	5·5	258	1	27	+ 2	—	—	—	—	2·5	3·2
Kobe	5·8	259	—	—	—	—	—	—	—	—	3·3
Hakodate	5·9	351	e 1	30	- 1	—	—	—	—	e 2·3	3·1
Zi-ka-wei z.	17·8	260	e 3	0	-75	—	—	—	—	—	—
Ekaterinburg	56·1	321	—	—	—	—	—	—	—	25·3	—

Additional readings : Osaka gives also MN = +3·4m. Kobe MN = +2·8m.

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July 21f. 14h. 1m. 30s. Epicentre 41°·5N. 40°·0W.

A = +·574, B = -·481, C = +·663 ; D = -·643, E = -·766 ;
G = +·508, H = -·426, K = -·749.

Very rough. The only stations which give both P and S (Coimbra and Moncalleri) indicate a later T_s (say 14h. 3m. 0s.), but this could not fit the La Paz observation.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Coimbra	23·8	82	5 52	+26	9 31	- 9	10·9	—
Rio Tinto	25·8	87	13 30	?L	—	—	(13·5)	28·5
Ottawa	26·1	291	—	—	—	—	e 12·0	—
Edinburgh	27·7	46	—	—	—	—	e 15·5	—
Paris	30·4	62	—	—	(e 11 36)	-11	e 11·5	—
Uccle	31·5	59	—	—	—	—	e 14·5	—
De Bilt	32·0	56	—	—	e 12 36	+28	e 15·5	18·6
Besançon	32·9	66	—	—	—	—	—	18·5
Strasbourg	33·9	61	e 12 30	?S	(e 12 30)	- 9	17·5	19·5
Moncalleri	34·4	69	e 7 24	+16	11 38	-68	17·1	—
Pulkovo	45·6	42	—	—	—	—	—	30·5
La Paz	63·6	210	10 35	- 1	—	—	—	—

Additional readings: Coimbra gives also LN = +16·7m. Ottawa L = +19·5m. De Bilt MN = +16·8m., MZ = +19·1m.

July 21d. Readings also at 0h. (near Tortosa), 1h. (Ekaterinburg, Pulkovo, Simla, De Bilt, Vienna, Hamburg, and Upsala), 2h. (La Paz (2) and Ekaterinburg), 7h. and 8h. (Toronto), 13h. (near Ekaterinburg and Mostar), 15h. (near Tortosa), 18h. (Nagasaki), 19h. (Nagoya), 22h. (Nagasaki), 23h. (Ekaterinburg and near Belgrade).

July 22d. 0h. 16m. 4s. Epicentre 28°·5S. 71°·5W. (as on July 20d.).

A = +·279, B = -·833, C = -·477 ; D = -·948, E = -·317 ;
G = -·151, H = +·453, K = -·879.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Andalgala N.	4·7	80	1 44	+31	—	—	2·3	2·5
Mendoza	5·2	150	1 20	0	—	—	2·6	3·2
Pilar E.	7·3	117	3 50	?S	(3 50)	+32	4·4	7·6
Pilar N.	7·3	117	3 26	?S	(3 26)	+ 8	4·4	5·2
Cipolletti	10·8	166	4 32	?S	(4 32)	-18	5·8	6·9
La Paz	12·4	15	e 3 0	- 5	15 21	- 8	6·3	7·4
La Plata E.	13·2	122	6 3	?S	(6 3)	+14	7·1	8·4
Rio de Janeiro	26·1	84	—	—	e 10 41	+17	16·4	—

Mendoza readings have been diminished by 2min. Rio de Janeiro readings are given for 3h. Andalgala readings have increased by 10min.

July 22d. 12h. 45m. 15s. Epicentre 45°·0N. 29°·0E.

A = +·618, B = +·343, C = +·707 ; D = +·485, E = -·875 ;
G = +·618, H = +·343, K = -·707.

But see alternative solution below.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Belgrade	6·1	272	e 1 27	- 6	e 2 34	-12	1 3·3	—
Budapest	7·3	293	5 59	+248	—	—	—	—
Athens	8·1	210	e 2 1	- 2	—	—	e 2·6	3·1
Zagreb	9·2	280	2 52	+33	e 3 40	-28	—	—
Vienna z.	9·2	295	e 4 9	?S	(e 4 9)	+ 1	—	6·2
Rocca di Papa	12·3	260	e 4 27	?S	(e 4 27)	-59	—	6·0
Ekaterinburg	22·9	48	—	—	—	—	16·8	—

Athens gives also MN = +2·7m. The Athens readings suggest that the epicentre is closer to Athens, and the Ekaterinburg L suggests that it is further from Ekaterinburg. If we may assume an error of 1min. at Athens and 4min. at Budapest, the following solution is suggested. (It will be seen that the times for Budapest are erroneous by 1min. in the following earthquake.):—

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July 22d. 12h. 45m. 15s. Epicentre 40°·5N. 25°·5E. (as on 1918 April 17d.).

A = +·686, B = +·327, C = +·649; D = +·430, E = -·903;
G = +·586, H = +·280, K = -·760.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	2·9	208	e 2 1	+76	—	—	e 2·6	3·1
Belgrade	5·7	322	e 1 27	- 1	e 2 34	- 2	i 3·3	—
Budapest	8·3	329	5 59	+233	—	—	—	—
Rocca di Papa	9·7	281	e 4 27	?S	(e 4 27)	+ 6	—	6·0
Vienna	10·0	323	e 4 9	?S	(e 4 9)	-20	—	6·2
Ekaterinburg	27·9	43	—	—	—	—	16·8	—

1923. July 22d. 14h. 17m. 54s. Epicentre 51°·6N. 172°·0E.

A = -·615, B = +·086, C = +·784; D = +·139, E = +·990;
G = -·776, H = +·109, K = -·621.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Ootomari	19·6	267	4 56	+20	—	—	7·1	7·4
Sapporo	22·3	260	5 13	+ 4	9 0	-11	14·9	—
Hakodate	23·4	258	5 8	-13	—	—	—	6·5
Mizusawa	24·8	252	5 43	+ 7	(10 3)	+ 4	10·0	—
Sitka	E. 30·3	60	c 6 36	+ 5	11 10	-29	14·2	22·2
	N. 30·3	60	—	—	—	—	16·0	24·3
Osaka	31·1	254	6 58	+19	(11 57)	+ 4	12·0	12·2
Kobe	31·3	254	6 53	+12	11 49	- 7	14·5	21·4
Honolulu	E. 38·1	133	7 26	-13	i 13 26	-13	e 17·2	18·7
	N. 38·1	133	i 7 24	-15	—	—	18·1	18·5
Victoria	E. 40·3	70	7 39	-18	13 39	-32	23·9	29·3
	N. 40·3	70	7 51	- 6	13 33	-38	23·7	24·4
Zi-ka-wei	42·0	264	e 8 6	- 5	e 13 50	-45	23·7	—
Taihoku	46·4	258	—	—	e 15 33	0	—	—
Berkeley	46·9	82	e 9 2	+16	e 15 29	-11	e 20·7	21·4
Manila	54·9	249	e 9 57	+19	(17 36)	+16	17·6	—
Ekaterinburg	57·8	324	i 10 20	+22	18 22	+26	26·1	33·9
Chicago	64·0	56	10 41	+ 3	19 0	-13	30·4	—
Pulkovo	64·4	340	i 10 42	+ 1	19 26	+ 8	35·1	40·4
Ann Arbor	65·5	53	—	—	19 36	+ 5	e 32·1	—
Toronto	E. 66·5	50	10 53	- 2	i 19 40	- 4	32·9	41·4
	N. 66·5	50	e 10 47	- 8	i 19 42	- 2	32·8	44·2
Upsala	E. 66·6	348	e 10 58	+ 3	e 19 49	+ 4	31·1	45·5
	N. 66·6	348	—	—	—	—	29·1	50·1
Ottawa	66·9	45	10 58	+ 1	19 46	- 3	e 33·1	—
Apia	67·0	164	—	—	—	—	—	37·1
Ithaca	68·8	49	e 11 6?	- 4	20 6?	- 6	37·1?	—
Simla	E. 68·9	294	e 20 24	?S	(e 20 24)	+11	37·7	40·5
Northfield	69·2	44	—	—	—	—	e 38·1	—
Dyce	71·1	358	11 23	+ 1	20 48	+ 9	—	41·4
Georgetown	E. 71·3	51	11 31	+ 6	20 41	- 1	e 34·6	46·2
	N. 71·3	51	11 31	+ 6	20 41	- 1	e 35·3	—
Washington	71·3	51	11 28	+ 3	20 41	- 1	e 36·1	—
Cheltenham	E. 71·6	51	e 10 46	-41	20 0	-45	33·6	45·6
	N. 71·6	51	e 11 29	+ 2	20 22	-23	35·0	—
Edinburgh	72·4	358	11 46	+14	21 0	+ 5	39·1	60·1
Hamburg	73·7	350	e 11 41	+ 1	e 21 8	- 2	e 38·1	43·1
Stonyhurst	74·4	357	21 6	?S	(21 6)	-13	—	45·1
De Bilt	75·7	353	11 53	0	21 35	+ 1	e 37·1	49·0
Tifis	76·1	324	e 14 36	?PR ₁	e 24 30	?SR ₁	e 40·1	46·2
Oxford	76·5	357	—	—	i 21 40	- 3	—	62·1
Uccle	77·1	353	e 12 0	- 2	21 47	- 3	e 37·1	42·3
Vienna	78·0	345	e 12 7	0	21 57	- 3	e 41·1	52·1
Budapest	78·3	343	i 13 6	+57	i 23 4	+60	28·3	—
Strasbourg	E. 78·9	351	12 14	+ 2	22 6	- 5	36·1	53·8
	N. 78·9	351	—	—	22 22	+11	—	46·1
Paris	79·2	355	e 12 14	0	i 22 10	- 4	40·1	61·1
Innsbruck	79·7	348	i 12 18	+ 1	—	—	e 28·1	—
Zurich	80·0	350	e 12 16	- 3	e 22 33	+10	—	—
Zagreb	N.E. 80·4	345	e 12 20	- 1	e 22 28	0	42·5	57·0
	N.W. 80·4	345	12 23	+ 2	e 22 25	- 3	—	53·0
Besançon	80·5	352	—	—	—	—	44·1	—
Belgrade	80·5	340	e 12 19	- 3	e 22 39	+10	e 46·7	—

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Bombay	80.8	290	12 26	+ 2	22 42	+ 9	42.8	46.0
Moncalieri	82.4	350	12 33	+ 1	22 53	+ 3	37.5	52.8
Florence	83.1	348	11 44	-53	—	—	—	—
Kodaikanal	84.8	281	23 24	?S	(23 24)	+ 7	48.0	61.3
Rocca di Papa	85.0	346	12 58	+10	23 18	- 1	e 31.9	65.3
Barcelona	86.5	354	e 12 58	+ 2	e 23 20	-16	c 36.7	57.7
Tortosa	E. 87.3	355	13 6	+ 5	23 40	- 4	45.2	56.4
	N. 87.3	355	12 59	- 2	23 27	-17	—	64.0
Riverview	87.4	197	e 13 31	+30	e 23 56	+ 5	e 38.5	45.6
Sydney	87.4	197	23 36	?S	(23 36)	—	47.5	50.7
Coimbra	E. 88.2	1	12 58	- 8	23 12	[- 4]	44.6	51.7
	N. 88.2	1	—	—	21 38	-136	47.3	52.8
Toledo	88.5	358	12 59	- 9	23 30	[+11]	e 40.4	57.4
Rio Tinto	90.6	0	21 6	?	—	—	—	74.1
Algiers	91.1	352	e 13 12	-10	23 45	[+10]	40.1	56.1
Granada	91.2	356	i 13 23	+ 1	24 15	-11	e 49.1	55.6
Adelaide	91.3	207	—	—	e 24 18	- 9	46.6	59.6
Helwan	91.6	328	e 13 18	- 7	23 49	[+12]	—	—
San Fernando	92.0	359	13 15	-12	23 57	[+17]	51.1	62.1
Melbourne	92.5	201	—	—	(i 24 36)	- 4	i 24.6	61.9
Perth	97.0	227	—	—	24 58	-28	—	—
La Paz	121.2	79	e 19 36	?PR ₁	e 33 53	?SR ₁	59.9	68.9
Cipolletti	137.1	97	57 18	?	—	—	67.2	71.3

Additional readings and notes: Sapporo gives also PR₁ = +5m.50s., PR₂ = +6m.6s. Hakodate MN = +5.7m. Sitka PR₁E = +6m.56s., Ee = +12m.48s., eN = +12m.56s. T₀ = 14h.18m.19s. Osaka MN = +15.4m. Kobe MN = +15.6m. Honolulu PR₁N = +8m.56s., eN = +14m.46s., LN = +16.6m. and +17.6m. T₀ = 14h.70m.40s. Zi-ka-wei MN = +22.8m. Ekaterinburg iPR₁ = +12m.25s., iPR₂ = +13m.50s., iPR₃ = +14m.30s., MN = +39.8m., MZ = +36.6m. Chicago L = +34.1m. Pulkovo PR₁ = +13m.19s., PR₂ = +14m.47s., SR₁ = +23m.42s., MZ = +44.1m. Ann Arbor L = +35.6m. and +39.6m. Toronto eE = +19m.36s., SR₁E = +27m.6s., i = +27m.14s., SR₁N = +27m.20s., LEN = +30.9m., iLE = +32.0m. Ottawa SR₂ = +27m.36s., L = +48.1m. T₀ = 14h.18m.7s. Ithaca L = +32.1m. Georgetown LE = +43.8m., LN = +42.6m. Washington L = +43.6m. Cheltenham LN = +32.4m. T₀ = 14h.17m.25s. De Bilt eZ = +16m.25s., eN = +16m.36s., eN = +26m.49s., MZ = +41.6m., MN = +41.8m. Tifis eN = +15m.18s., MN = +46.1m. Uccle SR₁ = +27m.12s., SR₂ = +31m.0s. Vienna i = +24m.20s. Paris MN = +46.1m. Zurich iPZ = +12m.19s. Zagreb ePR₁NE = +15m.22s., ePR₂NE = +18m.43s., eSR₁NW = +27m.53s. Belgrade iP = +12m.27s., PR₁ = +13m.39s., PR₂ = +16m.21s., iS = +22m.43s., SR₁ = +24m.49s., L = +52.8m. Florence readings has been diminished by 1h. Rocca di Papa PN = +13m.2s., eP = +13m.12s., SN = +23m.18s. Riverview eS = +23m.23s., SR₁ = +29m.31s., MN = +45.2m. T₀ = 14h.19m.21s. Coimbra eN = +10m.24s., eN = +12m.13s., iN = +23m.30s., iE = +23m.38s. T₀ = 14h.17m.36s. Toledo PR₁NE = +15m.48s., PR₁NW = +16m.38s., SR₁NE = +29m.44s., SR₁NW = +29m.52s., MNW = +53.7m. Adelaide e = +30m.6s., +32m.12s., +38m.54s., and +54m.6s. San Fernando MN = +65.1m. La Paz MN = +77.4m. T₀ = 14h.18m.20s.

July 22d. Readings also at 2h. (Ekaterinburg), 3h. (Strasbourg, De Bilt, Edinburgh, Pulkovo, and near Innsbruck, Vienna, Zagreb, and Zurich), 4h. and 5h. (Nagasaki), 13h. (near Belgrade), 14h. (Stonyhurst), 18h. (near Mostar), 23h. (Ekaterinburg).

July 23d. 7h. 30m. 18s. Epicentre 33° 0N. 119° 0W.

A = -.407, B = -.734, C = +.545; D = -.875, E = +.485;
G = -.264, H = -.476, K = -.839.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Berkeley	E. 5.6	333	e 1 25	- 2	(2 31)	- 3	2.5	3.4
	N. 5.6	333	e 1 26	- 1	(2 35)	+ 1	2.6	3.1
Tucson	E. 6.9	94	e 1 55	+10	2 54	-13	3.3	3.6
	N. 6.9	94	1 47	+ 2	3 4	- 3	3.2	3.5
Denver	13.1	55	1 42	?	—	—	3.7	4.2
Victoria	E. 15.7	350	3 47	- 1	—	—	6.8	8.5
	N. 15.7	350	3 46	- 2	—	—	7.1	8.7

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		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Chicago		26.3	61	5 25	-26	9 42	-46	12.0	—
Sitka	N.	26.5	340	—	—	—	e 16.3	17.1	—
Ann Arbor		29.3	61	e 7 42	+81	—	i 14.9	—	—
Toronto	E.	32.5	59	—	—	11 30	-46	16.9	19.3
	N.	32.5	59	—	—	11 30	-46	16.7	16.9
Georgetown		34.2	68	e 7 42	+35	i 16 55	?L (i 16.9)	—	—
Washington		34.2	68	—	—	9 51	-172	—	17.7
Cheltenham	N.	34.3	68	—	—	16 15	?L	17.2	17.6
Ithaca		34.5	61	—	—	e 13 42	+54	i 17.6	18.2
Ottawa		35.3	57	e 7 52	+36	—	—	e 17.7	—
Honolulu	E.	36.4	262	—	—	—	—	e 18.0	19.9
	N.	36.4	262	—	—	—	—	18.9	18.8
Northfield		37.4	58	—	—	e 14 42	+72	e 18.7	—
La Paz		69.4	128	e 11 13	0	21 11	+52	37.5	42.1
Edinburgh		75.8	32	—	—	—	—	e 36.7	43.2
Upsala		80.6	21	—	—	—	—	e 44.7	—
De Bilt		82.0	30	12 25	-5	e 22 37	-9	e 38.7	48.3
Hamburg		82.4	27	—	—	—	—	e 42.7	—
Uccle		82.5	31	—	—	—	—	e 36.7	—
Coimbra		82.9	46	—	—	e 22 12	-44	37.7	—
Pulkovo		83.9	15	12 35	-6	—	—	40.7	46.0
Strasbourg		85.7	32	—	—	—	—	e 37.7	—
Tortosa	N.	87.6	41	—	—	—	—	e 36.7	48.8
Moncalieri		88.3	35	—	—	e 23 32	-23	—	43.3
Ekaterinburg		90.2	0	i 13 26	+9	23 54	-22	39.7	49.5

Additional readings and notes: Berkeley gives also $iPZ? = +1m.51s.$, $iPE? = +1m.53s.$, $iN = +2m.23s.$, $MN = +4.0m.$ Sitka $LE = +13.0m.$, $eLE = +14.9m.$ Ann Arbor $e = +14m.24s.$ Toronto $eE = +9m.50s.$ and $+10m.32s.$, $iE = +16m.10s.$, $iN = +16m.11s.$, $iE = +16m.40s.$, $LN = +16.5m.$ Georgetown $iSN = +17m.5s.$ Cheltenham $eE = +16m.53s.$ Honolulu $SR_1 = +16m.1s.$, $LN = +17.1m.$ De Bilt $eZ = +22m.18s.$, $MN = +44.6m.$ $MZ = +48.6m.$ Coimbra $eN = +24m.12s.$ Pulkovo $MN = +50.5m.$ Ekaterinburg $MZ = +56.9m.$

July 23d. Readings also at 3h. (Strasbourg, De Bilt, Moncalieri, Pulkovo, Uccle, Edinburgh, Rocca di Papa, Zagreb, near Athens, and near Belgrade), 4h. (Apia, near Athens, and near Mizusawa), 6h. (Ekaterinburg, Zagreb, Strasbourg, De Bilt, and near Athens), 8h. (La Paz), 9h. (Honolulu), 11h. (Sarajevo (2)), 14h. (near Sarajevo (2)), 15h. (Ekaterinburg and Sarajevo (3)), 17h. (Sarajevo), 19h. (Toledo, Sarajevo (2), Ekaterinburg, Pulkovo, and Athens), 20h. (near Athens and near Mostar), 21h. (Paris, Coimbra, De Bilt, Strasbourg, Pulkovo, Eskdalemuir, and Edinburgh), 23h. (Apia).

July 24d. 3h. 32m. 50s. Epicentre $28^{\circ}5S.$ $71^{\circ}5W.$ (as on July 22d.).

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Andalgala	N.	4.7	80	—	—	—	—	2.4	2.9
Mendoza		5.2	150	1 34	+14	—	—	2.6	3.3
Pilar	E.	7.3	117	2 40	18	(2 40)	-38	4.1	4.7
	N.	7.3	117	2 34	18	(2 34)	-44	4.1	4.4
Cipolletti		10.8	166	4 22	18	(4 22)	-28	5.9	6.7
La Paz		12.4	15	13 9	+4	15 28	-1	6.4	9.5
La Plata	E.	13.2	122	13 11	-5	5 36	-13	6.8	8.7
	N.	13.2	122	13 23	+7	5 50	+1	6.7	7.4

Andalgala readings have been increased by 4m.

July 24d. Readings also at 0h. (near Athens and near Manila), 1h. (Nagasaki), 5h. (near Mostar), 6h. (Ekaterinburg), 7h. (Nagoya), 9h. and 11h. (Ekaterinburg), 12h. (Batavia), 13h. (La Paz, Pulkovo, Riverview, and Ekaterinburg), 14h. (Nagasaki), 20h. (Toledo and Ekaterinburg), 21h. (Tiflis and Ekaterinburg).

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July 25d. 12h. 23m. 46s. Epicentre 34°·0N. 14°·0E. (as on 1920 Aug. 16d.).

A = +·804, B = +·201, C = +·559 ; D = +·242, E = -·970 ;
G = +·543, H = +·135, K = -·829.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Pompeii	6·8	3	e 2 14	+30	—	—	—	—
Rocca di Papa	7·8	353	e 1 52	- 6	2 35	-56	2·9	3·3
Algiers	9·4	290	e 5 23	?L	—	—	(e 5·4)	—
Zagreb	N.E. 11·9	7	3 0	+ 2	e 5 17	0	e 5·7	7·5
	N.W. 11·9	7	2 58	0	—	—	e 5·8	6·7
Moncalieri	12·0	338	e 2 58	- 1	(5 6)	-13	5·1	6·1
Tortosa	N. 12·7	306	(4 39)	+90	—	—	4·6	9·1
Budapest	14·0	14	—	—	—	—	e 9·2	—
Vienna	14·3	6	—	—	(6 14)	- 1	e 6·2	13·2
Strasbourg	15·3	344	—	—	—	—	5·2	7·0
Coimbra	18·9	296	e 4 20	- 8	e 7 58	- 2	9·2	—
De Bilt	19·2	343	e 4 36	+ 5	—	—	e 9·2	—
Hamburg	19·8	353	e 4 49	+10	—	—	e 10·2	11·1
Edinburgh	24·9	337	—	—	—	—	e 13·2	—
Upsala	25·9	3	—	—	—	—	e 15·2	—
Ekaterinburg	38·8	39	(8 14)	+30	—	—	8·2	—

Additional readings : Rocca di Papa gives also iPN = +1m.57s., iPE = +2m.4s.
Algiers ? = +3m.54s. Zagreb eNW = +3m.7s., eNE = +3m.14s. and
+4m.55s. Tortosa ME = +13·1m. Coimbra e = +5m.10s., eN =
+8m.20s. Hamburg MN = +14·5m.

July 25d. Readings also at 2h. (Toronto and Ekaterinburg), 4h. (Batavia, Manila, La Paz, Pulkovo, and Ekaterinburg), 5h. (Nagasaki), 6h. (Batavia), 8h. (Ekaterinburg), 11h. (Apia and Toledo), 14h. and 16h. (Ekaterinburg), 17h. (Algiers), 20h. (Ekaterinburg), 21h. (near Mizusawa), 23h. (near Taihoku).

July 26d. 3h. 11m. 30s. Epicentre 32°·5N. 143°·0E. (as on 1922 May 1d.).

A = -·673, B = +·508, C = +·537 ; D = +·602, E = +·799 ;
G = -·429, H = +·323, K = -·843.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Nagoya	5·7	299	1 1	-27	—	—	—	—
Osaka	6·6	291	2 4	+23	—	—	4·2	4·7
Kobe	6·8	291	1 44	0	—	—	5·0	7·9
Mizusawa	E. 6·8	348	1 35	- 9	2 48	-17	—	—
Zi-ka-wei	18·3	272	e 4 6	-15	—	—	—	13·0
Manila	26·8	233	e 11 30	?S	(e 11 30)	+53	—	—
Honolulu	53·1	87	—	—	—	—	e 24·5	—
Ekaterinburg	59·2	321	i 10 24	+18	—	—	—	—
Victoria	68·6	46	—	—	—	—	29·6	34·0
De Bilt	87·7	335	—	—	—	—	e 47·5	57·1
Uccle	89·0	335	—	—	—	—	—	48·5
Strasbourg	89·6	331	—	—	—	—	e 52·5	—
Toronto	E. 94·6	30	e 8 30	?	—	—	—	14·9
Toledo	101·5	335	—	—	—	—	—	53·5
La Paz	147·7	66	19 58	[+ 6]	—	—	—	—

Additional readings : Osaka gives also MN = +4·5m. Kobe MN = +6·5m.
Mizusawa PN = +1m.37s.

July 26d. 7h. 27m. 30s. (I) } Epicentre 1°·2S. 149°·5E. (as on 1920 Feb. 9d.).
9h. 55m. 30s. (II) }

Very rough.

A = -·862, B = +·508, C = -·021 ; D = +·508, E = +·862 ;
G = +·011, H = -·018, K = -1·000.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
I Riverview	32·7	178	e 7 25	+31	e 12 25	+ 6	—	19·1
II Sydney	32·7	178	e 6 55	+ 1	e 12 29	+10	—	19·2
I Adelaide	32·7	178	7 30	+36	—	—	14·1	14·8
II Adelaide	32·7	178	12 30	?S	(12 30)	+11	16·2	17·5
	35·3	195	—	—	—	—	e 17·6	—
	35·3	195	—	—	—	—	e 15·0	—

Continued on next page.

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		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.	
		°	°	m. s.	s.	m. s.	s.	m.	m.	
I	Honolulu	N.	55-9	63	—	—	e 17 25	- 8	20-8	25-3
II		N.	45-9	63	—	—	e 17 27	- 6	20-8	25-5
I	Victoria	E.	89-1	41	25 14	?S	(25 14)	+70	—	44-1
I		N.	89-1	41	25 24	?S	(25 24)	+80	—	38-2
II		E.	89-1	41	14 55	+104	25 25	+81	37-9	44-2
II		N.	89-1	41	14 55	+104	25 30	+86	38-1	43-7
I	Ekaterinburg		90-4	327	22 10	?	31 45	?SR ₁	46-5	70-3
II			90-4	327	22 20	?	31 52	?SR ₁	48-5	70-4
II	Pulkovo		105-3	333	—	—	e 25 30	[+41]	59-5	—
II	Toronto		119-3	38	e 15 0	-39	e 37 8	?SR ₁	e 56-8	—
I	Ottawa		120-6	34	—	—	—	—	e 42-5	—
II			120-6	34	—	—	—	—	e 54-5	—
I	De Bilt		121-0	335	—	—	—	—	e 75-5	—
II			121-0	335	—	—	—	—	e 73-5	—
II	Venice		121-9	326	22 30	?PR ₁	—	—	—	—
I	Strasbourg		122-3	331	—	—	—	—	e 72-5	—
II			122-3	331	e 26 51	?S	(e 26 51)	-135	e 77-5	—
II	Pompeii		123-3	320	22 0	?PR ₁	—	—	—	—
II	Rocca di Papa		123-9	321	e 22 0	?PR ₁	—	—	—	—
II	Colmbra		136-1	337	e 49 0	?	—	—	e 67-0	—

Additional readings: Riverview gives also for I MN = +15.3m., II MN = +19.0m. Ekaterinburg I MN = +57.6, MZ = +73.7m., II MN = +59.9m., MZ = +73.8m. Rocca di Papa II ePNZ = +22m.30s.

July 26d. 23h. 37m. 6s. Epicentre 41°-0N. 131°-0E. (as on 1923 Mar. 3d.).

A = -495, B = +570, C = +656; D = +755, E = +656;
G = -430, H = +495, K = -755.

The European observations require an epicentre at least 6° nearer Europe, which the Japanese observations do not permit. Probably there was more than one shock, as indicated by Ekaterinburg.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.	
		°	°	m. s.	s.	m. s.	s.	m.	m.	
	Kobe		7-1	150	2 10	+22	—	—	3-9	4-0
	Osaka		7-2	149	—	—	3 52	+37	4-5	4-6
	Hakodate		7-3	81	1 59	+ 8	—	—	—	4-0
	Mizusawa	E.	8-0	100	2 3	+ 2	3 40	+ 3	—	—
		N.	8-0	100	2 4	+ 3	3 39	+ 2	—	—
	Sapporo		8-0	71	1 58	- 3	(2 58)	-39	3-0	3-4
	Zi-ka-wei		12-4	221	i 2 54	-11	e 5 14	-15	—	—
	Ekaterinburg		46-5	315	e 8 1	-43	13 56	-99	23-9	—
	Pulkovo		60-2	325	9 6	-67	16 27	-119	e 19-9	—
	Strasbourg		77-4	325	—	—	e 19 54	-119	—	—
	La Paz		150-5	40	19 59	[+ 2]	—	—	—	—

Additional readings and notes: Osaka gives also MN = +5.2m. Hakodate MN = +2.7m. Sapporo MN = +3.7m. Ekaterinburg i = +9m.24s., e = +10m.41s., i = +11m.32s., +12m.21s., and +16m.44s.

July 26d. Readings also at 2h. (near La Paz), 12h. (Ekaterinburg), 13h. (Zi-ka-wei), 15h. (Ekaterinburg), 16h. (near Toledo and Algiers), 18h. (Ekaterinburg and near Algiers).

July 27d. 11h. 24m. 54s. Epicentre 1°-0N. 101°-0E.

A = -191, B = +981, C = +017; D = +982, E = +191;
G = -003, H = +017, K = -1-000.

Doubtful.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.	
		°	°	m. s.	s.	m. s.	s.	m.	m.	
	Batavia		9-2	141	e 2 18	- 1	i 4 6	- 2	—	—
	Mandla		24-0	54	e 9 43	?S	(e 9 43)	- 1	11-5	—
	Perth		35-8	159	(7 7)	-13	7 7	?P	e 10-4	14-2
	Adelaide		50-2	140	—	—	e 17 36	+75	—	—
	Melbourne		56-0	139	—	—	(e 17 48)	+14	e 17-8	22-8
	Riverview		58-5	132	—	—	e 18 18	+13	e 24-0	24-9
	Sydney		58-5	132	18 12	?S	(18 12)	+ 7	24-1	25-6
	Pulkovo		79-6	331	e 27 25	?SR ₁	—	—	48-1	62-0
	La Paz		161-2	214	19 55	[-14]	—	—	—	—

Additional readings: Riverview gives also MN = +24.8m. Pulkovo MN = +54.9m., MZ = +63.0m.

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July 27d. Readings also at 2h. (Toronto), 3h. (Ekaterinburg), 4h. (Pulkovo and Ekaterinburg), 12h. (Ekaterinburg and near Taihoku), 13h. (near Algiers), 14h. (Zante), 16h. (Ascension), 18h. (Algiers), 22h. (Nagasaki).

July 28d. 10h. 48m. 20s. Epicentre 33°·0N. 140°·0E.

A = -·643, B = +·539, C = +·545 ; D = +·643, E = +·766 ;

G = -·417, H = +·350, K = -·839.

Very rough.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Nagoya	3·4	312	1 5	+12	—	—	—	—
Osaka	4·2	296	2 40	?L	—	—	3·9	5·1
Mizusawa E.	6·2	8	1 32	— 3	—	— 4	—	—
Zi-ka-wei	15·8	269	—	—	e 6 38	-12	—	—
Ekaterinburg	57·3	320	10 20	+26	18 24	+34	28·7	—

Additional readings: Osaka gives also MN = +5·3m. Mizusawa SN = +2m.46s.

July 28d. Readings also at 2h. (Nagasaki and Ekaterinburg), 3h. (Granada (2)), 6h. (Ekaterinburg), 12h. (Strasbourg), 13h. (Granada), 16h. (Rio Tinto), 18h. (Toronto and Mostar), 19h. (Nagasaki (2)), 22h. (Rocca di Papa and near Zagreb and Mostar), 23h. (Rocca di Papa).

July 29d. 9h. 37m. 20s. Epicentre 37°·5N. 70°·5E. (as on July 16d.).

A = +·265, B = +·748, C = +·609 ; D = +·943, E = -·334 ;

G = +·203, H = +·574, K = -·793.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Ekaterinburg	20·4	345	14 54	+ 8	8 41	+ 9	9·7	12·5
Colombo	31·8	162	22 10	?	—	—	—	—
Pulkovo	33·8	324	1 6 54	- 9	1 12 36	- 2	16·7	21·9
Upsala	39·9	323	—	—	—	—	e 19·7	25·6
Hamburg	43·8	313	—	—	—	—	e 23·7	26·7
Strasbourg	45·9	307	—	—	—	—	e 22·7	—
De Bilt	46·8	310	—	—	—	—	e 25·7	32·3
Uccle	47·6	308	—	—	—	—	e 26·7	—
Edinburgh	51·0	316	—	—	—	—	e 30·7	—

Additional readings: Pulkovo gives also MZ = +21·8m. Strasbourg eL = +32·7m. De Bilt eL = +27·7m. Uccle e = +31m.40s. Eskdalemuir ($\Delta = 51^\circ \cdot 2$) gives simply 10h.

July 29d. Readings also at 0h. (Colombo), 1h. (Apia), 2h. and 3h. (Nagasaki), 7h. (near Victoria), 8h. (near Rocca di Papa and Zagreb), 12h. (Mostar), 13h. (Ekaterinburg and near Zagreb and Athens), 18h. (Mostar), 19h. (Zagreb), 21h. (Ekaterinburg).

July 30d. Readings at 7h. (near Osaka and Kobe), 16h. (Nagasaki), 23h. (Ottawa)

July 31d. 1h. 38m. 35s. Epicentre 36°·0N. 21°·5E. (as on 1922 April 20d.).

A = +·753, B = +·297, C = +·588 ; D = +·366, E = -·930 ;

G = +·547, H = +·215, K = -·809.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	2·6	46	e 0 41	0	(1 10)	- 2	1·2	1·4
Pompeii	7·3	313	2 22	+31	—	—	—	—
Belgrade	8·8	355	e 2 16	+ 3	e 3 59	+ 1	—	5·5
Rocca di Papa	9·0	313	i 3 1	+45	—	—	—	4·9
Zagreb	10·8	339	2 37	- 4	e 4 34	-16	e 5·4	6·8
Moncalieri	13·8	315	—	—	e 5 40	-23	7·8	—
Strasbourg	16·1	326	—	—	—	—	e 6·4	—
Pulkovo	24·5	11	5 4	-29	8 34	-80	11·4	15·2
Ekaterinburg	33·4	39	e 7 3	+ 3	—	—	18·4	—

Additional readings and notes: Zante $\Delta = 2^\circ \cdot 8$ gives simply 1h.32m. Athens gives also iP = +46s., MN = +1·5m. Belgrade eP = +2m.37s. Zagreb gives many other e readings and MNW = +6·5m.

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July 31d. 5h. 34m. 55s. Epicentre 13°-08. 66°-0W.

A = +.396, B = -.890, C = -.225; D = -.914, E = -.407;
G = -.091, H = +.206, K = -.974.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
La Paz		4.1	210	1 2	- 2	i 1 52	- 1	2.2	2.5
Andalgala	N.	14.6	181	3 59	+25	—	—	5.1	6.6
Pilar	E.	18.8	174	2 11	-136	—	—	5.0	6.3
La Plata	E.	23.1	163	i 3 19	-119	6 46	-161	9.2	10.0
	N.	23.1	163	i 3 20	-118	6 51	-156	8.6	10.1
Rio de Janeiro	N.	23.8	118	i 4 35	-51	9 39	- 1	12.2	16.1
	E.	23.8	118	—	—	9 35	- 5	12.2	12.8
Cipolletti		26.0	184	(6 41)	+53	—	—	6.7	6.8
Toronto	E.	57.9	350	—	—	i 16 31	-87	26.4	—
	N.	57.9	350	—	—	i 18 45	+47	28.3	—
Chicago		58.6	341	10 5	+ 2	18 7	+ 1 e	29.9	—
Ottawa		59.0	353	—	—	i 19 4	+53	26.1	—
San Fernando		74.9	46	—	—	22 1	+36	—	—
Coimbra		75.4	42	—	—	e 20 25	-65	22.8	—
Granada		77.1	46	12 4	+ 2	22 22	+32	—	—
Toledo		78.1	44	12 4	- 4	22 23	+22	35.4	—
Tortosa		81.6	45	—	—	22 47	+ 5	—	—
Barcelona		82.9	45	34 59	?L	—	—	(35.0)	—
Eskdalemuir		86.1	30	—	—	e 23 12	-19	—	—
Strasbourg		89.3	40	—	—	—	—	e 25.1	—
Rocca di Papa		90.4	47	e 17 1	?PR ₁	(e 23 17)	-61 e	23.3	28.1
Zagreb		93.8	43	—	—	e 23 52	[+ 1]	—	—
Pulkovo		104.4	30	—	—	e 26 21	-16 e	34.3	—
Ekaterinburg		120.6	31	—	—	37 14	?SR ₁	50.1	—

Additional readings and notes: La Paz readings have been diminished by 1h. Andalgala readings have been increased by 8min. Toronto gives several other e and i readings for both components. Ottawa i = +19m.53s., e = +24m.5s. Coimbra i = +22m.4s.

July 31d. 15h. 8m. 0s. Epicentre 52°-0N. 175°-0E.

A = -.613, B = +.054, C = +.788; D = +.087, E = +.996;
G = -.785, H = +.069, K = -.616.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Sitka		28.6	60	—	—	14 12	?L	(14.2)	19.9
Honolulu	E.	37.1	135	—	—	13 10	-15	19.0	19.8
	N.	37.1	135	7 16	-15	e 12 42	-43	17.3	25.3
Victoria	N.	38.5	70	7 35	- 7	13 39	- 6	20.5	27.6
Zi-ka-wei		43.9	265	e 8 16	- 9	—	—	—	—
Berkeley	E.	45.0	84	—	—	—	—	e 23.1	29.2
Manila		56.7	250	e 13 0	?	—	—	—	—
Ekaterinburg		58.6	325	19 23	-40	17 24	-42	27.0	35.9
Chicago		62.2	57	10 30	+ 4	18 54	+ 3	e 31.0	—
Ann Arbor		63.8	53	e 11 0	+23	—	—	e 35.0	—
Pulkovo		64.7	341	10 40	- 3	19 12	- 9	33.0	38.6
Toronto		64.9	50	—	—	—	—	56.0	—
Ottawa		65.3	46	e 15 0	?	e 19 30	+ 1	e 34.0	—
Upala		66.7	349	—	—	e 19 34	-12	—	—
Edinburgh		72.1	359	—	—	e 21 0	+ 9	—	—
Eskdalemuir		72.6	359	e 11 31	- 3	e 20 47	-10	35.0	—
Hamburg		73.6	352	e 13 0	+80	e 21 6	- 3	e 42.0	51.0
De Bilt		75.5	354	e 11 55	+ 3	e 21 29	- 3	e 38.0	—
Oxford		76.2	357	—	—	e 21 35	- 4	—	57.0
Uccle		76.8	355	—	—	—	—	e 38.0	—
Strasbourg		78.8	352	—	—	e 22 0	-10	e 52.0	57.0
Zagreb		80.5	346	12 12	-10	22 12	-17	—	—
Moncalieri		82.4	351	e 12 40	+ 8	25 15	?	47.2	—
Rocca di Papa		85.0	348	e 12 36	-12	—	—	e 60.6	—
Colombo		87.7	279	51 30	?L	—	—	(51.5)	59.5
Coimbra		87.8	3	e 14 10	+66	(e 22 40)	-70	e 22.7	—
Toledo		88.1	359	—	—	23 0	-53	—	—
Algiers		91.0	354	—	—	23 58	-26	e 55.0	—
Rio de Janeiro		138.8	60	—	—	e 31 8	?	40.2	—
Cape Town		155.2	308	—	—	—	—	—	83.0

For Notes see next page.

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NOTES TO JULY 31d. 15h. 8m. 0s.

Additional readings: Sitka gives also eE = +19m.23s., eN = +16m.30s., MN = +21.0m. Honolulu LE = +16.5m., LN = +16.1m. T₀ = 15h.7m.49s.
 Berkeley eN = +22m.34s. Ekaterinburg PR₁ = +11m.43s., PR₂ = +12m.54s., SR₁ = +21m.9s., MN = +35.5m., MZ = +43.1m. Chicago
 L = +34.5m. Pulkovo MN = +37.6m., MZ = +46.5m. Toronto
 iN = +56m.44s., LN = +60.4m. Ottawa e = +31m.50s. and +33m.10s.
 Zagreb e = +12m.42s. Coimbra e = +18m.30s. (†PR₁). Rocca di
 Papa ePEN = +13m.6s.

July 31d. 16h. 33m. 26s. Epicentre 29°-0S. 73°-0W.

A = +.256, B = -.836, C = -.485; D = -.956, E = -.292;
 G = -.142, H = +.464, K = -.875.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Andalgala N.	6.0	78	—	—	—	—	2.7	7.3
Pilar E.	8.3	111	3 46	‡S	(3 46)	+ 1	4.4	5.3
La Quiaca	9.5	45	3 58	‡S	(3 58)	-18	5.2	6.3
Cipolletti	10.7	159	1 16	-84	—	—	5.3	6.1
La Paz	13.3	21	3 22	+ 5	6 1	+10	6.7	7.4
La Plata E.	14.1	118	3 28	+ 1	5 53	-17	6.8	8.9
La Plata N.	14.1	118	3 33	+ 6	5 53	-17	6.7	7.6
Coimbra	91.5	44	—	—	—	—	e 45.6	—
De Bilt E.	105.8	38	—	—	—	—	e 57.6	64.9
Ekaterinburg	137.4	36	—	—	—	—	61.6	74.2

Additional readings and notes: Andalgala readings have been increased by 5min. La Quiaca gives also LN = +5.3m., MN = +5.6m. De Bilt eLN = +58.6m.

July 31d. Readings also at 0h. (Ekaterinburg, La Plata, and Strasbourg), 5h. (La Paz, near Tortosa, and near Victoria), 9h. (Ekaterinburg), 18h. (near Algiers), 19h. (Apia and near La Paz), 21h. (Ekaterinburg), 23h. (La Paz).

Aug. 1d. 4h. 29m. 42s. Epicentre 50°-0S. 31°-5E.

A = +.548, B = +.336, C = -.766; D = +.522, E = -.853;
 G = -.653, H = -.400, K = -.643.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Cape Town	18.7	324	4 24	- 1	7 53	- 2	—	10.4
Johannesburg	24.0	352	5 18	-10	(9 48)	+ 4	9.8	—
Rio de Janeiro	63.0	266	—	—	(e 18 41)	-20	e 18.7	—
Colombo	70.6	50	30 48	‡L	—	—	(30.8)	36.3
La Paz	83.4	251	12 38	0	—	—	—	—
Algiers	90.3	338	—	—	—	—	e 43.3	48.3
San Fernando	92.6	330	—	—	i 24 31	-10	—	60.3
Rocca di Papa	93.2	346	e 14 27	+54	e 23 28	[-19]	e 49.4	58.4
Rio Tinto	94.0	330	55 18	‡L	—	—	(55.3)	63.3
Tortosa N.	94.8	336	—	—	—	—	—	48.7
Toledo	95.1	333	—	—	—	—	—	e 41.0
Coimbra	96.8	330	—	—	e 25 31	+ 7	—	44.3
Innsbruck	98.8	346	—	—	—	—	—	e 52.3
Vienna	99.1	350	e 58 5	?	—	—	—	68.8
Strasbourg	100.6	344	e 18 18	‡PR ₁	—	—	—	e 95.3
Manila	100.8	80	—	—	e 44 18	?	—	—
Paris	101.9	340	—	—	—	—	—	e 54.3
Hong Kong	102.4	70	—	—	—	—	—	54.3
Uccle	103.4	343	—	—	—	—	—	54.3
De Bilt	104.5	344	—	—	33 30	‡SR ₁	e 52.3	55.0
Kew	105.0	339	—	—	—	—	—	59.3
Hamburg	105.1	347	—	—	—	—	—	e 54.3
Oxford	105.5	339	—	—	—	—	—	49.3
Stonyhurst	107.7	339	e 38 18	?	—	—	—	59.3
Taihoku	109.0	74	—	—	e 46 58	?	—	49.2
Ekdalemuir	109.3	339	—	—	—	—	—	51.3
Ekaterinburg	109.5	15	(21 48)	‡PR ₁	—	—	—	21.8
Pulkovo	109.8	359	19 23	‡PR ₁	28 41	+15	—	60.3
Edinburgh	109.8	339	—	—	—	—	—	e 55.3
Uppsala	110.4	353	—	—	—	—	—	e 61.3
Ottawa	132.8	293	—	—	—	—	—	e 54.3
Toronto E.	134.0	289	—	—	—	—	—	54.7

For Notes see next page.

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NOTES TO AUG. 1d. 4h. 29m. 42s.

Additional readings and notes: Rio de Janeiro gives its readings as at 3h. San Fernando gives also e = +23m.28s. Rocca di Papa eP = +15m.36s. Tortosa ME = +50.7m. Toledo MNW = +60.4m. Coimbra eE = +31m.21s. Vienna iPZ = +58m.6s. These readings perhaps belong to a local shock. De Bilt MN = +60.6m., MZ = +62.2m. Pulkovo SR₁ = +34m.54s., P₂ = +56m.50s., iS₂ = +66m.15s., MN = +87.2m. Ottawa L = +85.3m.

Aug. 1d. 8h. 16m. 30s. Epicentre 35°·0N. 24°·0E. (as on 1922 July 12d.).

A = +.748, B = +.333, C = +.574; D = +.407, E = -.914; G = +.524, H = +.233, K = -.819.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	2.9	356	10 56	+11	e 1 31	+11	i 1.6	1.6
Helwan	8.1	129	11 43	-20	3 2	-38	—	3.2
Pompeii	9.4	310	12 37	+15	4 17	+ 4	—	8.0
Mostar	9.6	332	i 2 49	+25	4 23	+ 5	—	5.6
Travnik	9.6	331	e 2 34	+10	6 14	?L	(6.2)	8.0
Sarajevo	9.8	336	e 2 46	+19	14 34	+11	—	4.9
Belgrade	10.2	346	e 2 32	- 1	15 59	?L	(6.0)	9.3
Rocca di Papa	E. 11.1	311	i 2 50	+ 4	16 6	?L	(i 6.1)	6.7
	N. 11.1	311	—	—	15 18	+21	—	7.4
Florence	13.1	315	3 17	+ 3	5 47	+ 1	—	23.5
Venice	13.6	323	3 29	+ 8	—	—	—	8.1
Vienna	14.4	339	i 3 32	0	6 29	+11	—	10.5
Lemberg	14.8	0	e 3 34	- 2	e 6 22	- 5	—	9.0
Innsbruck	15.5	326	i 3 46	0	i 6 33	-11	—	6.9
Zurich	16.9	322	i 4 6	+ 2	i 7 23	+ 7	—	—
Algiers	17.0	282	i 4 10	+ 5	7 31	+13	—	14.5
Strasbourg	18.1	324	i 4 19	+ 1	7 47	+ 5	8.5	8.5
Besançon	18.1	318	4 22	+ 4	7 48	+ 6	—	8.5
Barcelona	18.3	297	i 4 24	+ 3	7 54	+ 7	9.6	—
Tortosa	E. 19.3	295	i 4 36	+ 3	18 17	+ 9	—	10.2
	N. 19.3	295	i 4 38	+ 5	18 16	+ 8	9.2	9.2
Hamburg	20.2	335	i 4 48	+ 5	18 42	+15	e 10.8	—
Paris	20.9	317	i 4 55	+ 3	18 43	+ 1	11.5	13.0
Uccle	21.2	324	e 4 54	- 1	18 48	0	—	—
De Bilt	21.7	328	4 58	- 3	i 9 0	+ 1	11.3	—
Granada	22.3	283	i 5 8	- 1	i 9 13	+ 2	—	—
Toledo	22.7	291	5 9	- 4	i 9 19	0	e 14.9	—
San Fernando	24.5	282	5 38	+ 5	9 40	-14	—	12.0
Oxford	24.6	321	5 25	- 9	9 53	- 2	—	—
Pulkovo	25.1	7	i 5 23	-16	19 39	-26	12.7	15.2
Upsala	25.2	353	5 24	-16	9 41	-26	e 10.9	13.9
Coimbra	26.1	291	5 43	- 6	10 13	-11	—	10.9
Stonyhurst	26.3	324	—	—	—	—	—	13.5
Lisbon	26.6	288	5 44	-10	10 20	-13	—	—
Eskdalemuir	27.6	326	e 5 51	-13	i 10 30	-22	13.5	—
Edinburgh	27.9	327	6 24	+17	10 38	-19	—	10.9
Ekaterinburg	32.9	37	i 6 1	-55	i 11 11	-71	15.5	—
Kodaikanal	54.4	103	16 36	?S	(16 36)	-38	(33.1)	—
Colombo	58.3	106	14 0	?PR ₁	—	—	—	38.5
Ottawa	71.9	314	—	—	i 20 50	+ 1	e 36.5	—
Toronto	75.0	314	—	—	i 21 21	- 5	37.5	—
Georgetown	E. 76.2	309	—	—	i 21 36	- 3	—	—
Washington	76.2	309	—	—	i 21 35	- 4	e 40.5	—
Chicago	80.9	317	—	—	i 22 15	-19	e 38.5	—
Batavia	87.7	100	e 12 39	-24	i 22 57	[-16]	—	—
Victoria	N. 91.7	340	23 30	?[S]	(23 30)	[- 8]	—	51.8
La Paz	101.1	258	17 37	?PR ₁	—	—	—	—

Additional readings and notes: Vienna gives also iN = +3m.56s., i = +4m.56s., and +5m.29s. Strasbourg PR₂ = +4m.46s., SR₁ = +8m.12s., T₁ = 8h.16m.31s. Barcelona PR₁ = +4m.41s., SR₁ = +8m.22s. Hamburg +9m.12s., +9m.18s., and +10m.24s. De Bilt iE = +9m.3s. Toledo PR₁ = +5m.38s., PR₂NE = +6m.36s., PR₂NW = +6m.35s. San Fernando PR₁ = +6m.18s., SR₁ = +10m.18s. Pulkovo i = +10m.23s., MZ = +14.5m. MN = +17.4m. Coimbra PR₁ = +6m.9s., MN = +12.5m., T₁ = 8h.16m.34s. Stonyhurst eP = 8h.14m. Kodaikanal readings are given as P's for two separate shocks. Ottawa i = +21m.17s. Toronto iE = +21m.24s. Georgetown iN = +21m.38s.

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Aug. 1d. Readings also at 1h. (Nagasaki), 5h. (Upsala, La Paz, Osaka, Zi-ka-wei, and Mizusawa), 6h. (Hamburg, De Bilt, Ekaterinburg, near Mizusawa, and near Nagasaki (2)), 8h. (Rocca di Papa, Venice, and Innsbruck), 9h. (Florence), 12h. (Apia), 13h. (near Nagasaki), 16h. (Ekaterinburg), 17h. (Pompeii and Rocca di Papa), 20h. (Kobe).

Aug. 2d. Readings at 0h. (Nagasaki), 1h. (Ekaterinburg and Manila), 4h. (Apia), 5h. (near Kobe), 9h. (Ottawa, Chicago, Honolulu, Toronto, and Victoria), 10h. (Victoria), 14h. (Venice), 17h. (near Manila), 18h. (Toledo), 22h. (near Kobe), 23h. (Taihoku).

Aug. 3d. 1h. 56m. 0s. Epicentre 35°·0N. 24°·0E. (as 1923 Aug. 1d.).

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	2·9	356	e 0 54	+ 9	e 1 33	+13	e 2·0	3·0
Belgrade	10·2	346	e 2 22	-11	i 4 5	-30	—	—
Rocca di Papa	11·1	311	e 2 24	-22	e 5 6	+ 9	—	9·9
Vienna	14·4	339	e 2 35	-57	—	—	—	9·0
Strasbourg	18·1	324	—	—	—	—	e 3·0	12·0
Uccle	21·2	324	—	—	—	—	e 11·8	—
De Bilt	21·7	328	—	—	e 8 18	-41	—	14·7
Pulkovo	25·1	7	5 47	+ 8	9 49	-16	12·5	—
Ekaterinburg	32·9	37	4 23	-153	—	—	15·0	—

Additional readings and notes: Athens gives also MN = +3·1m. Belgrade i = +2m.50s. and +3m.32s. Rocca di Papa iPN = +3m.0s. (O-C = +14s.). Pulkovo readings have all been increased by 2m.

Aug. 3d. 10h. 23m. 48s. Epicentre 54°·0N. 160°·5W. (as on 1922 July 5d.).

A = -·554, B = -·196, C = +·809; D = -·334, E = +·943;
G = -·763, H = -·270, K = -·588.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Victoria N.	23·7	88	5 27	+ 2	—	—	11·5	9·7
Honolulu	32·7	175	—	—	—	—	e 15·4	—
Chicago	48·1	74	—	—	e 19 2	?	e 25·6	—
Ekaterinburg	63·9	337	i 10 35	- 2	19 1	-11	29·2	34·0
Pulkovo	65·9	354	11 5	+15	19 35	- 1	—	—

Additional readings: Honolulu gives also eN = +16m.52s. Ekaterinburg MN = +38·5m.

Aug. 3d. 17h. 2m. 8s. Epicentre 15°·0N. 137°·0E. (as on 1914 July 4d.).

A = -·706, B = +·659, C = +·259; D = +·682, E = +·731;
G = -·189, H = +·177, K = -·966.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	15·5	270	e 4 52	+66	—	—	—	—
Osaka	19·7	356	4 38	+ 1	(8 18)	+ 1	8·3	13·7
Zi-ka-wei	21·5	321	e 5 4	+ 5	—	—	—	14·2
Ekaterinburg	70·0	326	10 46	-31	20 16	-10	34·9	43·6
Pulkovo	85·2	331	e 12 51	+ 2	e 23 9	-12	40·9	—
Strasbourg	102·1	328	e 17 52	?PR ₁	—	—	e 62·9	—
Rocca di Papa	103·5	321	—	—	—	—	e 27·7	29·2

Osaka gives also MN = +11·1m.

Aug. 3d. Readings also at 2h. (Ekaterinburg and near La Paz), 4h. (Vienna), 7h. (Ekaterinburg and La Paz), 7h. (La Paz), 8h. (Ekaterinburg and Zi-ka-wei), 9h. (Nagasaki), 11h. (La Paz), 12h. (Pulkovo and near Ekaterinburg), 17h. (Zi-ka-wei and Ekaterinburg), 18h. (La Paz, Vienna, Innsbruck, and near Zurich), 21h. (near Lick).

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Aug. 4d. 4h. 12m. 8s. Epicentre 38°-5N. 22°-5E. (as on 1919 July 25d.).

A = +.723, B = +.299, C = +.623 ; D = +.383, E = -.924 ;
G = +.575, H = +.238, K = -.783.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	1.2	116	i 0 13	- 5	—	—	0.8	0.9
Rocca di Papa	8.1	296	e 2 8	+ 5	—	—	4.4	4.7
Zurich	13.4	316	i 3 22	+ 4	6 0	+ 7	—	—

Rocca di Papa gives also ePN = +2m.24s., iPE = +2m.16s., and +2m.32s.

Aug. 4d. Readings also at 7h. (Colombo and near Belgrade), 8h. and 9h. (La Paz), 15h. (Nagasaki), 16h. (Pulkovo, Ekaterinburg, Riverview, and Adelaide), 17h. (Toronto, Strasbourg, De Bilt, Ottawa, Eskdalemuir, Uccle, Kodaikanal, Chicago, Colombo, and La Paz), 18h. (Kodaikanal), 19h. (Nagasaki), 20h. (Ekaterinburg), 22h. (Nagasaki).

Aug. 5d. 1h. 10m. 0s. Epicentre 37°-0S. 175°-0E. (as on 1921 June 23d.).

A = -.795, B = +.070, C = -.602 ; D = +.087, E = +.996 ;
G = +.600, H = -.052, K = -.799.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Christchurch	6.7	195	1 42	0	2 54	- 8	4.5	5.3
Riverview	19.6	272	e 4 36	0	—	—	5.3	10.7
Honolulu e.	63.7	29	—	—	e 19 10	+ 1	—	22.3
Ekaterinburg	133.2	317	e 22 0	?PR ₁	—	—	57.0	—
Pulkovo	148.0	327	e 14 12	?	—	—	—	—
Eskdalemuir	161.7	257	—	—	—	—	80.0	—

Additional readings : Riverview gives also MN = +8.4m. Honolulu eN = +19m.55s., MN = +22.1m.

Aug. 5d. Readings also at 0h. (Tortosa, Nagasaki), 1h. (Azores), 6h. (Manila), 10h. (Christchurch, Riverview, and Honolulu), 14h. (near Manila and near Athens), 22h. (Colombo).

Aug. 6d. 15h. 24m. 30s. Epicentre 37°-5N. 142°-5E. (as on 1921 June 14d.).

A = -.630, B = +.483, C = +.609.

	Δ	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	2.0	0 31	0	0 53	- 2	—	—
Hakodate	4.5	—	—	2 4	0	e 2.4	3.5
Sapporo	5.7	e 1 25	- 3	—	—	—	—

Additional readings and notes : Mizusawa gives also SN = +54s. Hakodate MN = +3.4m.

Aug. 6d. Readings also at 8h. (Ekaterinburg), 10h. (Nagasaki), 13h. (Azores (2), and Nagasaki), 15h. (Ekaterinburg), 16h. (Rocca di Papa), 18h. (Ekaterinburg), 22h. (Riverview, Ekaterinburg, Manila, and La Paz), 23h. (Apta).

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Aug. 7d. 7h. 27m. 50s. Epicentre 28°·5S. 71°·5W. (as on 1923 July 24d.).

A = +·279, B = -·833, C = -·477; D = -·948, E = -·317;
G = -·151, H = +·453, K = -·879.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Andalgala	N.	4·7	80	0 52	-21	—	—	1·3	1·5
Pilar	E.	7·3	117	4 4	?S	(4 4)	+46	4·5	5·1
Cipolletti		10·8	166	1 34	-67	—	—	2·1	2·7
La Paz		12·4	15	3 2	-3	5 27	-2	6·2	7·2
La Plata	E.	13·2	122	3 24	+8	6 0	+11	6·9	7·9
	N.	13·2	122	4 21	+65	6 42	+53	6·9	9·4
Río de Janeiro		26·1	84	—	—	e 10 18	-6	14·2	—
Victoria	E.	39·8	330	—	—	—	—	47·0	48·5

Andalgala readings have been increased by 4min.

Aug. 7d. 14h. 23m. 28s. Epicentre 32°·5N. 97°·5E.

A = -·110, B = +·836, C = +·537; D = +·991, E = +·131;
G = -·070, H = +·533, K = -·843.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Zi-ka-wei		20·3	87	e 4 48	+3	—	—	—	—
Ekaterinburg		35·0	324	7 12	-1	12 54	-1	16·5	22·4
Pulkovo		51·0	323	e 11 52	?PR ₁	e 18 52	?SR ₁	28·5	—
Hamburg		63·0	318	—	—	e 21 32?	?	—	35·5
Strasbourg		66·1	313	—	—	—	—	e 38·5	—
De Bilt		66·3	318	—	—	—	—	e 37·5	—
Bidston		70·2	320	—	—	—	—	—	44·5
Riverview		83·3	138	—	—	e 26 56	?	—	32·0
Victoria		91·4	26	—	—	—	—	61·5	68·2
La Paz		159·4	318	106 0?	?L	—	—	(106·0?)	—

Riverview gives also MN = +33·6m.

Aug. 7d. Readings also at 8h. (Victoria, De Bilt, Belgrade, and near Athens), 12h. (Nagasaki and Ascension).

Aug. 8d. 8h. 28m. 55s. Epicentre 49°·0N. 174°·0E. (as on 1916 Dec. 14d.).

A = -·652, B = +·068, C = +·755; D = +·105, E = +·995;
G = -·751, H = +·079, K = -·656.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Mizusawa		25·3	260	5 46	+5	—	—	—	—
Honolulu		35·5	131	—	—	—	—	e 18·4	—
Ekaterinburg		60·7	325	1 9 54	-23	—	—	26·1	35·1
Pulkovo		67·3	341	1 11 3	+3	19 49	-5	—	—
Toronto		67·3	49	—	—	—	—	35·1	—
Ottawa		67·8	45	—	—	—	—	e 36·1	—

Additional readings: Ekaterinburg gives also MN = +31·2m. Pulkovo e = +16m.51s.

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Aug. 8d. 12h. 1m. 27s. Epicentre 10°-6N. 65°-6W.

A = +.406, B = -.895, C = +.184; D = -.911, E = -.413;
G = +.076, H = -.168, K = -.983.

A depth of focus 0.025 has been assumed.

		Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
					m. s.	s.	m. s.	s.	m.	m.
Porto Rico	E.	-0.2	7.6	1	e 1 58	+ 6	e 2 52	-29	e 3.7	3.8
	N.	-0.2	7.6	1	i 1 50	- 2	e 2 36	-45	e 3.7	3.8
Port au Prince		-0.3	10.3	322	e 2 51	+21	2 58	?	—	5.4
La Paz		-1.5	27.2	185	i 5 48	+ 3	i 10 16	0	13.8	15.1
Georgetown		-1.7	30.1	344	i 6 16	+ 4	11 11	+ 5	e 13.4	—
Washington		-1.7	30.1	344	e 6 13	+ 1	11 53	+47	—	—
Ithaca		-1.9	33.2	348	i 6 40	- 1	e 11 33	-23	18.6	—
Toronto	E.	-2.0	35.1	344	i 6 53	- 4	i 12 24	- 2	e 14.3	20.1
	N.	-2.0	35.1	344	i 6 53	- 4	e 12 21	- 5	e 15.7	20.8
Ann Arbor		-2.0	35.4	337	i 7 3	+ 3	i 12 33	+ 3	e 14.6	—
Ottawa		-2.0	35.8	350	i 7 1	- 2	e 12 18	-20	e 15.0	—
Chicago		-2.0	36.6	333	i 7 12	+ 2	i 12 56	+ 7	15.7	—
Rio de Janeiro	E.	-2.1	40.1	147	i 13 3	?S	20 51	?L	28.4	30.8
	N.	-2.1	40.1	147	i 13 3	?S	29 45	?L	28.2	32.8
Pilar	E.	-2.2	42.3	177	i 6 57	?S	(16 57)	+169	40.4	42.2
Cipolletti		-2.6	49.6	183	i 8 3	?S	(18 3)	+142	40.0	44.4
Coimbra		-3.0	58.3	50	e 9 12	-29	17 15	-10	—	—
Rio Tinto		-3.0	59.1	53	i 11 33	+106	—	—	—	44.6
San Fernando		-3.0	59.2	55	e 9 47	0	i 17 39	+ 3	—	—
Victoria	E.	-3.0	60.9	321	i 10 16	+18	19 19	+81	30.8	66.7
	N.	-3.0	60.9	321	i 10 18	+20	18 35	+37	31.8	62.4
Granada		-3.0	61.4	54	i 9 58	- 3	i 19 37	+93	—	—
Toledo		-3.0	61.5	51	i 10 0	- 2	i 18 3	- 2	—	—
Tortosa	N.	-3.1	65.1	50	i 10 26	+ 1	i 18 50	+ 2	—	—
Bidston		-3.1	65.3	37	i 10 33	+ 7	i 18 53	+ 2	—	46.2
Eskdalemuir		-3.1	65.7	35	e 10 29	0	e 18 57	+ 1	26.6	—
Oxford		-3.1	65.9	39	i 10 30	- 1	19 0	+ 2	29.8	46.4
Barcelona		-3.1	66.4	50	—	—	e 19 3	- 2	—	—
Kew		-3.1	66.4	39	—	—	—	—	—	82.6
Algiers		-3.1	66.6	55	e 10 33	- 2	19 3	- 4	—	—
Paris		-3.2	67.7	41	i 10 42	0	i 19 18	- 1	—	—
Uccle		-3.2	69.2	40	e 10 50	- 1	e 19 38	+ 1	—	—
De Bilt		-3.2	69.8	39	i 10 55	0	19 49	+ 4	—	—
Strasbourg		-3.2	71.1	43	e 11 5	+ 2	20 2	+ 1	—	—
Zurich		-3.2	71.5	45	e 11 4	- 2	e 20 2	- 4	—	—
Hamburg		-3.2	73.0	38	i 11 14	- 2	i 20 24	0	—	—
Florence		-3.2	73.2	47	e 9 3	-134	e 11 58	?	—	—
Innsbruck		-3.2	73.4	44	e 11 15	- 3	—	—	—	—
Rocca di Papa		-3.2	74.3	50	i 11 21	- 4	20 39	0	—	—
Vienna		-3.3	76.8	42	i 11 46	+ 7	21 6	- 2	—	—
Upsala		-3.3	77.4	30	e 11 39	- 4	e 21 10	- 5	—	—
Belgrade		-3.3	79.8	47	e 11 53	- 5	i 12 3	?	—	—
Pulkovo		-3.4	83.8	30	e 12 18	- 3	i 22 25	- 3	—	—
Helwan		-3.5	90.7	60	e 12 50	-10	23 8	-35	—	55.6
Cape Town		-3.5	91.1	125	23 17	?[S]	(23 17)	[-18]	—	—
Ekaterinburg		-3.7	99.5	27	i 13 14	-34	23 40	[-42]	—	—

Additional readings and notes: La Paz readings are all given as at 11h. Georgetown eLN = +13.2m. Washington PR₁ = +7m.13s. Ithaca e = +7m.52s. and +14m.0s. Toronto LE = +14.8m., iSN = +12m.26s., LN = +16.9m. T₀N = 12h.1m.24s. Ann Arbor e = +8m.27s. Ottawa i = +8m.24s., L = +22.6m. T₀ = 12h.1m.48s. Chicago PR₁ = 8m.40s. Coimbra ePN = +9m.33s. Tortosa iSE = +18m.51s. Bidston readings have been diminished by 1h. Eskdalemuir e = +19m.41s. Rocca di Papa iPE = +11m.0s. Belgrade readings are given as of a local shock. Pulkovo i = +12m.43s., PR₁ = +15m.21s., PS = +23m.15s. Cape Town S = +33m.47s. Ekaterinburg PR₁ = +17m.17s.

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Aug. 8d. 12h. 17m. 20s. Epicentre 0°-0, 28°-2W. (as on 1920 Nov. 12d.).

A = +.881, B = -.473, C = .000; D = -.473, E = -.881;
G = .000, H = .000, K = -1.000.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Azores	37.8	4	15 22	?L	—	—	(15.4)	16.6
San Fernando	41.8	27	8 7	- 2	14 21	-11	21.2	27.2
La Paz	42.7	244	—	—	20 42	?L	(20.7)	24.0
Granada	43.6	28	18 14	- 9	e 14 39	-17	—	24.5
Coimbra	44.1	22	8 20	- 7	i 14 56	- 7	20.3	21.8
Toledo	45.6	27	18 30	- 7	i 15 20	- 2	e 22.3	25.4
Algiers	46.8	35	8 37	- 9	15 19	-19	22.7	25.7
Tortosa	N. 48.5	28	18 52	- 5	15 59	- 1	23.3	37.8
Barcelona	49.7	30	9 1	- 4	e 16 13	- 2	24.3	—
Puy de Dôme	53.3	26	10 31	+63	—	—	25.7	—
Paris	55.6	25	19 47	+ 4	i 17 33	+ 4	27.7	30.7
Rocca di Papa	N. 55.7	37	19 47	+ 3	17 43	+13	e 30.7	33.0
Besançon	55.8	28	9 48	+ 3	—	—	—	28.7
Florence	56.1	33	—	—	—	—	29.7	31.7
Pompeii	56.2	39	(9 38)	- 9	9 38	?P	—	—
Zurich	57.2	29	e 9 57	+ 4	e 17 56	+ 7	—	—
Strasbourg	57.6	28	10 6	+10	e 18 4	+10	26.7	35.2
Ucele	57.8	25	e 10 0	+ 2	e 17 58	+ 2	e 24.7	29.9
Innsbruck	58.5	30	e 10 7	+ 5	—	—	e 28.7	—
Eskdalemuir	58.9	17	—	—	e 18 10	0	24.7	32.7
De Bilt	59.1	25	10 9	+ 3	18 27	+15	e 27.7	30.4
Georgetown	N. 59.2	318	e 9 53	-13	i 18 12	- 1	—	—
Washington	59.2	318	—	—	—	—	e 28.7	—
Ottawa	61.7	325	e 10 19	- 4	e 18 28	-16	e 25.4	—
Vienna	61.7	31	i 10 30	+ 7	19 0	+16	—	32.7
Belgrade	62.1	39	(i 11 37)	+71	i 11 37	?P	e 21.4	—
Hamburg	62.2	26	i 10 31	+ 5	e 18 40	-11	e 24.2	31.9
Budapest	62.7	34	10 25	- 5	19 0	+ 3	e 33.6	—
Ann Arbor	65.2	320	—	—	e 19 28	+ 1	30.4	—
Chicago	67.7	317	e 10 40	-22	—	—	33.7	—
Upsala	69.5	23	e 11 16	+ 2	e 20 25	+ 5	—	39.7
Pulkovo	74.7	27	i 11 53	+ 6	21 36	+14	26.7	50.0
Ekaterinburg	89.4	34	i 12 57	-15	23 47	-20	37.7	47.2
Colombo	107.9	84	53 10	?L	—	—	(53.2)	78.7

Additional readings and notes: San Fernando gives also MN = +25.7m.
La Paz readings are given as for 11h. Coimbra PR₁N = +10m.6s., MN = +21.5m. T₀ = 12h.17m.20s. Toledo MNW = +25.7m. Algiers PR₁ = +10m.28s. Tortosa PE = +8m.53s., ME = +36.8m. Barcelona PR₁ = +11m.6s. Paris MN = +28.7m. Rocca di Papa iPE = +9m.50s., eLE = +32.3m. Georgetown eEN = +9m.1s. Ottawa L = +23.3m. Belgrade eP = +5m.45s. (?S for previous shock), SR₁ = +12m.12s. Hamburg MN = +33.0m., MZ = +37.7m. Budapest readings have been diminished by 5min. Ann Arbor eL = +25.7m. Chicago L = +35.7m. Pulkovo MZ = +40.1m., MN = +40.4m. Ekaterinburg L = +26.7m., MZ = +52.2m.

Aug. 8d. Readings also at 2h. (near Osaka and Kobe), 8h. (Florence), 10h. (Victoria), 11h. (Ottawa), 12h. (Toronto), 17h. (Algiers (2)), 21h. (La Paz), 22h. (Zante).

Aug. 9d. Readings at 12h. (La Paz and Ekaterinburg), 15h. (Azores), 16h. (Florence), 21h. (Apia, Ekaterinburg, and Riverview), 22h. (Sydney), 23h. (Apia, Vienna, De Bilt, Pulkovo, Strasbourg and Ekaterinburg).

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Aug. 10d. 1h. 0m. 34s. (I) } Epicentre 41°·0N. 77°·5E.
2h. 17m. 20s. (II) }

A = +·163, B = +·737, C = +·656 ; D = +·976, E = -·216 ;
G = +·142, H = +·640, K = -·755.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
II Simla		9·9	182	3 16?	+47	—	—	e 4·6?	—
I Ekaterinburg		19·2	331	4 32	+ 1	8 28	+22	9·9	11·7
II		19·2	331	4 40	+ 9	8 32	+26	10·7	13·2
II Calcutta	E.	20·6	151	8 22	?S	(8 22)	-14	—	—
II Bombay		22·5	192	8 1	?	10 5	+50	e 11·3	11·7
II Tiflis		24·4	283	e 5 40	+ 8	e 9 52	0	e 20·3	—
II Kodaikanal		30·8	181	16 16	?L	—	—	(16·7)	—
I Pulkovo		34·4	320	7 5	- 3	12 35	-11	17·9	—
II		34·4	320	17 6	- 2	i 12 40	- 6	16·2	22·9
I Upsala	N.	40·8	320	—	—	—	—	e 22·4	—
II		40·8	320	e 9 31	+90	e 16 24	+126	e 22·2	26·2
II Vienna		43·0	302	8 6	-12	e 19 40	?L	(e 19·7)	—
I Hamburg		45·7	310	—	—	—	—	e 25·4	—
II		45·7	310	—	—	—	—	e 18·7	25·7
II Rocca di Papa		47·5	294	e 8 28	-23	—	—	—	—
I Strasbourg		48·4	305	—	—	—	—	e 25·4	—
II		48·4	305	(e 8 40)	-16	—	—	e 8·7	30·2
I De Bilt	N.	48·9	309	—	—	—	—	e 26·4	28·8
II		48·9	309	8 56	- 3	16 1	- 4	e 26·7	32·2
I Uccle		49·7	307	—	—	—	—	e 25·4	—
II		49·7	307	—	—	e 16 9	- 6	e 24·7	—
II Paris		51·5	306	—	—	—	—	e 31·7	—
II Kew		52·2	310	—	—	—	—	—	34·7
I Eskdalemuir		52·5	315	—	—	—	—	26·4	—
II		52·5	315	—	—	e 17 0	+10	25·7	29·7
II Oxford		52·7	310	—	—	—	—	21·0	35·0
I Bidston		53·1	312	—	—	—	—	—	33·4
II		53·1	312	22 0	?	28 20	?L	(28·3)	30·4
I Rio Tinto		62·4	298	22 26	?	—	—	—	27·4
II Victoria	E.	88·7	13	—	—	—	—	55·9	60·7
II Ottawa		90·4	341	—	—	—	—	50·7	—
II Toronto	E.	92·8	345	—	—	—	—	e 45·0	—

Additional readings: Ekaterinburg gives also for I MZ = +12·7m., for II MNZ = +19·7m. Calcutta II PN = +8m.23s. Tiflis II eE = +6m.52s. and +13m.10s., eN = +14m.40s. Pulkovo II MN = +20·1m., MZ = +22·8m. Upsala II MN = +23·8m. Vienna II iZ = +10m.1s. Rocca di Papa II e = +10m.10s. Strasbourg II MN = +28·2m. De Bilt I eLE = +27·4m., II PR.Z = +10m.55s., SR₁ = +19m.48s., MN = +28·9m. Uccle II e = +20m.4s. Eskdalemuir II e = +11m.20s. and +20m.40s. Bidston II P = +22m.57s. Victoria II MN = +62·4m. Toronto II L = +58·8m., eL = +88·0m.

Aug. 10d. 15h. 58m. 6s. Epicentre 22°·6N. 93°·4E.

A = -·055, B = +·922, C = +·384 ; D = +·998, E = +·059 ;
G = -·023, H = +·384, K = -·923.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Calcutta	E.	4·7	269	1 18	+ 5	(2 8)	- 1	2·1	3·5
	N.	4·7	269	1 29	+16	(2 17)	+ 8	2·3	3·7
Simla		18·8	304	4 6	+ 4	7 0	-13	e 10·1	—
Hong Kong		19·2	87	4 23	- 8	8 6	—	10·7	13·1
Bombay		19·6	263	4 38	+ 2	8 18	+ 3	10·6	11·9
Kodaikanal		19·6	234	8 48	?S	(8 48)	+33	—	—
Colombo		20·4	222	4 54	+ 8	8 54	+22	12·2	16·9
Zi-ka-wei		26·4	65	—	—	e 11 47	+77	—	—
Manila		27·3	102	e 6 22	+21	—	—	—	—
Batavia		31·6	155	e 6 30	-13	1 11 29	-32	—	—
Ekaterinburg		41·7	334	17 43	-26	i 13 55	-36	20·9	24·9
Pulkovo		57·2	330	19 52	- 1	e 17 49	0	28·9	—
Budapest		63·2	315	e 15 19	?	—	—	—	—

Continued on next page.

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Upsala	63.6	330	e 10 32	- 4	e 19 0	- 8	e 34.9	41.4
Vienna	64.9	316	i 10 47	+ 3	19 25	+ 1	—	—
Pompeii	67.3	308	e 11 51	+51	—	—	—	—
Hamburg	68.2	321	e 11 15	+10	e 19 54	-10	e 36.9	—
Innsbruck	68.4	316	i 11 6	- 1	—	—	—	—
Rocca di Papa	68.5	310	i 11 9	+ 1	21 0	+52	—	—
Zurich	70.2	315	e 11 20	+ 2	e 20 26	- 2	—	—
Strasbourg	70.5	318	i 11 22	+ 2	e 20 54	+22	33.9	41.9
De Bilt	E. 71.4	321	—	—	20 43	0	e 38.9	45.5
	N. 71.4	321	—	—	20 42	- 1	e 37.9	42.3
	Z. 71.4	321	11 27	+ 1	—	—	—	47.9
Uccle	72.1	320	e 11 30	- 1	e 20 50	- 1	e 35.9	—
Edinburgh	75.0	325	—	—	e 21 54	+28	—	—
Eskdalemuir	75.2	325	—	—	e 21 21	- 7	37.9	—
Oxford	75.3	322	—	—	i 21 56	+27	42.2	51.0
Bidston	75.8	322	13 36	+102	31 26	?	—	44.9
Algiers	77.0	308	12 1	0	21 44	- 5	38.9	59.9
Tortosa	E. 77.6	310	11 52	-13	21 51	- 5	—	—
	N. 77.6	310	12 5	0	21 50	- 6	—	—
Toledo	81.1	310	12 23	- 3	22 30	- 6	—	—
Granada	81.8	308	e 12 28	- 1	i 23 24	+40	—	—
San Fernando	84.1	308	e 12 47	+ 4	23 5	- 4	—	24.9
Ottawa	111.3	352	—	—	—	—	56.9	—
Toronto	113.5	356	—	—	—	—	e 57.9	—

Additional readings: Ekaterinburg gives also PR₁ = +9m.39s., SR₁ = +16m.42s., MZ = +29.6m. Pulkovo PR₁ = +12m.39s. Vienna PS₁ = +19m.58s. Uccle e = +24m.54s. Granada i = +12m.41s. and +23m.10s. Ottawa eL = +46.9m. Toronto L = +48.4m.

Aug. 10d. 22h. 14m. 38s. Epicentre 7° 0S, 145° 0E. (as on 1922 Aug. 26d.).

A = - .813, B = + .569, C = - .122 ; D = + .574, E = + .819 ;
G = + .100, H = - .070, K = - .993.

Very doubtful.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	27.4	169	e 6 1	- 1	—	—	e 12.3	16.2
Adelaide	28.5	191	—	—	e 10 22	-46	e 14.0	17.8
Melbourne	30.7	180	—	—	(e 12 10)	+24	e 12.2	17.6
Manila	32.2	312	e 8 22	?PR ₁	—	—	—	—
Perth	36.9	224	—	—	13 37	+15	17.3	20.4
Honolulu	E. 62.6	62	e 10 26	- 3	e 17 26	-90	25.2	28.8
	N. 62.6	62	—	—	e 19 0	+ 4	25.2	28.7
Ekaterinburg	92.8	327	13 53	+22	25 19	+36	41.4	60.3
Victoria	E. 96.4	42	23 44	?S	(23 44)	[-21]	41.8	44.8
Pulkovo	108.3	331	—	—	—	—	e 57.9	71.3
De Bilt	124.2	331	e 21 43	?PR ₁	—	—	e 61.4	74.3
Strasbourg	125.0	327	e 22 22	?PR ₁	—	—	e 67.4	—
Uccle	125.4	331	e 22 58	?PR ₁	—	—	e 61.4	—
Rocca di Papa	125.4	318	—	—	—	—	e 63.6	77.0
Eskdalemuir	125.5	338	e 22 45	?PR ₁	—	—	—	—
Toronto	126.6	39	—	—	—	—	58.1	—
Bidston	126.9	337	—	—	—	—	—	80.4
Ottawa	128.0	36	—	—	—	—	60.4	—
Granada	138.5	321	20 3	[+26]	26 37	?	—	—
San Fernando	140.6	322	—	—	20 30	?	—	—

Additional readings and notes: Riverview e = +10m.28s., +10m.47s., and +11m.57s., MZ = +18.5m. Adelaide e = +13m.16s. Perth readings have been diminished by 10m. Ekaterinburg MN = +51.2m. Victoris PN = +24m.7s., MN = +44.0m. Toronto LN = +61.4m. Ottawa eL = +53.4m.

Aug. 10d. Readings also at 0h. (near Mizusawa), 1h. (Sydney), 2h. (Kobe), 4h. (Ekaterinburg), 9h. (Florence), 11h. (Ekaterinburg), 12h. (Kodai-kanal and Algiers), 14h. (Pompeii, Rocca di Papa, and near Sarajevo), 15h. (La Paz), 16h. (near Belgrade and Sarajevo), 19h. (Manila).

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Aug. 11d. 0h. 54m. 15s. Epicentre 5°·0N. 120°·0E.

A = -·498, B = +·863, C = +·087 ; D = +·866, E = +·500 ;
G = -·044, H = +·075, K = -·996.

The positive residual for La Paz [P] and those of [S] for several stations suggest a high focus. But the Ekaterinburg observation does not accord with this view.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	9·7	6	e 2 45	+19	—	—	7·0	15·0
Batavia	17·2	230	i 4 9	+ 2	i 7 23	+ 1	—	9·9
Malabar	17·4	225	4 16	+ 6	i 7 43	+16	—	—
Hong Kong	18·2	342	4 35	+16	—	—	8·0	13·2
Taihoku	20·1	4	e 5 11	+29	(8 55)	+ 30	8·9	—
Zi-ka-wei	26·4	3	e 6 13	+21	—	—	—	—
Nagoya	34·0	27	7 10	+ 5	—	—	—	—
Calcutta	N. 35·3	305	8 20	+64	—	—	26·6	—
Perth	37·1	186	—	—	13 35	+10	17·4	—
Colombo	40·0	275	(6 27)	-88	11 45	-142	16·8	25·8
Kodalkanal	42·5	280	8 3	-12	—	—	24·4	30·2
Adelaide	43·6	158	—	—	e 15 3	+ 7	e 25·2	—
Simla	47·9	310	e 9 51	+58	—	—	—	—
Bombay	48·0	291	15 51	?S	(15 51)	- 3	—	—
Riverview	48·7	145	e 10 32	?PR ₁	e 16 28	+26	e 23·6	25·1
Melbourne	48·7	154	—	—	(16 51)	+49	i 16·8	33·2
Christchurch	67·8	142	20 33	?S	(20 33)	+33	37·0	44·0
Ekaterinburg	69·5	330	i 11 13	- 1	i 20 19	- 1	32·8	37·4
Honolulu	E. 80·7	70	e 13 13	+50	23 1	+30	38·5	38·7
	N. 80·7	70	e 17 34	?PR ₁	22 55	+24	—	23·2
Pulkovo	85·6	330	i 12 59	+ 8	i 23 23	- 3	42·8	54·2
Upsala	91·9	331	—	—	e 23 45	[+ 6]	e 46·8	52·4
Budapest	93·6	320	—	—	e 26 35	+103	—	—
Vienna	95·2	321	e 13 43	- 1	24 35	-33	e 45·8	54·8
Hamburg	97·6	326	—	—	e 24 45	-47	e 49·8	60·8
Innsbruck	98·7	320	—	—	—	—	e 51·8	—
Rocca di Papa	99·4	315	e 17 57	?PR ₁	25 51	+ 1	e 47·8	64·0
Florence	99·8	317	18 15	?PR ₁	24 45	[+22]	45·8	57·8
Strasbourg	100·6	323	e 13 56	-17	e 24 49	[+22]	e 47·8	62·0
Uccle	101·8	325	e 18 20	?PR ₁	e 24 52	[+19]	e 37·8	56·1
De Bilt	100·9	326	14 12	- 3	e 24 50	[+21]	e 50·8	63·2
Cape Town	102·3	236	—	—	—	—	—	65·8
Victoria	E. 103·4	39	18 40	?PR ₁	27 52	+84	48·8	65·4
	N. 103·4	39	—	—	28 45	+137	43·2	—
Edinburgh	103·5	331	e 15 25	+57	i 25 5	[+24]	50·8	57·8
Paris	103·6	324	—	—	e 25 7	[+26]	52·8	64·8
Eskdalemuir.	103·8	331	e 18 45	?PR ₁	e 24 57	[+15]	50·8	58·4
Kew	104·2	327	—	—	—	—	—	71·8
Oxford	104·6	328	e 18 45	?PR ₁	e 25 9	[+24]	46·8	56·8
Bidston	104·7	329	25 15	?S	(25 15)	[+29]	—	56·8
Algiers	108·0	313	—	—	e 25 22	[+21]	e 46·8	67·8
Tortosa	E. 108·3	316	—	—	—	—	46·2	64·0
	N. 108·3	316	—	—	e 21 45	?PR ₁	46·4	62·7
Toledo	111·8	316	e 21 47	?PR ₁	—	—	—	69·0
Coimbra	114·6	319	—	—	e 25 45	[+17]	59·8	—
San Fernando	114·9	314	25 9	?S	(25 9)	[-20]	71·8	82·8
Ottawa	127·7	13	—	—	e 33 27	?	e 57·2	—
Ann Arbor	128·0	21	—	—	—	—	e 67·8	—
Toronto	128·3	16	i 22 53	?PR ₁	e 32 8	?	58·0	—
Georgetown	133·3	16	—	—	e 21 20	?PR ₁	e 43·4	—
Rio de Janeiro	155·8	221	—	—	—	—	e 40·8	—
La Paz	166·0	146	20 39	[+27]	33 57	?	85·7	90·2

Additional readings: Manila gives also MN = +11·4m. Batavia iE = +6m.0s., i = +7m.43s. Malabar e = +4m.13s. Calcutta PE = +2m.23s. Colombo P = +2m.21s. Adelaide eS = +18m.33s. and +22m.45s., eL = +29·4m. and +36·2m. Riverview MN = +24·9m. Christchurch S = +28m.27s. Ekaterinburg MN = +39·5m., MZ = +48·8m. Pulkovo PR₁ = +16m.21s., SR₁ = +29m.57s., SR₂ = +33m.57s., MZ = +63·4m. Budapest eN = +32m.35s. Hamburg MN = +52·8m. De Bilt PR₁ = +18m.17s., MN = +56·0m., MZ = +67·9m. Strasbourg e = +18m.15s., MN = +59·8m. Uccle MN = +57·3m. Eskdalemuir MN = +57·7m. Oxford e = +28m.53s. Bidston S = +33m.50s. Paris MN = +60·8m. Toledo MNW = +64·0m. Coimbra eE = +48m.45s., L = +46·8m. Ottawa i = +43m.45s., L = +64·8m. Toronto iEN = +33m.53s. Georgetown eN = +12m.31s., eSN = +23m.9s., eN = +23m.68s.

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Aug. 11d. 7h. 45m. 20s. Epicentre 40°·0N. 125°·0E.

A = -·439, B = +·628, C = +·643; D = +·819, E = +·574;
G = -·369, H = +·527, K = -·766.

Very doubtful.

	Δ	Az.	P.	O-C.	S.	O-C.	L.
	°	°	m. s.	s.	m. s.	s.	m.
Nagoya	10·6	114	2 29	- 9	—	—	—
Hakodate	12·0	76	2 58	- 1	—	—	4·4
Sapporo	12·6	71	3 14	+ 7	—	—	4·6
Ekaterinburg	44·0	314	i 8 25	- 1	i 14 30	-32	21·7

No additional readings.

Aug. 11d. Readings also at 0h. (Strasbourg and near Belgrade), 1h. (near Belgrade (2)), 2h. (Batavia), 6h. and 10h. (Bidston), 11h. (Nagasaki), 12h. (near Batavia and Malabar), 16h. (La Paz), 17h. (Bidston), 22h. (La Paz).

Aug. 12d. 5h. 59m. 30s. Epicentre 11°·5N. 149°·0E.

A = -·840, B = +·505, C = +·199; D = +·515, E = +·857;
G = -·171, H = +·103, K = -·980.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Osaka	26·3	334	5 53	+ 2	—	—	13·3	13·7
Kobe	26·4	334	5 11	-41	13 24	?L	14·6	15·1
Manila	27·5	280	e 15 13	?L	—	—	(e 15·2)	—
Taihoku	29·3	301	—	—	e 11 42	+20	18·3	—
Zi-ka-wei	32·2	313	—	—	—	—	e 13·9	17·5
Hong Kong	34·9	291	12 50	?S	(12 50)	- 4	21·9	23·4
Tiflis	92·7	314	—	—	—	—	e 54·7	—
Pulkovo	93·7	335	—	—	—	—	e 40·5	—
Upsala	98·8	339	—	—	—	—	e 51·5	59·0
Hamburg	106·2	337	—	—	—	—	e 53·5	63·5
Vienna	107·0	330	e 23 19	?	e 33 30	?SR ₁	e 52·5	57·5
Edinburgh	108·7	344	—	—	—	—	e 56·5	66·5
De Bilt	109·2	338	e 23 32	?	e 34 3	?SR ₁	e 57·5	66·9
Eskdalemuir	109·3	344	—	—	e 33 57	?SR ₁	56·5	—
Toronto	109·5	35	—	—	—	—	67·8	—
Ottawa	110·3	30	—	—	—	—	e 55·5	—
Uccle	110·5	337	—	—	e 33 30	?SR ₁	—	66·6
Strasbourg	110·9	35	—	—	e 34 30	?SR ₁	e 58·5	66·8
Oxford	111·7	340	—	—	—	—	—	68·8
Kew	111·7	340	—	—	—	—	—	61·5
Florence	112·7	328	e 17 30	+140	e 29 30	+98	e 42·5	52·5
Paris	112·9	338	—	—	—	—	e 58·5	67·6
Rocca di Papa	113·3	325	e 23 50	?	33 36	?SR ₁	56·6	69·6
Barcelona	118·9	351	—	—	—	—	e 63·1	66·3
Tortosa	120·1	333	—	—	—	—	e 61·5	73·7
Algiers	120·1	333	—	—	—	—	e 60·5	66·6
Toledo	122·0	327	—	—	e 58 59	?	e 65·5	67·5
Coimbra	122·9	335	—	—	e 63 30	?	e 63·9	69·8
Rio Tinto	124·2	340	—	—	—	—	e 67·5	75·5
San Fernando	125·2	337	69 30	?L	—	—	(69·5)	78·0
	126·7	335	e 63 35	?L	—	—	68·5	73·5

Additional readings: Osaka gives also MN = +14·7m. Kobe MN = +14·8m.
Zi-ka-wei MN = +16·4m. Hong Kong S = +18m.15s. (?L). Upsala
MN = +54·2m. Hamburg MN = +58·2m. Vienna PR,Zi = +26m.28s.
De Bilt e = +26m.44s., MN = +60·6m., MZ = +66·8m. Toronto eN =
+71·1m. Ottawa e = +64m.30s., L = +73·5m. Uccle MN = +65·5m.
Strasbourg MN = +61·0m. Rocca di Papa ePE = +23m.54s. Barcelo-
na MN = +72·8m. Algiers MN = +74·5m. Toledo MNW =
+63·4. San Fernando MN = +75·5m.

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The following is an alternative solution on the supposition that there were two shocks near the Japanese coast, and that Osaka recorded both and regarded them as separate phases of a more distant disturbance.

Aug. 12d. 6h. 3m. 24s. (I) | Epicentre 35°·0N. 143°·0E.
6h. 10m. 13s. (II) | (as on 1922 Mar. 16d.).

A = -·654, B = +·493, C = +·574; D = +·602, E = +·799;
G = -·458, H = +·345, K = -·819.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
I Osaka	6·2	270	1 59	+24	—	—	—	—
II	6·2	270	—	—	2 33	-16	—	2·9
I Kobe	6·4	266	1 17	-21	—	—	—	—
II	6·4	266	—	—	2 40	-15	3·9	4·4
II Zi-ka-wei	18·4	266	e 3 12	-70	—	—	—	6·8
I Taihoku	21·0	247	—	—	e 7 48	-56	14·4	—
I Hong Kong	23·1	251	8 56	+167	—	—	—	—
II	23·1	251	(7 31)	+82	(11 9)	+ 8	11·2	12·7
I Manila	28·5	230	e 11 19	?S	(e 11 19)	+11	—	—
I Pulkovo	70·3	330	—	—	—	—	e 36·6	—
II Tiflis	72·8	309	—	—	—	—	e 44·0	—
II Upsala	75·1	336	—	—	—	—	e 40·8	48·3
II Hamburg	82·6	335	—	—	—	—	e 42·5	52·8
II Vienna	84·1	328	e 12 35	- 8	e 22 46	-23	e 41·8	46·8
II Edinburgh	84·7	342	—	—	—	—	e 45·8	55·8
II Eskdalemuir	85·1	341	—	—	e 23 15	- 5	45·8	—
II De Bilt	85·4	336	e 12 48	- 2	e 23 19	- 4	e 46·8	56·2
II Uccle	86·7	336	—	—	e 22 46	-52	—	55·8
II Strasbourg	87·4	331	—	—	e 23 46	+ 1	e 47·8	56·1
II Kew	87·7	338	—	—	—	—	—	50·8
II Oxford	87·8	340	—	—	—	—	—	58·1
II Paris	89·1	335	—	—	—	—	e 47·8	56·9
I Florence	89·8	329	e 13 36	+21	e 25 36	+84	e 38·6	48·6
II Rocca di Papa	90·7	326	e 13 6	-14	22 52	-89	e 45·9	58·9
II Ottawa	92·3	27	—	—	—	—	e 44·8	—
II Toronto	E. 92·4	30	—	—	—	—	57·0	—
II Barcelona	E. 95·5	331	—	—	—	—	e 52·4	55·6
II Tortosa	E. 96·6	332	—	—	—	—	e 50·8	63·0
II	N. 96·6	332	—	—	—	—	e 49·8	55·8
II Toledo	99·1	336	—	—	e 48 15	?L	e 53·2	59·1
II Algiers	99·2	329	—	—	—	—	e 54·8	56·8
II Coimbra	100·2	340	—	—	e 52 46	?L	e 56·8	64·8
II Rio Tinto	101·9	336	58 46	?L	—	—	(58·8)	67·3
II San Fernando	103·0	335	e 52 51	?L	—	—	57·8	62·8

Aug. 12d. 10h. 6m. 12s. Epicentre 28°·0N. 126°·0E.

A = -·519, B = +·714, C = +·489; D = +·809, E = +·588;
G = -·276, H = +·380, K = -·883.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Taihoku	5·0	234	1 38	+21	—	—	4·0	5·7
Zi-ka-wei	5·1	310	e 3 6	?S	(e 2 6)	-14	e 3·7	7·3
Nagasaki	5·8	34	1 36	+ 6	3 10	+31	4·0	5·2
Hokoto	7·4	234	e 1 42	-10	e 3 19	- 2	e 4·4	—
Kobe	10·3	47	2 28	- 6	—	—	7·1	7·7
Osaka	10·5	48	2 45	+ 8	(4 55)	+12	4·9	8·9
Hong Kong	12·1	245	4 2	+62	—	—	—	10·3
Manila	14·2	200	e 3 2	-27	—	—	7·9	8·3
Mizusawa	E. 16·7	44	4 4	+ 3	7 21	+10	10·3	—
II	N. 16·7	44	4 1	0	7 16	+ 5	10·3	—
Hakodate	18·3	37	4 32	+11	—	—	4·7	5·4
Calcutta	E. 34·4	270	7 26	+18	—	—	—	—
Batavia	38·9	211	1 7 13	-32	1 13 10	-41	—	—
Simla	42·3	257	14 18	?S	(14 18)	-21	25·6	—
Colombo	48·4	254	8 24	-32	15 54	- 5	31·1	33·3
Kodaikanal	48·7	260	16 36	?S	(16 36)	+34	31·0	40·2
Bombay	49·2	272	16 25	?S	(16 25)	+16	—	—
Adelaide	64·0	168	—	—	—	—	e 29·8	—
Tiflis	65·6	307	8 14 0	+191	e 23 6	+214	e 35·9	48·3
Riverview	66·3	158	e 11 24	+30	e 18 46	-55	e 31·7	39·2
Honolulu	68·2	77	19 27	?S	(19 27)	-37	e 31·6	41·3
Pulkovo	68·8	329	1 11 20	+10	1 20 43	+31	37·8	56·7

Continued on next page.

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	m.	°	m. s.	s.	m. s.	s.	m.	m.
Upsala	74.6	331	e 11 49	+ 3	e 21 39	+18	e 40.8	50.8
Belgrade	80.6	316	e 12 29	+ 6	e 23 9	+39	e 45.0	—
Vienna	81.2	321	i 12 25	- 1	e 22 57	+20	e 41.8	49.8
Hamburg	81.5	328	e 12 34	+ 6	e 22 56	+15	e 46.8	48.8
Victoria	E. 81.8	40	12 17	-12	22 31	-13	—	55.7
	N. 81.8	40	12 19	-10	22 36	- 8	—	56.5
Innsbruck	84.5	322	e 12 39	- 6	—	—	e 44.8	51.6
De Bilt	84.7	328	12 46	0	23 16	0	e 46.8	51.6
Edinburgh	85.6	334	12 48	- 3	23 18	- 8	e 44.8	50.3
Strasbourg	85.7	324	e 12 49	- 3	e 23 19	- 8	e 38.8	51.0
Uccle	86.0	326	e 12 52	- 1	e 23 21	- 9	—	58.8
Zurich	86.0	322	e 12 51	- 2	e 23 50	+20	—	—
Eskdalemuir	86.1	334	e 12 51	- 3	e 23 17	-14	43.8	—
Pompeii	86.5	315	24 4	?S	(24 4)	+28	—	—
Florence	86.7	320	12 51	- 6	23 53	+17	—	43.8
Rocca di Papa	87.1	317	e 12 52	- 8	23 52	+10	e 49.4	59.9
Kew	87.6	330	—	—	—	—	—	52.8
Oxford	87.8	331	13 6	+ 2	24 1	+11	45.9	53.0
Paris	88.1	327	e 16 46	?PR ₁	i 24 7	+14	—	57.8
Barcelona	93.3	321	—	—	—	—	e 51.4	55.8
Tortosa	N. 94.6	322	13 32	- 9	24 1	-61	e 49.8	60.3
Algiers	95.9	318	e 13 53	+ 5	e 24 33	-42	e 40.8	60.8
Toledo	97.8	324	19 1	?PR ₁	—	—	e 36.8	67.6
Granada	99.6	321	e 17 12	?PR ₁	29 43	?	e 55.8	58.3
Coimbra	E. 99.8	327	18 19	?PR ₁	29 55	?	e 51.8	58.9
	N. 99.8	327	18 11	?PR ₁	—	—	55.8	58.3
Rio Tinto	100.8	324	58 48	?L	—	—	(58.8)	71.8
San Fernando	101.5	323	18 25	?PR ₁	27 8	+58	57.8	68.8
Chicago	103.7	25	—	—	e 27 33	+63	59.8	—
Ottawa	104.0	15	e 18 34	?PR ₁	—	—	e 47.8	—
Toronto	N. 104.7	19	—	—	—	—	52.3	—
La Paz	162.6	51	i 20 4	[- 6]	31 22	?	47.8	—
Rio de Janeiro	169.0	295	—	—	—	—	e 89.0	—

Additional readings and notes : Taihoku gives also MN = +5.5m. Zi-ka-wei MN = +7.0m. Kobe MN = +7.9m. Osaka MN = +3.3m, all readings being increased by 2min. Manila MN = +8.8m. Hakodate MN = +4.9m. Batavia i = +8m.41s. All readings are given as i simply. Adelaide e = +36m.30s. Tiflis eL? = +43.3m, MN = +44.8m. River view MN = +39.6m. Honolulu eN = +27m.38s., MN = +46.8m. Pulkovo SR₁ = +23m.48s., SR₂ = +30m.6s., MZ = +47.7m. Upsala MN = +44.2m. Belgrade i = +12m.52s., PR₁ = +13m.29s., L = +51.4m. Vienna iZ = +12m.42s., PR₁ = +15m.50s., PS = +23m.59s. De Bilt iE = +23m.38s., MN = +51.7m., MZ = +58.2m. Strasbourg MN = +51.2m. Uccle PR₁ = +16m.24s., MN = +51.0m. Eskdalemuir ePR₁? = +16m.25s., eSR₁? = +29m.48s. Rocca di Papa i = +12m.53s., eN = +16m.12s., eE = +16m.36s., eN = +16m.42s. Paris MN = +53.8m. Barcelona MN = +64.2m. Tortosa SN = +20m.31s., eLE = +50.8m., ME = +64.8m. Toledo MNW = +53.4m. Granada i = +18m.18s. San Fernando MN = +63.8m. Chicago eL = +48.8m. Ottawa e = +19m.0s., L = +55.3m. Toronto eE = +39m.56s. and several other L readings.

Aug. 19d. 17h. 16m. 36s. Epicentre 1°5S. 23°0W.

A = +.920, B = -.391, C = -.026; D = -.391, E = -.920; G = -.024, H = +.010, K = -1.000.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	m.	°	m. s.	s.	m. s.	s.	m.	m.
Rio de Janeiro	E. 29.0	221	e 6 36	+18	—	—	11.7	17.3
	N. 29.0	221	e 6 32	+14	—	—	12.2	19.2
San Fernando	41.0	21	4 24	?	10 6	?	23.9	29.4
Rio Tinto	42.1	20	24 24	?L	—	—	(24.4)	29.9
Coimbra	43.8	17	8 7	-17	e 14 43	-16	18.7	21.4
Algiers	45.3	30	—	—	—	—	e 25.4	27.9
La Paz	46.9	249	e 8 11	-35	15 33	- 7	21.8	24.1
Tortosa	47.4	24	8 49	- 1	15 42	- 4	23.8	25.1
Pilar	E. 48.9	228	25 12	?L	—	—	30.0	30.7
	N. 48.9	228	24 54	?L	—	—	28.9	29.4
Rocca di Papa	54.0	34	19 40	+7	—	—	e 29.7	39.5
Cipolletti	55.8	222	29 30	?L	—	—	32.7	34.4
Oxford	56.4	16	—	—	117 38	- 1	23.7	30.0

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Strasbourg	56.7	25	e 10 17	+27	e 17 45	+ 3	e 28.4	—
Uccle	57.3	22	e 5 30	?	e 17 48	- 2	e 26.4	—
De Bilt	58.6	20	10 3	0	e 18 9	+ 3	e 26.4	36.9
Eskdalemuir	59.1	13	—	—	e 17 56	-16	24.4	—
Edinburgh	59.6	13	—	—	e 18 24	+ 6	—	28.4
Hamburg	61.5	21	—	—	—	—	e 30.4	—
Ottawa	66.0	323	—	—	—	—	e 25.4	—
Toronto	67.5	320	—	—	—	—	e 27.2	—
Pulkovo	73.8	26	—	—	e 21 15	+ 3	34.4	—

Additional readings: San Fernando gives also MN = +25.9m. Rocca di
 Papa iPE = +9m.43s. De Bilt MNZ = +35.9m.

Aug. 12d. Readings also at 0h. (near Mizusawa), 4h. (Nagoya, Florence, and near Nagasaki (2)), 5h. (Florence), 8h. (near Mizusawa), 9h. (Apia), 11h. (near La Paz), 12h. (Zante), 15h. (near La Paz), 14h. (Colombo), 22h. (Toledo).

Aug. 13d. Readings at 1h. (Granada), 2h. (Florence), 9h. (San Fernando), 10h. (Ekaterinburg), 20h. (near Batavia and Malabar), 21h. (near Batavia and Malabar and near Granada).

Aug. 14d. 17h. 51m. 0s. Epicentre 39°-5N. 24°-0E.

A = +.705, B = +.314, C = +.636; D = +.407, E = -.914;
 G = +.581, H = +.256, K = -.772.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	1.6	188	1 0 28	+ 4	—	—	1 0.8	0.9
Mostar	6.0	312	e 2 10	+38	e 3 27	1L	(e 3.4)	4.3
Belgrade	6.0	336	1 2 14	+42	1 3 24	1L	(1 3.4)	4.9
	6.0	336	e 2 7	+35	1 3 21	1L	(1 3.3)	4.4
Pompeii	7.4	283	1 55	+ 3	—	—	14.0	—
Rocca di Papa	8.9	289	e 2 24	+ 9	4 12	+11	e 5.6	8.0
Vienna	10.3	331	e 2 32	- 2	—	—	16.0	7.4
Florence	10.4	299	(e 2 0)	-36	—	—	e 5.5	9.0
Venice	10.4	308	5 36	1L	—	—	(5.6)	7.4
Innsbruck	12.0	315	e 3 6	+ 7	—	—	—	—
Strasbourg	14.5	313	e 7 59	1L	e 9 35	?	(e 8.0)	—
Hamburg	17.0	331	—	—	—	—	e 8.0	12.0
Uccle	17.8	316	—	—	—	—	e 9.5	—
Paris	17.9	307	e 4 16	0	e 7 40	+ 2	10.0	11.0
Tortosa	17.9	282	—	—	—	—	e 10.0	13.6
De Bilt	18.1	320	4 21	+ 3	7 50	+ 8	e 9.2	10.9
Pulkovo	20.6	9	4 50	+ 2	8 50	+14	11.0	14.2
Kew	20.6	314	—	—	—	—	—	13.0
Upsala	20.8	351	—	—	—	—	e 12.0	14.0
Oxford	21.4	314	—	—	1 8 48	- 5	—	12.8
Bidston	23.0	316	—	—	9 0	-25	—	14.0
Eskdalemuir	24.0	320	—	—	e 9 39	- 5	11.5	—
Edinburgh	24.3	321	—	—	e 10 0	+10	—	15.0
Ekaterinburg	29.4	42	6 6	-16	11 40	+16	16.0	18.8

Additional readings: Athens gives also IP = +30s., MN = +1.1m. Belgrade
 i = +3m.42s. Pompeii S = +5m.0s. Rocca di Papa ePN = +2m.30s.,
 iE = +2m.98s. Vienna iZ = +8m.27s. Florence readings are both
 given as eL. Hamburg readings have been diminished by 1h. Tortosa
 eLE = +11.0m. De Bilt MN = +10.8m., MZ = +12.8m. Upsala
 MN = +14.6m.

Aug. 14d. 21h. 24m. 14s. Epicentre 42°-0N. 142°-0E. (as on 1923 July 20d.).

A = -.586, B = +.458, C = +.669.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Hakodate	1.0	256	0 19	+ 4	(0 32)	+ 4	0.5	0.8
Sapporo	1.2	336	0 16	- 2	(0 29)	- 4	0.5	0.5
Misusawa	2.9	193	0 40	- 5	1 15	- 6	—	—
	2.9	193	0 45	0	1 21	+ 1	—	—

Hakodate gives also MN = +0.6m.

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Aug. 14d. Readings also at 1h. and 7h. (La Paz), 12h. (Manila), 13h. (Ekaterinburg), 16h. (Lick), 21h. (Apia), 22h. (Colombo and near Manila).

Aug. 15d. Readings at 6h. (Adelaide, Riverview, and Ekaterinburg), 7h. (Victoria, Chicago, Melbourne, Pulkovo, Manila, Honolulu, and near Athens), 10h. (Zi-ka-wei, Ekaterinburg, Manila, and near Mizusawa), 16h. (Florence and Lick (3)), 17h. (Apia), 18h. (Apia, Toledo, Ekaterinburg, and Victoria), 20h. (Ekaterinburg and La Paz), 22h. (Ekaterinburg and La Paz).

Aug. 16d. 3h. 51m. 40s. Epicentre 40°·2N. 34°·4E.

A = +·630, B = +·432, C = +·645; D = +·565, E = -·825;
G = +·533, H = +·365, K = -·764.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Tifis	7·9	76	—	—	—	—	e 4·3	6·6
Athens	8·6	258	e 2 27	+17	3 36	-17	3·8	4·6
Belgrade	11·3	299	e 3 1	+12	1 5 28	+26	—	7·4
Vienna	15·2	308	e 2 43	-59	—	—	—	15·8
Rocca di Papa	16·4	283	4 8	+11	6 20	-44	e 9·4	12·4
Florence	17·5	289	e 4 20	+9	10 20	?L	(10·3)	12·3
Pulkovo	19·8	354	14 40	+1	i 8 17	-2	9·8	14·2
Strasbourg	20·7	303	4 53	+4	e 8 34	-4	e 12·0	—
Hamburg	21·2	317	e 4 52	-3	e 8 45	-3	e 13·3	17·1
Besançon	21·6	298	5 4	+4	—	—	—	15·3
Upsala	22·3	338	e 5 2	-7	e 9 2	-9	—	—
De Bilt	23·3	311	5 21	+1	9 31	0	e 11·3	13·7
Uccle	23·4	307	e 5 18	-3	—	—	—	—
Ekaterinburg	23·8	37	15 26	0	i 9 41	+1	14·3	22·2
Paris	24·1	302	e 5 29	0	e 9 46	0	13·3	16·3
Algiers	24·7	272	e 5 34	-1	e 9 55	-2	—	25·3
Oxford	27·1	308	15 53	-6	i 10·25	-18	—	18·5
Bidston	28·4	310	6 5	-7	14 52	?L	(14·9)	23·1
Edinburgh	29·1	316	—	—	i 11 0	-19	—	20·3

Additional readings and notes: Tifis gives also e = +5m.38s. Athens
i = +3m.29s., MN = +5·5m. Belgrade iP = +3m.35s. Vienna
ePR₁? = +3m.48s., iPS = +6m.49s. Rocca di Papa iN = +4m.26s.,
eLN = +11·0m. Pulkovo iS = +7m.54s. Bidston S = +14m.15s.,
P has been increased by 10m.

Aug. 16d. 20h. 22m. 30s. Epicentre 46°·5N. 151°·5E. (as on 1921 Mar. 29d.).

A = -·605, B = +·328, C = +·725; D = +·477, E = +·879;
G = -·638, H = +·346, K = -·688.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Ootomari	6·0	274	1 31	-1	(2 47)	+3	2·8	—
Sapporo	8·0	248	2 4	+3	(3 36)	—	3·6	4·1
Hakodate	9·1	242	1 14	-64	(2 48)	-78	2·8	4·1
Mizusawa	E. 10·6	229	2 27	-11	4 12	-33	—	—
	N. 10·6	229	2 25	-13	4 13	-32	—	—
Nagoya	15·8	229	4 46	+57	—	—	—	—
Osaka	16·9	232	4 4	0	(6 47)	-29	6·8	10·2
Kobe	17·1	232	e 3 59	-7	(e 7 8)	-12	e 7·1	—
Zi-ka-wei	27·7	247	e 5 49	-16	—	—	—	—
Ekaterinburg	53·0	319	9 20	-6	16 50	-6	24·5	33·5
Victoria	N. 54·5	53	17 15	?S	(17 15)	0	—	44·2
Pulkovo	63·4	332	9 39	-55	18 17	-49	30·5	34·4
Upsala	67·2	339	—	—	—	—	e 33·5	47·4
Tifis	N. 70·5	313	—	—	—	—	e 41·0	43·4
Kodaikanal	71·7	270	46 30	?L	—	—	(46·5)	—
Colombo	72·4	266	39 42	?L	—	—	(39·7)	53·5
Hamburg	74·7	337	e 11 54	+7	e 21 30	+8	e 36·5	47·5
Edinburgh	75·4	346	—	—	—	—	e 39·5	—
Eskdalemit	76·0	346	e 12 0	+5	21 42	+5	37·5	—
De Bilt	77·3	340	12 4	+1	21 59	+7	e 35·5	44·4
Chicago	77·3	40	—	—	21 45	-7	e 42·5	—
Vienna	77·5	331	12 5	+1	22 6	+11	e 38·5	52·5

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Bidston	77.8	346	12 55	+49	22 55	+57	—	51.2
Kew	79.1	345	—	—	—	—	—	58.5
Ottawa	79.1	31	—	—	e 22 10	- 3	e 40.5	—
Toronto	79.2	35	—	—	i 22 11	- 3	40.6	—
	N.	79.2	35	—	i 22 4	-10	40.3	—
Strasbourg	79.9	337	12 14	- 4	—	—	47.5	—
Innsbruck	80.0	336	e 12 16	- 3	—	—	e 48.5	—
Riverview	80.3	181	—	—	e 22 6	-21	e 40.3	50.6
Zurich	80.7	337	i 12 22	- 1	—	—	—	—
Paris	80.9	341	e 12 25	+ 1	e 22 37	+ 3	43.5	47.5
Florence	83.1	334	e 11 10	-87	23 30	-28	—	44.5
Rocca di Papa	84.5	330	i 12 44	- 1	e 23 15	+ 1	e 51.4	56.6
Tortosa	88.9	340	—	—	—	—	e 46.5	51.5
Toledo	91.0	343	—	—	—	—	43.5	—
Coimbra	91.5	347	—	—	e 23 0	[-37]	50.3	—
San Fernando	94.7	343	e 52 5	?L	—	—	(e 52.1)	62.5
La Paz	135.6	61	20 2	[+31]	—	—	—	—

Additional readings and notes : Sapporo gives also MN = +4.3m. Hakodate MN = +3.1m. Nagoya readings are diminished by 1h. Osaka MN = +8.3m. Ekaterinburg PR₂ = +12m.37s., SR₁ = +20m.47s., MN = +29.4m., MZ = +35.0m. Pulkovo PS = +18m.27s., MN = +35.4m. Tiflis eLE = +44.3m., ME = +45.7m. Hamburg MN = +41.5m. Eskdalemuir eSR₁ = +27m.10s. De Bilt MN = +56.5m., MZ = +56.9m. Bidston readings have been diminished by 1h. Ottawa e? = +31m.18s., L = +49.5m. Toronto LE = +44.4m., LN = +47.8m. and +48.5m. Rocca di Papa P = +12m.49s. Tortosa eLE = +47.5m. Toledo reading has been diminished by 1h.

Aug. 16d. Readings also at 0h. (near Belgrade), 1h. (Lick), 3h. (3) and 4h. (La Paz), 6h. (Mizusawa and near Manila), 8h. (Bidston), 9h. (Florence), 10h., 12h., and 16h. (Nagasaki), 18h. (near Berkeley), 19h. (Lick, Kobe, and Hong Kong), 21h. (La Paz).

Aug. 17d. 0h. 32m. 28s. Epicentre 33°-0N. 18°-5E.

A = +.747, B = +.250, C = +.616; D = +.317, E = -.948;
G = +.584, H = +.195, K = -.788.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	4.1	89	e 1 3	- 1	—	—	1.5	1.7
Rocca di Papa	5.8	313	e 1 32	+ 2	(e 2 36)	- 3	3.9	6.1
Belgrade	6.9	11	e 1 43	- 2	(e 3 5)	- 2	—	3.7
Vienna	10.3	352	e 2 44	+10	—	—	i 6.4	7.4
Strasbourg	13.1	327	—	—	—	—	e 8.5	—
De Bilt	16.9	331	—	—	—	—	e 10.0	12.4

Additional readings and notes : Athens gives also iP = +1m.7s., MN = +1.9m. Rocca di Papa readings are all given as P, also iPE = +2m.20s. Vienna eZ = +3m.44s. De Bilt MN = +12.5m.

Aug. 17d. 1h. 5m. 5s. Epicentre 24°-0S. 69°-0W. (as on 1916 Dec. 23d.).

A = +.327, B = -.853, C = -.407; D = -.934, E = -.358;
G = -.146, H = +.380, K = -.914.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Andalgala	N.	4.3	147	0 49	-18	—	2.1	3.0
La Paz		7.6	6	i 2 17	+22	i 3 55	+29	4.7
Pilar	E.	8.9	154	2 25	+10	—	—	5.1
Mendoza		9.0	176	3 43	18	(3 43)	-20	5.1
La Plata	E.	14.5	141	3 33	0	6 24	+ 4	7.6
	N.	14.5	141	3 28	- 5	6 11	- 9	7.5
Cipolletti		15.0	177	6 31	18	(6 31)	- 1	7.7
Río de Janeiro	E.	23.7	93	e 5 25	0	9 55	+17	13.6
	N.	23.7	93	15 25	0	10 3	+25	13.6

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Chicago	68.0	346	—	—	e 18 28	-94	e 39.9	—
Toronto	68.3	352	—	—	i 20 3	- 3	39.8	—
	68.3	352	—	—	i 20 10	+ 4	41.9	—
Ottawa	69.7	355	—	—	i 20 26	+ 4	e 40.4	—
Cape Town	75.0	121	—	—	—	—	—	41.9
San Fernando	84.6	46	e 12 55	+ 9	i 23 40	+25	—	54.9
Coimbra	85.5	41	12 47	- 4	e 23 22	- 3	43.4	52.8
Granada	86.7	47	e 12 56	- 1	e 16 43	?PR ₁	—	—
Victoria	87.2	327	12 50	-10	23 22	[+12]	41.5	46.5
Toledo	88.0	45	e 14 45	+100	e 23 5	[-10]	e 40.9	—
Algiers	91.1	50	e 13 12	-10	e 24 35	+10	46.9	59.9
Kew	96.4	36	—	—	—	—	—	62.9
Paris	96.7	39	—	—	—	—	e 54.9	67.9
Eskdalemuir	96.9	32	—	—	e 24 18	[+11]	43.9	—
Edinburgh	97.3	31	—	—	—	—	e 50.9	e 54.9
Honolulu	97.6	290	—	—	—	—	e 45.4	—
De Bilt	99.7	37	e 14 3	- 6	e 24 37	[+15]	e 49.9	64.4
Florence	99.8	47	26 55	?S	(26 55)	+61	52.9	62.9
Rocca di Papa	100.0	49	e 11 1	?S	e 20 31	?PR ₁	e 53.5	70.5
Hamburg	102.9	38	—	—	—	—	e 58.9	66.9
Vienna	104.8	44	e 18 31	?PR ₁	27 58	+78	—	67.9
Upsala	108.9	32	—	—	—	—	e 69.9	—
Pulkovo	115.2	33	—	—	—	—	e 58.9	—
Ekaterinburg	122.1	34	i 19 24	[+26]	e 28 36	-29	54.9	65.5
Kodaikanal	145.2	108	82 7	?L	—	—	(82.1)	—
Colombo	145.5	115	77 13	?L	—	—	(77.2)	81.9
Nagasaki	161.3	302	39 53	?S	—	—	—	—

Additional readings and notes: Andalgalá readings have been increased by 7m. Pilar gives also LN = +5.2m., MN = +7.1m. Mendoza readings have been diminished by 3min. La Plata SN = +6m.27s., SE = +6m.44s. T₀ = 1h. 4m. 58s. Rio de Janeiro SR₁ = +11m.18s. Toronto eN = +19m.0s., eE = +19m.15s., iE = +20m.18s. Eskdalemuir e = +26m.35s. De Bilt e = +27m.8s., MZ = +57.4m., MN = +59.5m. Ekaterinburg i = +21m.39s., MZ = +81.2m.

Aug. 17d. 3h. 46m. 38s. Epicentre 48°·0N. 148°·0E. (as on 1919 Sept. 12d.).

A = -·567, B = +·355, C = +·743; D = +·530, E = +·848;
G = -·630, H = +·394, K = -·669.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Ootomari	3.8	249	1 25	+26	(1 25)	-19	—	—
Sapporo	6.7	226	1 50	+ 8	(3 16)	+14	3.3	3.8
Hakodate	8.0	222	2 0	- 1	(3 31)	- 6	3.5	5.2
Mizusawa	10.1	211	1 16	-75	2 58	-94	—	—
	10.1	211	4 3	+92	5 50	+78	—	—
Nagoya	15.2	217	4 32	+50	—	—	—	—
Kobe	16.4	220	3 48	- 9	(e 7 12)	+ 8	e 7.2	—
Nagasaki	20.5	228	4 39	- 8	—	—	—	—
Zi-ka-wei	26.3	240	e 5 37	-14	—	—	—	—
Ekaterinburg	50.2	316	9 9	+ 1	—	—	28.4	34.9
Pulkovo	61.0	330	9 27	-52	e 17 57	-39	28.4	40.6
Upsala	64.8	335	—	—	—	—	e 39.4	—
Hamburg	72.4	337	e 11 22	-10	—	—	e 40.4	46.4
De Bilt	75.0	339	11 53	+ 4	21 48	+22	e 36.4	44.2
Vienna	75.0	330	i 11 52	+ 3	21 19	- 7	42.4	54.4
Zurich	78.4	333	i 12 10	+ 1	22 22	+17	—	—
Paris	78.6	340	—	—	—	—	e 46.4	54.4
Ottawa	79.1	29	—	—	—	—	e 40.4	—
Toronto	79.3	33	—	—	—	—	47.7	—
Florence	80.6	330	—	—	—	—	42.4	45.4
Rocca di Papa	81.9	329	12 27	- 3	20 40	+125	e 51.8	56.3
Tortosa	86.6	336	—	—	—	—	e 48.4	—
Toledo	88.7	339	—	—	—	—	43.4	—

Additional readings and notes: Sapporo gives also S = +2m.28s. Hakodate MN = +3.9m. Ekaterinburg i = +10m.17s., e = +20m.19s. Pulkovo MN = +34.6m. De Bilt MN = +50.8m., MZ = +56.7m. Toronto eE = +44m.7s.

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Aug. 17d. 12h. 10m. 25s. Epicentre 9°-0S. 141°-0E.

A = -.768, B = +.622, C = -.156; D = +.629, E = +.777;
G = +.122, H = -.098, K = -.988.

Rough. The observations are inconsistent, indicating different values for T₀. The only two fairly accordant are those of Riverview and Ekaterinburg; but the inferred values of Δ are 26°·6 and 85°·4, which together do not make up the shortest distance (118°·1) between these stations. We could invoke the aid of a deep focus, but the material is not good enough to warrant it.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Adelaide	26·1	185	i 5 53	+ 4	i 11 35	+71	e 14·9	19·1
Riverview	26·6	161	e 5 58	+ 4	e 10 37	+ 4	e 14·3	18·1
Sydney	26·6	161	10 29	?S	(10 29)	—	4	14·9
Melbourne	29·0	174	—	—	11 35?	+18	14·9?	22·1
Manila	30·8	390	e 6 35	- 1	—	—	—	15·1
Perth	32·7	222	10 54	+240	17 40	?L	e 23·6	—
Batavia	33·9	272	e 8 18	+74	—	—	—	—
Taihoku	38·9	332	—	—	e 12 35	-76	—	—
Zi-ka-wei	44·3	338	e 7 43	-45	e 14 23	-43	—	23·7
Honolulu	E. 67·0	63	16 32	?PR ₁	e 23 47	?	—	27·2
	N. 67·0	63	16 39	?PR ₁	e 23 10	?	—	27·2
Ekaterinburg	E. 92·2	327	i 12 45	-43	23 18	[-23]	41·6	56·0
Victoria	N. 100·4	43	23 29	?	31 47	?	36·5	39·2
Pulkovo	N. 108·1	331	e 14 59	+10	26 19	-52	51·1	67·8
Upsala	N. 114·0	332	—	—	—	—	e 61·6	—
Vienna	119·3	321	—	—	—	—	e 58·6	74·6
Hamburg	120·7	328	—	—	—	—	e 61·6	—
De Bilt	E. 123·9	328	—	—	—	—	e 58·6	64·0
	N. 123·9	328	—	—	—	—	e 57·6	71·3
Florence	124·3	317	—	—	—	—	e 69·6	72·6
Chicago	126·2	42	—	—	e 30 30	?	59·6	—
Paris	127·1	326	—	—	—	—	75·6	76·6
Toronto	130·7	37	—	—	—	—	68·5	—
Ottawa	131·8	32	—	—	—	—	63·6	—
San Fernando	139·5	318	25 35	?	—	—	—	89·6

Additional readings and notes: Adelaide gives also e? = +18m.5s. Riverview MZ = +15·2m., MN = +17·6m., T₀ = 12h.10m.31s. Honolulu SR, E = +25m.37s., Ekaterinburg PR₁ = +16m.33s., ISR₁ = +30m.28s., MN = +47·0m., MZ = +55·2m., Pulkovo eSR₁ = +34m.3s., MN = +65·0m. De Bilt MZ = +71·2m., Eskdalemuir (Δ = 125°·7) gives simply 13h. Florence eL has been increased by 1h. Chicago eL = +53·6m. Paris e = +62m.35s. Toronto gives several other LE and LN.

Aug. 17d. Readings also at 0h. (Ekaterinburg), 1h. (La Paz and near Belgrade), 3h. and 5h. (Bidston), 6h. (Mendoza, La Paz, and La Plata), 7h., 8h., 9h., and 10h. (Ekaterinburg), 11h. (near Mizusawa), 12h. (Toronto), 15h. (Ekaterinburg and Vienna), 16h. (Florence).

Aug. 18d. Readings at 0h. (Nagasaki), 1h. (near Mizusawa), 3h. (near Athens), 5h. (Apia and Vienna), 7h. (Apia), 15h. (Florence), 18h. (Strasbourg), 20h. (La Paz, near Mostar (3), and near Belgrade), 22h. (Toronto).

Aug. 19d. 12h. 21m. 50s. Epicentre 1°-0S. 154°-0E. (as on 1918 June 24d.).

A = -.899, B = +.438, C = -.017; D = +.438, E = +.899;
G = +.016, H = -.008, K = -1·000.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	32·9	184	—	—	e 13 0	+38	e 15·9	21·5
Sydney	32·9	184	e 13 4	?S	(e 13 4)	+42	18·5	21·4
Manila	36·3	297	e 10 21	?	—	—	15·7	—
Adelaide	36·8	201	—	—	e 13 16	- 5	e 17·2	20·7
Melbourne	37·8	192	—	—	12 52	-43	17·7	22·1
Osaka	39·8	336	9 38	?PR ₁	(12 59)	-64	13·0	17·8
Zi-ka-wei	44·6	319	8 28	- 2	e 15 6	- 4	18·2	22·6
Perth	47·5	225	—	—	—	—	e 22·9	—
Honolulu	E. 51·9	61	—	—	—	—	e 31·0	33·7

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		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Victoria	E.	85.9	41	25 19	?	—	—	44.2	50.4
	N.	85.9	41	26 9	?	—	—	42.3	51.2
Ekaterinburg		92.7	327	14 44	+73	1 25 11	+29	38.2	53.6
Pulkovo		107.1	334	—	—	e 26 33	-29	53.2	65.6
Chicago		111.4	45	—	—	—	—	63.2	—
Upsala	N.	112.2	339	—	—	—	—	e 58.2	—
Toronto		116.3	40	—	—	—	—	e 56.7	—
Ottawa		117.7	37	—	—	—	—	e 56.7	—
Hamburg		119.6	336	—	—	—	—	e 59.2	—
Edinburgh		122.1	345	—	—	—	—	57.2	61.2
De Bilt	E.	122.6	338	—	—	—	—	e 59.2	67.8
	N.	122.6	338	—	—	—	—	e 60.2	70.3
Eskdalemuir		122.6	345	—	—	—	—	52.2	—
Uccle		123.9	336	—	—	—	—	e 60.2	—
Strasbourg		124.3	334	e 22 10	?PR ₁	—	—	62.2	—
Kew		125.1	340	—	—	—	—	—	79.2
Florence		125.9	328	—	—	—	—	45.7	63.2
Paris		126.2	338	—	—	e 38 55	?SR ₁	71.2	77.2
Coimbra		137.6	340	—	—	44 55	?	70.2	—
San Fernando		140.1	335	34 58	?	69 4	?	85.7	88.2

Additional readings: Riverview gives also e = +8m.15s., MN = +20.4m., MZ = +22.3m. Adelaide eSR₁ = +15m.10s. Osaka MN = +21.1m. Honolulu eE = +20m.32s. Ekaterinburg iPS = +26m.43s., SR₁ = +30m.45s., SR₂ = +35m.5s., MN = +45.5m., MZ = +54.8m. Pulkovo ePR₁ = +20m.21s., PS = +29m.19s., SR₁ = +35m.1s., SR₂ = +42m.40s., MN = +64.8m. Chicago L = +77.2m. All readings have been increased by 1h. Toronto eN = +29m.25s., LE = +64.2m., eLN = +61.0m., LN = +66.2m. Ottawa e = +34m.40s., I = +39m.38s., L = +63.2m. De Bilt MZ = +78.0m. Coimbra e = +27m.50s., +30m.20s., and +36m.25s.

Aug. 19d. 22h. 23m. 18s. Epicentre 38°-5N. 139°-0E.

A = -591, B = +513, C = +623.

		Δ	P.	O-C.	S.	O-C.	L.	ME.	MN.
		°	m. s.	s.	m. s.	s.	m.	m.	m.
Mizusawa	E.	1.7	0 28	+ 2	0 52	+ 4	—	—	—
Hakodate		3.5	0 51	- 4	—	—	1.9	2.6	2.2
Nagoya		3.7	0 24	-34	—	—	1.2	1.2	1.6
Osaka		4.8	0 58	-16	(2 2)	- 9	2.0	2.8	2.7
Kobe		4.9	1 11	- 5	—	—	2.1	2.4	2.3
Ekaterinburg		52.6	8 57	-27	e 16 37	-14	25.7	—	—

Mizusawa gives also PN = +26s.

Kobe readings are given for 21h.

Aug. 19d. Readings also at 1h. (La Paz, Malabar, and Batavia), 3h. (Bidston), 8h. (Ekaterinburg), 10h. (Riverview), 11h. (Hamburg, Hong Kong, and near Granada), 15h. (Strasbourg and La Paz), 17h. (La Paz), 19h. (Ekaterinburg), 21h. (Ekaterinburg and Zi-ka-wel), 23h. (Zi-ka-wel).

Aug. 20d. 18h. 9m. 30s. (i) } Epicentre 8°-5S. 125°-5E. (as on 1918 Oct. 16d.).
19h. 13m. 42s. (ii)

A = -574, B = +805, C = -148; D = +814, E = +581;
G = +086, H = -120, K = -989.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
I Batavia		18.6	278	1 4 40	+16	—	—	11.5	—
II		18.6	278	1 4 45	+21	—	—	12.3	—
I Manila		23.5	349	5 30	+ 7	—	—	11.0	—
II		23.5	349	e 6 13	+50	(9 43)	+ 8	9.7	—
I Perth		25.1	200	—	—	10 5	0	18.0	—
I Adelaide		29.0	157	—	—	e 11 12	- 5	e 16.0	—
II		29.0	157	—	—	—	—	e 16.3	18.1

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	\circ	\circ	m. s.	s.	m. s.	s.	m.	m.
I Melbourne	34.1	152	—	—	e 12 42	0	19.7	21.5
II	34.1	152	—	—	—	—	—	21.8
I Riverview	34.6	141	—	—	e 11 42	-67	e 21.9	22.4
II	34.6	141	—	—	—	—	e 21.0	22.6
I Sydney	34.6	141	12 30	?S	(12 30)	-19	19.9	21.3
II	34.6	141	12 36	?S	(12 36)	-13	20.0	21.6
I Zi-ka-wei	39.9	358	7 48	-6	—	—	—	—
II	39.9	358	e 5 38	-136	—	—	—	—
I Colombo	48.1	287	16 30	?S	(16 30)	+35	26.7	31.5
II	48.1	287	18 48	?	—	—	26.5	31.8
I Kodaikanal	51.3	291	27 42	?L	—	—	32.0	33.3
II	51.3	291	28 36	?L	—	—	(28.6)	—
I Ekaterinburg	83.9	330	12 42	+ 1	23 0	- 8	35.5	57.0
II	83.9	330	12 40	- 1	23 0	- 8	39.3	55.0
I Pulkovo	100.0	330	e 17 48	?PR ₁	—	—	48.5	—
I Strasbourg	114.6	320	e 19 40	?PR ₁	e 30 40	?	e 63.5	—
I De Bilt	115.1	324	—	—	e 27 48	-23	e 66.5	67.7
II	115.1	324	—	—	—	—	e 67.3	—
I Toronto	N. 138.7	27	—	—	—	—	63.1	—
I Ottawa	138.8	21	—	—	—	—	70.5	—
I La Paz	151.6	152	20 27	[+29]	—	—	—	—

Additional readings and notes : Batavia I gives also $i = +5m.11s.$ and $+5m.38s.$
 Adelaide I SR₁ = $+13m.36s.$ Riverview I MN = $+22.3m.$, MZ = $+23.2m.$,
 II e = $+15m.48s.$ and $+19m.36s.$, MZ = $+24.6m.$, MN = $+24.7m.$ Ekaterin-
 burg I MZ = $+55.0m.$ De Bilt I MN = $+67.6m.$

Aug. 20d. Readings also at 0h. (Apia, Pulkovo, and Ekaterinburg), 1h. (Apia and Strasbourg), 7h. (Kingston), 12h. (Rocca di Papa), 18h. (La Paz), 20h. (Apia), 21h. (Rio Tinto), 22h. (near Athens).

Aug. 21d. Readings at 0h. (Florence), 2h. (Apia), 8h. (Ekaterinburg, De Bilt, Innsbruck, and near Athens), 9h. (Nagasaki), 10h. (Ekaterinburg), 15h. (Toledo, Rocca di Papa, and Pompeii), 16h. (Ekaterinburg), 17h. (La Paz and near Athens), 19h. (Rocca di Papa), 23h. (Ekaterinburg).

Aug. 22d. 14h. 45m. 42s. Epicentre $46^{\circ}0'N. 149^{\circ}0'E.$ (as on 1923 Mar. 21d.).

A = -596 , B = $+358$, C = $+719$; D = $+515$, E = $+857$;
 G = -617 , H = $+370$, K = -695 .

Uncertain.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	\circ	\circ	m. s.	s.	m. s.	s.	m.	m.
Sapporo	6.2	245	1 47	+12	—	—	3.4	—
Hakodate	7.3	238	2 6	+15	—	—	3.6	6.2
Mizusawa	8.9	223	2 13	- 2	3 58	- 3	—	—
Ekaterinburg	52.2	316	e 10 13	+52	18 56	+130	25.3	29.4
Pulkovo	63.1	330	—	—	e 19 10	+ 8	—	36.0

Additional readings : Hakodate gives also MN = $+4.6m.$ All readings have been diminished by 3m. Ekaterinburg MZ = $+37.4m.$ Pulkovo e = $+15m.48s.$

Aug. 22d. Readings also at 1h. (near Malabar and Batavia), 5h. (Florence), 6h. and 8h. (Ekaterinburg), 9h. (Florence and near Granada), 13h. (Ekaterinburg), 16h. (Lick), 19h. (near La Paz), 21h. (Ekaterinburg), 22h. (La Paz).

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Aug. 23d. 5h. 12m. 45s. Epicentre 5°-0S. 95°-0W.

A = -087, B = -992, C = -087; D = -996, E = +087;
G = +008, H = +087, K = -996.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
La Paz	28.7	115	6 15	0	11 15	+ 3	15.3	21.2
Chicago	47.2	8	15 26	?S	(15 26)	-18	26.1	—
Berkeley	N. 49.3	332	—	—	—	—	e 19.4	—
Toronto	E. 50.6	15	16 31	?S	(16 31)	+ 5	30.0	—
	N. 50.6	15	16 26	?S	(16 26)	0	30.3	—
Rio de Janeiro	53.1	116	—	—	—	—	e 30.2	—
Ottawa	53.2	19	17 18	?S	(17 18)	+19	e 30.2	—
Victoria	E. 58.9	340	10 1	-3	16 32	-98	25.3	29.1
Honolulu	E. 67.1	296	20 34	?S	(20 34)	+43	(26.2)	28.5
Kew	96.9	39	—	—	—	—	—	66.2
Paris	98.7	41	—	—	—	—	e 50.2	—
De Bilt	E. 100.2	38	—	—	—	—	e 52.2	58.2
Strasbourg	102.2	41	—	—	—	—	—	47.2

Additional readings: Chicago gives also L = +29.6m. Toronto iN = +16m.35s. and +20m.38s., also several L's. Ottawa L = +38.2m. Honolulu SN = +26m.25s., MN = +28.6m. De Bilt eLN = +49.2m. Eskdalemuir gives simply 6h.

Aug. 23d. Readings also at 2h. (Innsbruck), 8h. (La Paz and La Plata), 9h. (La Paz), 22h. (La Paz and near Malabar and Batavia).

Aug. 24d. 1h. 15m. 22s. Epicentre 38°-5N. 139°-0E. (as on Aug. 19d.).

A = -591, B = +513, C = +623.

	Δ	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	E. 1.7	0 21	- 5	0 45	- 3	—	—
	N. 1.7	0 22	- 4	0 46	- 2	—	—
Hakodate	3.5	1 2	+ 7	—	—	1.9	2.1
Nagoya	3.7	0 55	- 3	—	—	1.9	2.1
Osaka	4.8	1 31	+17	—	—	2.9	3.7
Kobe	4.9	e 1 3	- 8	—	—	2.7	2.9
Sapporo	4.9	-0 25	-101	—	—	0.6	—
Ekaterinburg	52.6	1 8 17	-67	16 18	-33	26.6	33.9
Apia	69.7	—	—	—	—	e 27.8	28.2

Additional readings: Hakodate gives also MN = +2.3m. Osaka MN = +3.3m. Kobe MN = +3.1m.

Aug. 24d. 7h. 25m. 40s. (I) } Epicentre 17°-0N. 122°-0E.
9h. 2m. 20s. (II) }

A = -507, B = +811, C = +292; D = +848, E = +530;
G = -155, H = +248, K = -956.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
I Manila	2.6	202	10 41	0	—	—	1 1.3	—
II	2.6	202	10 40	- 1	—	—	1 1.3	—
I Taihoku	8.1	357	—	—	—	—	e 4.1	—
I Hong Kong	9.1	307	1 40	-38	—	—	—	5.3
II	9.1	307	—	—	—	—	—	4.9
I Ekaterinburg	60.2	327	10 14	+ 1	18 26	0	29.3	33.9
II	60.2	327	10 17	+ 4	18 28	+ 2	27.7	33.9
I Pulkovo	76.3	330	—	—	—	—	e 38.3	—
II	76.3	330	12 6	+ 9	e 22 30	+49	37.7	—
I De Bilt	92.0	328	—	—	—	—	e 48.3	49.2
II	92.0	328	—	—	—	—	e 47.7	49.2
II Strasbourg	92.4	324	—	—	—	—	—	47.7
I Uccle	93.1	325	—	—	—	—	e 48.3	—
II	93.1	325	—	—	—	—	—	49.7
I Rio Tinto	107.1	320	71 20	?L	—	—	(71.3)	74.8

Additional readings and notes: Taihoku reading has been diminished by 20m. Ekaterinburg gives also for I i = +10m.23s., MZ = +38.0m., and for II MZ = +31.4m., MN = +33.6m.

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Aug. 24d. Readings also at 0h. (Azores and La Paz), 5h. (Apia), 11h. (De Bilt, Algiers, and near Granada and San Fernando), 13h. (near Athens and near Manila), 18h. (Ekaterinburg), 19h. (near Rocca di Papa), 21h. and 23h. (Lick).

Aug. 25d. Readings at 0h. (La Paz), 1h. (Ekaterinburg), 7h. (Nagoya and near Kobe), 8h. (near Osaka), 11h. (near Lick and near Berkeley), 14h. (Ekaterinburg), 15h. (Mizusawa), 16h. (Nagasaki), 18h. (Hakodate and Ekaterinburg), 19h. (Ekaterinburg), 23h. (Florence).

Aug. 26d. Readings at 0h. (Lick), 1h. (Barcelona), 11h. (Ekaterinburg and Calcutta), 12h. (Zante), 14h. (Ottawa), 18h. (Lick and La Paz), 20h. (Lick (2)), 22h. (La Paz).

Aug. 27d. 11h. 15m. 0s. Epicentre 24°·8N. 120°·4E.

A = -·459, B = +·783, C = +·419; D = +·863, E = +·506;
G = -·212, H = +·362, K = -·908.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Taihoku	1·1	77	0 17	0	(0 30)	- 1	0·5	0·5
Hokoto	1·5	211	i 0 22	- 1	(e 0 41)	- 1	e 0·7	0·7
Hong Kong	6·2	248	1 30	- 5	—	—	3·2	4·3
Zi-ka-wei	6·5	8	e 1 36	- 3	e 3 8	+11	—	4·0
Manila	10·2	176	e 2 9	-24	—	—	4·2	—
Osaka	16·4	49	3 32	-25	(6 41)	-23	6·7	11·3
Colombo	42·7	253	26 0	?L	—	—	(26·0)	32·0
Kodaikanal	43·2	260	28 6	?L	—	—	(28·1)	—
Ekaterinburg	53·0	325	19 4	-12	i 16 50	- 6	28·0	32·6
Pulkovo	68·8	327	11 12	+ 2	20 6	- 6	35·0	44·0
Honolulu E.	73·9	75	—	—	—	—	e 35·8	—
Strasbourg	85·3	323	—	—	—	—	e 48·0	—
Uccle	85·8	325	—	—	—	—	e 44·0	—
Eskdalemuir	86·6	332	—	—	—	—	43·0	—
Kew	87·7	329	—	—	—	—	—	59·0
Bidston	87·8	330	—	—	—	—	—	57·3
Oxford	88·0	330	—	—	—	—	46·7	—

Additional readings: Osaka gives also MN = +14·7m. Ekaterinburg MZ = +34·7m. Pulkovo MN = +38·9m. Strasbourg e = +55m.0s.

Aug. 27d. Readings also at 0h. (Ekaterinburg), 7h. (Manila, Riverview, Ekaterinburg (2), and near La Paz), 8h. (Riverview, Ekaterinburg, and Honolulu), 11h. (Ekaterinburg), 12h. (Manila), 15h. (near Mizusawa), 16h. (Ekaterinburg), 17h. (Batavia and Florence), 19h. (Belgrade), 23h. (Nagasaki).

Aug. 28d. 6h. 46m. 38s. Epicentre 38°·5N. 22°·5E. (as on 1923 Aug. 4d.).

A = +·723, B = +·299, C = +·623; D = +·383, E = -·924;
G = +·575, H = +·238, K = -·783.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	1·2	116	e 0 19	+ 1	(0 42)	+ 9	0·7	1·1
Belgrade N.	6·4	348	e 1 31	- 7	e 4 41	?L	(e 4·7)	—
Rocca di Papa	8·1	298	11 58	- 5	3 54	+14	e 4·5	5·7
Innsbruck E.	11·9	321	—	—	—	—	16·2	—
Strasbourg	14·6	318	e 7 46	?L	—	—	(e 7·8)	—

Additional readings and notes: Athens gives also iP = +35s. Belgrade P has been increased by 3min. Rocca di Papa ePN = +2m.3s. (O-C = 0s.).

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1923. Aug. 28d. 23h. 15m. 12s. Epicentre 26°0N. 107°0W.

A = - .263, B = - .860, C = + .438; D = - .956, E = + .292;
G = - .128, H = - .419, K = - .899.

The European and American stations though in the same azimuth, do not agree as to epicentral distances. The present determination favours the latter set as being the nearer of the two.

		△	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Tucson	E.	7.1	333	1 51	+ 3	3 48	+35	4.1	4.4
	N.	7.1	333	1 48	0	—	—	4.1	5.1
Denver	E.	13.8	6	3 18	- 5	5 28	-35	8.3	14.8
Berkeley	E.	17.6	316	3 56	-16	e 7 15	-16	e 7.9	9.0
	N.	17.6	316	i 4 8	- 4	—	—	e 8.3	11.0
Chicago	E.	22.5	40	i 5 23	+12	i 9 36	+21	12.6	13.8
Ann Arbor	N.	25.1	44	4 48	-51	10 48	+43	13.8	15.4
Victoria	E.	25.8	334	5 26	-20	10 6	-12	12.8	16.4
	N.	25.8	334	5 26	-20	10 18	0	12.8	18.4
Georgetown	E.	28.2	55	i 6 19	+ 9	e 10 32	-31	15.1	20.1
	N.	28.2	55	e 6 23	+13	e 10 48	-15	14.4	17.1
Washington	E.	28.2	55	6 10	0	10 6	-57	e 13.3	17.3
Cheltenham	E.	28.3	56	—	—	e 11 15	+11	e 15.9	19.3
	N.	28.3	56	—	—	—	—	e 15.7	17.5
Toronto	E.	28.5	45	i 6 18	+ 5	e 11 11	+ 3	15.2	16.6
	N.	28.5	45	i 6 21	+ 8	i 11 14	+ 6	i 15.3	17.1
Ithaca	E.	29.9	49	6 29	+ 2	11 28	- 4	15.8	17.8
Ottawa	E.	31.6	45	i 6 43	0	i 11 58	- 3	e 15.8	18.8
Northfield	E.	33.1	43	e 5 28	-89	12 10	-16	—	19.8
Sitka	E.	37.1	334	7 4	-27	13 3	-22	e 17.5	21.3
	N.	37.1	334	6 56	-35	—	—	e 19.1	21.4
Porto Rico	E.	39.1	91	e 7 34	-13	e 16 10	?	e 21.7	—
Honolulu	E.	46.7	275	e 7 48	-57	14 37	-60	19.4	23.2
	N.	46.7	275	8 16	-29	14 49	-48	18.8	25.7
La Paz	E.	56.9	135	19 48	- 3	i 17 53	+ 8	26.8	31.6
Mendoza	E.	69.4	145	24 42	?	—	—	42.6	45.2
Cipolletti	E.	74.5	149	2 40	?	(24 0)	+160	41.5	44.3
Edinburgh	E.	76.0	35	—	—	e 22 48	+71	—	46.6
Eskdalemuir	E.	76.2	35	—	—	21 51	+12	33.8	40.2
Bidston	E.	77.2	37	—	—	23 8	+77	—	41.8
Stonyhurst	E.	77.3	37	e 21 48	?	(e 21 48)	- 4	(31.5)	48.3
Bergen	E.	77.8	28	—	—	e 21 48	-10	e 35.8	44.8
Rio de Janeiro N.	E.	78.8	124	e 12 11	- 1	22 11	+ 1	37.2	42.3
Oxford	E.	78.9	38	i 12 20	+ 8	i 22 21	+10	32.9	47.2
Kew	E.	79.6	38	-37 43	?	—	—	(37.8)	48.8
Coimbra	E.	79.7	50	e 12 28	+11	22 2	-18	36.8	41.0
Lisbon	E.	79.8	51	—	—	—	—	e 38.7	—
Rio Tinto	E.	82.0	51	23 48	?	(23 48)	+62	—	46.8
De Bilt	E.	82.1	35	12 37	+ 6	22 58	+11	e 34.8	49.4
Uccle	E.	82.4	37	e 12 37	+ 5	e 22 58	+ 8	34.8	48.4
Paris	E.	82.5	39	e 12 38	+ 5	e 23 3	+11	38.8	45.8
Toledo	E.	82.8	49	e 12 39	+ 4	e 23 5	+10	e 38.7	42.6
San Fernando	E.	82.9	53	12 48	+13	e 22 25	-31	40.8	52.3
Upsala	E.	83.0	32	e 15 51	+ 6	e 22 58	+ 1	e 38.8	48.5
Hamburg	E.	83.7	32	e 12 46	+ 6	e 22 54	-12	e 37.8	52.8
Granada	E.	84.4	51	i 13 51	+67	i 23 12	0	e 41.1	45.9
Besangon	E.	85.3	39	—	—	23 36	+ 8	—	39.8
Tortosa	E.	85.4	47	—	—	—	—	e 39.8	46.3
	N.	85.4	47	—	—	23 31	+ 8	35.8	51.5
Strasbourg	E.	85.5	37	e 16 9	?	23 33	+ 8	36.8	45.5
Barcelona	E.	86.1	45	e 23 15	?	(e 23 15)	[+12]	e 43.0	53.7
Zurich	E.	86.6	39	e 16 18	?	e 23 41	+ 4	e 38.8	—
Pulkovo	E.	87.4	20	12 56	- 5	i 23 22	[+11]	36.3	45.9
Innsbruck	E.	88.2	36	—	—	—	—	e 38.8	—
Algiers	E.	89.2	49	e 17 27	?	e 24 15	+10	39.8	45.8
Vienna	E.	90.2	33	e 12 55	-22	23 41	[+12]	e 35.8	49.8
Florence	E.	90.3	39	15 38	?	23 58	-19	37.6	47.8
Rocca di Papa	E.	92.3	40	e 13 24	- 5	—	—	e 48.3	64.4
Belgrade	E.	94.6	34	e 11 23	?	e 17 55	?	e 45.6	50.6
Ekaterinburg	E.	96.5	7	13 38	-14	e 24 27	[+22]	40.8	48.6
Zi-ka-wei	E.	106.4	319	e 18 24	?	—	—	—	—
Tiflis	E.	107.5	21	e 20 36	?	—	—	e 48.1	55.7
Riverview	E.	113.4	242	—	—	e 28 45	+48	e 51.2	54.7
Manila	E.	118.2	306	e 19 48	?	—	—	54.8	—
Kodakamal	E.	143.5	353	77 54	?	—	—	(77.9)	—
Colombo	E.	146.5	347	34 48	?	—	—	—	—

For Notes see next page.

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NOTES TO AUG. 28d. 23h. 15m. 12s.

Additional readings and notes: Cheltenham gives also eN = +8m.54s., eE = +9m.59s., SR₁E = +12m.57s., SR₁N = +13m.8s., eN = +16m.4s. Toronto iE = +11m.18s., iN = +11m.27s. T₁E = 23h.15m.20s. T₁N = 23h.15m.23s. Also several L's. Ithaca e = +13m.2s. and +13m.48s. Sitka SR₁ = +16m.4s., eE = +20m.56s., eN = +20m.48s. T₁ = 23h.14m.34s. La Paz S = +17m.55s. T₁ = 23h.15m.4s. Eskdalemuir MN = +40.6m. Bidston readings are given for 0h. Coimbra eN? = +9m.8s., SN = +19m.2s., MN = +41.3m. De Bilt MNZ = +46.7m. Paris MN = +40.8m. Uccle MN = +44.0m. San Fernando MN = +50.3m. Upsala MN = +47.8m. Hamburg MN = +44.8m., MZ = +51.8m. Strasbourg MN = +45.0m. Barcelona MN = +52.7m. Pulkovo PR₁ = +16m.30s., eS = +22m.35s., SR₁ = +29m.36s., SR₂ = +33m.12s., MN = +49.6m., MZ = +54.8m. Vienna PS = +25m.24s. Rocca di Papa eP = +13m.54s. Ekaterinburg iPR₁ = +17m.24s., e = +30m.49s., MZ = +60.7m. Tiflis eLN = +46.8m., MN = +56.1m. Riverview eSR₁ = +34m.42s., MN = +54.1m.

Aug. 28d. Readings also at 2h. (Nagasaki and Nagoya), 5h. (La Paz), 6h. (near Zurich), 8h. (Nagasaki), 9h. (Ekaterinburg and La Paz), 13h. (Granada (2)), 14h. (Granada and Florence), 22h. (Ekaterinburg).

Aug. 29d. Readings at 4h. (Manila, Ekaterinburg, La Paz, and Riverview), 6h. (Granada), 9h. (Florence), 18h. (near Kobe), 20h. (Riverview and Ekaterinburg), 21h. (Riverview).

Aug. 30d. 2h. 47m. 8s. Epicentre 9°-0N. 128°-0E. (as on 1913 April 29d.).

A = -0.608, B = +0.778, C = +0.156; D = +0.788, E = +0.616;
G = -0.096, H = +0.123, K = -0.988.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	8.9	310	e 2 16	+ 1	(4 3)	+ 2	4.0	4.6
Zi-ka-wei	23.0	345	5 14	- 3	e 9 36	+11	—	—
Batavia	26.0	235	15 40	- 8	1 10 9	-13	—	—
Colombo	47.8	273	23 52	?L	—	—	(23.9)	35.9
Riverview	48.1	154	e 9 10	+15	e 16 25	+30	e 20.7	21.4
Ekaterinburg	70.2	328	i 11 21	+ 3	i 20 22	- 6	30.9	39.7
Pulkovo	86.1	330	12 52	- 2	23 11	[+ 8]	46.9	53.4

Additional readings: Manila gives also MN = +5.1m. Ekaterinburg MN = +42.3m., MZ = +43.2m.

Aug. 30d. Readings also at 2h. (Tiflis), 8h. (Florence), 12h. and 14h. (near Manila 15h. (Ottawa), 18h. (near Algiers), 19h. (Ekaterinburg), 20h. (Tiflis, Pulkovo, Ekaterinburg, and near Manila), 22h. (La Paz), 23h. (near Granada).

Aug. 31d. 2h. 15m. 50s. Epicentre 38°-5N. 71°-0E.

A = +0.255, B = +0.740, C = +0.623; D = +0.946, E = -0.326;
G = +0.203, H = +0.589, K = -0.783.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Simla N.	9.0	143	1 46	-30	—	—	e 4.7	—
Ekaterinburg	19.5	343	i 4 33	- 2	i 8 13	0	9.7	10.9
Calcutta E.	21.8	132	4 45	-18	—	—	14.0	—
	21.8	132	4 58	- 5	—	—	14.4	—
Colombo N.	39.6	164	15 22	?L	—	—	(15.4)	20.4
Pulkovo	33.2	325	6 49	- 9	12 10	-17	16.2	20.8
Belgrade	37.7	297	e 8 4	+28	e 15 22	+108	24.4	—
Upsala N.	39.4	322	—	—	—	—	e 16.5	24.6
Vienna	40.0	304	7 55	0	e 13 10	-57	—	29.2
Hamburg	48.4	312	e 10 19	+118	—	—	e 22.2	27.3

Continued on next page.

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Rocca di Papa	43.8	295	8 24	0	e 10 8	-291	e 21.9	33.7
Strasbourg	45.6	305	e 11 11	1PR ₁	—	—	e 26.2	—
De Bilt	46.5	310	—	—	—	—	e 27.2	31.0
Besançon	47.0	303	—	—	—	—	—	26.2
Uccle	47.3	308	—	—	—	—	e 24.2	—
Paris	48.9	306	—	—	—	—	e 32.2	34.2
Oxford	50.5	310	—	—	—	—	e 29.2	33.8
Edinburgh	50.6	316	—	—	—	—	e 32.2	—
Bidston	51.1	313	16 50	1S	(16 50)	+18	(24.8)	34.2

Additional readings: Simla gives also eLE = +5.1m. Ekaterinburg
 MNZ = +11.9m. Pulkovo MN = +19.5m., MZ = +21.6m. Belgrade
 L = +42.3m. Upsala ME = +25.1m. Rocca di Papa eP = +7m.26s.,
 L = +25.7m. De Bilt eLN = +26.2m., MN = +27.4m.

Aug. 31d. 11h. 9m. 30s. (I) } Epicentre 5° 4N. 125° 2E. (as on 1919 Jan. 1d.).
 11h. 14m. 30s. (II) }

A = -.574, B = +.813, C = +.094; D = +.817, E = +.576;
 G = -.054, H = +.077, K = -.996.

It seems impossible to reconcile the observations on the hypothesis of a single shock. Manila reports that the earthquake was felt in S.W. Mindanas, which fixes the epicentre approximately, and the one adopted has been used on many previous occasions.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
I Manila	10.1	336	e 2 56	+25	—	—	—	—
II Batavia	21.7	238	—	—	—	—	i 11.0	—
II Zi-ka-wei	26.0	353	—	—	e 11 55	+93	—	—
II Adelaide	42.3	163	e 8 0	-13	—	—	e 19.1	21.2
II Colombo	45.2	274	22 30	?L	—	—	(22.5)	46.5
I Riverview	46.3	150	—	—	—	—	e 23.0	26.3
I Sydney	46.3	150	9 42	+60	—	—	—	26.7
I Ekaterinburg	71.8	329	20 5	1S	(20 5)	-43	45.5	52.2
II Honolulu	75.8	69	—	—	21 24	-11	—	33.9
II Victoria	E. 99.9	39	26 6	1S	(26 6)	+11	44.4	57.7
II	N. 99.9	39	26 26	1S	(26 26)	+31	40.4	—
II De Bilt	E. 103.4	327	—	—	—	—	e 61.5	76.4
II	N. 103.4	327	—	—	—	—	e 60.5	65.3
II Strasbourg	103.5	321	—	—	—	—	e 62.5	—
II Uccle	104.4	326	—	—	—	—	—	64.5

Additional readings and notes: Adelaide II gives also e = +20m.0s. Riverview I MN = +25.2m. Ekaterinburg IS = +30m.53s. Honolulu II eN = +19m.42s., MN = +31.9m. All readings have been diminished by 1h.

Aug. 31d. Readings also at 2h. (Ascension), 8h. (Colombo), 10h. (Colombo and Algiers (2)), 11h. (Riverview), 12h. (Riverview, Sydney, and Ekaterinburg), 13h. (near Algiers (2)), 14h. (Melbourne), 20h. (Ekaterinburg, Strasbourg, De Bilt, near Nagoya, and Mizusawa), 21h. (Ekaterinburg).

1923. Sept. 1d. 2h. 58m. 28s. Epicentre 35° 0N. 139° 5E.

(as on 1922 April 26d.).

A = -.623, B = +.532, C = +.574; D = +.649, E = +.760;
 G = -.436, H = +.372, K = -.819.

See note in introduction.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Nagoya	2.1	274	0 37	+ 4	(0 47)	-11	0.8	—
Osaka	3.4	266	0 56	+ 3	(1 47)	+13	1.8	3.0
Kobe	3.6	266	0 59	+ 3	—	—	—	—
Mizusawa	E. 4.3	17	1 10	+ 3	—	—	—	—
Hakodate	6.8	7	1 45	+ 1	—	—	—	—
Nagasaki	8.4	257	2 3	- 4	—	—	3.4	—
Ootomari	11.9	11	2 52	- 6	—	—	4.1	6.9
Zi-ka-wei	15.6	261	1 3 47	0	e 6 49	+ 3	—	—
Taihoku	18.4	242	4 24	+ 2	(7 53)	+ 4	7.9	—

Continued on next page.

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1923

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		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Hokoto		20.8	242	5 3	+12	—	—	9.0	13.2
Hong Kong		25.5	247	5 32	-11	9 52	-21	—	19.5
Manila		26.4	224	1 5 43	-9	—	—	4.8	—
Calcutta	E.	46.0	270	8 21	-19	15 21	-7	22.7	—
	N.	46.0	270	8 24	-16	15 5	-23	—	—
Dehra Dun		51.1	282	7 57	-7	15 15	-77	19.0	36.9
Batavia		51.4	223	1 9 8	-7	16 31	-5	26.6	34.4
Simla	E.	51.5	284	9 8	-9	16 38	0	25.3	—
	N.	51.5	284	9 8	-9	16 20	-18	24.8	—
Malabar		51.9	222	9 13	-6	—	-9	19.4	31.6
Ekaterinburg		55.5	320	1 9 37	-6	17 19	-9	—	—
Honolulu	E.	55.8	87	9 54	+9	17 54	+23	—	48.5
	N.	55.8	87	9 49	+4	17 40	+9	—	26.5
Sitka		58.7	40	e 9 57	-6	18 25	+18	e 27.8	40.4
Bombay		60.5	275	10 16	0	18 29	-1	31.4	—
Colombo		61.3	260	10 20	-1	14 32	?PR ₁	25.5	40.9
Kodalkanal		61.3	265	11 2	+41	—	—	12.8	46.2
Apia	Z.	67.2	128	11 16	+17	20 39	+47	—	33.1
Pulkovo		68.9	330	i 11 8	-2	20 11	-2	32.5	43.7
Victoria	E.	68.9	45	11 12	+2	20 15	+2	28.4	34.5
	N.	68.9	45	11 12	+2	20 27	+14	28.0	30.7
	Z.	68.9	45	11 12	+2	—	—	29.6	34.4
Riverview		69.7	170	11 19	+4	i 20 23	+1	e 30.8	34.3
Sydney		69.7	170	11 20	+5	20 14	-8	35.0	39.5
Adelaide		70.0	181	e 11 32	+15	i 20 2	-24	33.0	38.1
Perth		70.6	201	11 27	+6	20 28	-5	32.4	42.6
Tifis		70.7	310	11 26	+5	20 38	+4	e 31.5	43.5
Melbourne		73.0	176	e 11 26	-10	i 20 14	-48	34.7	40.1
Upsala		73.9	334	e 11 33	-8	i 21 16	+3	e 37.0	46.4
Berkeley	E.	74.9	54	11 47	-1	21 33	+8	31.8	—
	N.	74.9	54	11 47	-1	21 31	+6	31.6	34.2
	Z.	74.9	54	11 47	-1	21 32	+7	—	—
Lick	E.	75.7	54	e 11 49	-4	i 21 49	+15	i 31.9	34.8
	N.	75.7	54	e 11 57	+4	i 21 49	+15	i 31.7	34.8
	Z.	75.7	54	e 11 53	0	i 21 49	+15	e 32.1	—
Saskatoon		76.1	35	11 57	+1	21 41	+3	e 33.0	—
Bergen		77.5	340	12 9	+5	21 58	+3	34.5	—
Lemberg		77.8	324	e 12 5	-1	i 22 4	+6	e 37.2	49.0
Hamburg		81.3	333	i 12 19	-8	i 22 43	+5	e 42.7	48.6
Budapest		81.9	325	11 18	-72	i 21 41	-64	e 33.3	—
Vienna		82.6	326	12 26	-8	22 56	+3	e 36.5	51.5
Wellington		82.9	154	e 12 38	+3	i 22 44	-12	34.9	43.5
Belgrade		83.0	322	12 32	-4	i 22 59	+2	e 40.5	53.1
Edinburgh		83.7	340	12 40	0	23 4	-2	39.5	52.7
Christchurch		84.2	156	e 12 26	-17	i 22 50	-20	39.1	61.4
De Bilt	E.	84.2	334	12 34	-9	23 1	-9	e 41.5	53.5
	N.	84.2	334	—	—	23 4	-6	—	53.0
Sarajevo		84.7	323	e 12 37	-9	e 23 5	-11	e 45.8	53.0
Stonyhurst		85.3	339	i 12 50	0	i 22 50	-32	46.7	51.0
Mostar		85.3	324	e 12 46	-4	e 24 6	+44	42.0	52.8
Innsbruck		85.5	328	i 12 46	-5	i 23 4	-21	e 39.5	53.8
Travnik		85.5	324	e 13 5	+14	e 24 0	+35	e 46.9	54.3
Uccle		85.5	334	12 41	-10	i 23 15	-10	38.5	54.1
Sinj		85.7	323	e 13 19	+27	e 23 19	-8	e 43.2	52.6
Bidston		85.8	339	12 50	-2	21 32?	-116	—	108.5
Tucson	E.	85.8	53	12 54	+2	25 33	+5	e 36.1	51.9
	N.	85.8	53	13 1	+9	23 41	+13	e 36.3	38.8
Strasbourg		86.1	330	i 12 44	-10	i 23 18	-13	38.5	55.7
West Bromwich		86.3	338	12 50	-5	22 50	+17	—	—
Helwan		86.4	304	i 12 45	-10	23 12	[+7]	—	55.0
Venice		86.5	328	i 12 55	-1	i 23 19	[+13]	42.5	55.7
Kew		86.6	337	12 32	-25	—	—	—	53.5
Zurich		86.7	329	e 12 46	-11	i 23 18	[+11]	e 46.5	—
Oxford		87.0	337	12 54	-5	23 14	[+5]	43.7	51.8
Besançon		87.9	330	13 1	+3	23 32	[+18]	—	38.5
Paris		87.9	333	i 12 55	-9	i 23 33	[+19]	42.5	45.5
Florence		88.2	325	13 3	-3	23 43	-11	32.0	47.5
Pompeii		88.9	321	i 13 20	+10	23 11	[-10]	46.5	56.5
Rocca di Papa	E.	89.1	323	13 0	-11	23 8	[-15]	e 43.3	57.9
	N.	89.1	323	13 3	-8	23 32	[+9]	—	57.0
Puy de Dôme		90.3	332	13 2	-16	23 44	[+14]	38.5	52.6
Marsailles		91.2	329	e 13 7	-15	23 42	[+7]	43.5	59.8
Chicago		91.9	33	13 14	-12	23 48	[+9]	—	43.4
Ann Arbor		93.2	30	13 20	-13	i 24 2	[+15]	37.5	51.5

Continued on next page.

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	o	o	m. s.	s.	m. s.	s.	m.	m.
Ottawa	93-6	23	e 13 21	-15	i 24 8	[+18]	e 38-5	55-0
Toronto	93-7	27	e 13 20	-16	i 24 26	[+36]	44-8	57-8
	93-7	27	e 13 21	-15	i 24 25	[+35]	i 48-6	61-9
Barcelona	94-1	329	13 43	+ 4	e 24 5	[+12]	e 41-7	53-3
Tortosa	95-3	350	13 37	- 8	e 24 12	[+13]	43-5	60-6
	95-3	350	e 13 39	- 6	e 24 23	[+24]	—	64-8
Northfield	95-6	22	e 13 35	-12	e 24 18	[+18]	42-9	—
Ithaca	95-8	26	e 13 31	-17	24 16	[+15]	48-5	55-5
Algiers	97-5	326	e 13 40	-17	23 56	[+14]	47-5	62-5
Halifax	97-6	16	13 32	-26	24 32	[+21]	e 44-0	—
Toledo	97-9	333	13 37	-22	i 24 32	[+19]	e 43-6	59-0
Georgetown	98-7	28	e 13 5	-59	24 32	[+15]	e 43-4	61-8
	98-7	28	e 13 16	-48	24 35	[+18]	e 43-4	67-0
Washington	98-7	28	13 53	-11	24 33	[+16]	47-0	—
Cheitenham	98-9	28	e 14 15	+10	25 31	-14	43-8	61-9
	98-9	28	—	—	25 17	-28	43-7	66-7
Coimbra	99-2	335	e 13 44	-22	24 35	[+15]	45-0	63-9
Granada	100-1	331	i 14 5	- 6	25 58	+ 1	49-1	59-9
Rio Tinto	100-7	334	11 32	-162	—	—	—	68-5
Lisbon	100-8	335	14 4	-10	26 13	+10	46-2	54-2
San Fernando	101-7	333	14 0	-19	24 44	[+12]	34-5	—
Azores	106-0	349	-2 28	?	11 32	?	—	53-5
Johannesburg	121-5	258	19 2	[+ 5]	28 38	-23	61-7	—
Porto Rico	121-8	27	e 21 42	?PR ₁	e 28 42	-21	e 49-2	77-9
	121-8	27	e 20 52	?PR ₁	e 32 8	?	e 67-6	73-4
Balboa Heights	122-6	46	21 32	?PR ₁	—	—	—	61-5
Accra	124-5	308	21 32	?PR ₁	—	—	—	83-5
Cape Town	132-1	254	22 57	?PR ₁	39 56	?SR ₁	70-0	74-4
La Paz	149-2	60	20 1	[+ 7]	34 3	?	69-7	74-4
	149-2	60	i 19 59	[+ 5]	34 8	?	62-8	78-1
La Quiaca	154-5	67	—	—	—	—	74-1	119-0
	154-5	67	—	—	—	—	73-6	109-5
Andalgala	156-8	78	—	—	—	—	61-2	73-5
Mendoza	156-9	93	25 20	?PR ₁	—	—	59-0	117-1
Cipolletti	157-7	109	22 8	?	—	—	75-5	86-5
Pilar	160-2	87	—	—	—	—	—	119-3
La Plata	165-7	95	21 36	?	—	—	68-9	89-3
	165-7	95	22 13	?	37 13	?	65-7	96-5
Rio de Janeiro	167-7	11	e 20 24	[+10]	25 2	?PR ₁	50-9	95-3
	167-7	11	e 20 24	[+10]	24 40	?PR ₁	50-0	96-7

Additional readings: Mizusawa gives also PN = +1m.11s. Nagasaki MN = +4-7m. Batavia i = +16m.56s. and +18m.20s., MN = +31-2m. Ekaterinburg iPR₁ = +11m.20s., iPR₂ = +12m.58s. Honolulu SR₂E = +22m.55s., SR₂N = +23m.2s. T₀ = 2h.58m.28s. Sitka eLN = +25-0m. T₀ = 2h.57m.58s. Colombo L = +19-5m. (fS). Apia gives several other readings. T₀ = 2h.58m.20s. Pulkovo PR₁ = +13m.43s., PR₂ = +16m.9s., PS = +21m.3s., SR₁ = +24m.38s., SR₂ = +27m.44s., MN = +47-0m., MZ = +50-3m. Riverview iP = +11m.46s., +12m.23s., +14m.6s., and +16m.54s., PS = +21m.19s., SR₁ = +26m.8s., SR₂ = +28m.46s., MN = +35-2m., MZ = +37-6m. T₀ = 2h.58m.35s. Sydney SR₁ = +23m.32s., SR₂ = +28m.20s., SR₃ = +31m.26s. Adelaide PR₂ = +16m.2s. Perth SR₁ = +24m.4s., SR₂ = +30m.6s. Tifis e = +11m.14s., e = +20m.56s., i = +24m.56s., MN = +43-1m. Melbourne SR₁ = +25m.2s., SR₂ = +28m.32s. Upsala MN = +48-7m. Berkeley PZ = +11m.55s., PE = +12m.3s., PZ = +12m.7s., PN = +12m.9s. and +12m.12s., PZ = +12m.15s., PR₁N = +14m.52s., PR₁Z = +15m.3s., PR₁E = +15m.4s., PR₁Z = +16m.47s., PR₁N = +16m.55s., PR₁E = +17m.19s., SR₁Z = +26m.52s., SR₁E = +26m.59s., SR₁N = +27m.17s. Lick iPZ = +13m.1s., iPN = +12m.8s., PR₁Z = +14m.51s., SR₁ = +26m.47s. Hamburg ePEN = +12m.22s., iSN = +22m.50s., MN = +49-3m., MZ = +55-3m. Budapest gives six i readings, also SR₁ = +29m.46s. Vienna PEN = +12m.28s., PR₁ = +15m.55s., PSN = +23m.51s., SR₁N? = +28m.22s., also several i readings. Wellington i = +14m.3s., +26m.20s., and +29m.44s. T₀ = 2h.58m.45s. Belgrade iP = +12m.36s., i = +12m.56s., and +13m.2s. PR₁ = +16m.11s. and +17m.16s., i = +24m.0s. and +25m.30s., L = +44-4m. Edinburgh PR₁ = +16m.2s., PR₂ = +18m.20s., SR₁ = +29m.14s., SR₂ = +33m.2s. Christchurch PR₁ = 16m.8s., L = +35-6m. All readings have been increased by 1h. Mostar iP = +12m.48s., PR₁ = +15m.48s. and +19m.14s., eL = +31-9m., and several i readings. Innsbruck PR₁NE = +16m.11s., MNW = +51-6m. Uccle PR₁ = +15m.50s., SR₁ = +29m.8s., SR₂ = +32m.56s., MZ = +54-2m., MN = +54-3m. Tucson eR = +46m.58s. T₀ = 2h.58m.42s. Strasbourg PR₁ = +16m.12s., PR₂ = +18m.7s., SR₁ = +29m.7s., SR₂ = +32m.49s., MZ = +55-9m. Venice L = +46-7m. Oxford PR₁ = +16m.32s. Paris MN = +54-5m.

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Rocca di Papa PZ = +13m.2s, eSN = +21m.15s. Puy de Dôme i = +16m.54s. Chicago MN = +52.5m. Ann Arbor PR₁ = +17m.2s., SR₁ = +30m.32s. T₀ = 2h.59m.0s. Toronto gives many i readings for both components. Barcelona PR₁ = +17m.25s. Tortosa PZ = +13m.36s. (O-C = -1s.). Ithaca PR₁ = +17m.12s., PR₂ = +21m.12s., SR₁ = +30m.44s., L = +40.5m. Algiers PR₁ = +17m.44s., ? = +27m.22s. Halifax PR₁ = +17m.22s., SR₁? = +30m.50s. T₀ = 2h.58m.55s. Toledo PR₁ = +17m.54s., PR₂NE = +20m.7s., PR₂NW = +20m.13s., PR₂NW = +21m.32s., PR₂NE = +21m.33s., SR₂NE = +31m.20s., SR₂NW = +31m.33s., SR₂NE = +35m.13s., SR₂NW = +35m.15s., SR₂NE = +37m.15s., SR₂NW = +37m.17s., MNW = +61.3m. Washington PR₁ = +17m.47s., L = +43.2m. Cheltenham PR₁ = +17m.52s., eN = +24m.34s., eE = +24m.41s., eN = +33m.18s., eE = +34m.1s. T₀ = 2h.58m.36s. Coimbra PR₁ = +17m.48s., and +19m.48s., i = +24m.52s., SR₁ = +32m.48s., LN = +47.5m., MN = +64.2m. T₀ = 2h.59m.17s. Granada PR₁ = +16m.50s., PR₂ = +18m.1s., PR₂ = +20m.59s., MN = +66.3m. San Fernando PR₁ = +18m.24s. Porto Rico SR₁N = +37m.20s. Accra gives several other readings. La Paz IPZ = +19m.57s. (O-C = +3s.), PR₁ = +26m.24s., PR₂E = +30m.49s., PR₂N = +30m.59s., SR₂E = +42m.44s., SR₂N = +42m.47s., SR₂ = +47m.59s. T₀ = 2h.58m.32s. Pilar MN = +117.4m. La Plata PE = +24m.34s., PR₁?E = +25m.13s. and 32m.12s., N = +33m.8s., PR₂E? = +46m.36s., SR₂N? = +45m.42s., SR₂?E = +51m.50s., SR₂?N = +52m.22s., SR₂E = +59m.50s., LE = +71.1m. and +77.2m. Rio de Janeiro SR₁ = +32m.32s., SR₂N = +36m.51s., SR₂E = +36m.54s., SR₂N = +46m.2s.

Sept. 1d. 5h. 22m. 30s. Epicentre 35°-0N. 139°-5E. (as at 2h.).

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Osaka	3.4	266	1 12	+19	—	—	2.1	2.5
Kobe	3.6	266	0 58	+ 2	(1 46)	+ 7	1.8	1.9
Mizusawa N.	4.3	17	1 13	+ 6	2 4	+ 6	—	—
Hakodate	6.8	7	1 49	+ 5	—	—	e 3.5	3.9
Nagasaki	8.4	257	1 59	- 8	3 50	+ 3	3.8	5.2
Taihoku	18.4	242	7 54	?S	(7 54)	+ 5	—	—
Batavia	51.4	223	e 9 4	-12	16 26	-10	—	—
Kodaikanal	61.3	265	—	—	—	—	8.0	16.2
Hamburg z.	81.3	333	e 12 21	- 6	—	—	—	—
Vienna	82.6	326	i 12 30	- 4	—	—	—	—
Innsbruck N.W.	85.5	328	e 40 36	?L	—	—	(e 40.6)	—
Pompeii	88.9	321	17 20	?PR ₁	e 25 20	+78	32.5	—
Rocca di Papa	89.1	323	—	—	—	—	48.3	57.4
Accra	124.5	308	5 30	?	20 30	?	—	—
La Paz	149.2	60	19 57	[+ 3]	—	—	—	—

Hakodate gives also MN = +4.5m. Osaka MN = +2.9m. Rocca di Papa LN = +56.2m.

Sept. 1d. 7h. 38m. 0s. Epicentre 35°-0N. 139°-5E. (as at 5h.).

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Nagoya	2.1	274	0 24	- 9	—	—	3.5	—
Osaka	3.4	266	1 3	+10	—	—	1.8	3.5
Kobe	3.6	266	0 53	- 3	—	—	1.7	2.1
Mizusawa N.	4.3	17	1 12	+ 5	2 12	+14	—	—
Hakodate	6.8	7	1 49	+ 5	—	—	3.7	4.0
Nagasaki	8.4	257	2 0	- 7	—	—	4.3	4.6
Zi-ka-wei	15.6	261	3 46	- 1	e 6 49	+ 3	—	9.2
Taihoku	18.4	242	7 56	?S	(7 56)	+ 7	12.1	12.8
Hong Kong	25.5	247	5 21	-22	10 1	-12	13.6	16.5
Manila	26.4	224	e 6 18	+26	—	—	—	—
Calcutta N.	46.0	270	15 4	?S	(15 4)	+24	26.3	—
Batavia	51.4	223	e 9 30	+14	16 33	- 3	38.1	—
Ekatereburg	55.5	320	19 48	+ 5	1 17 23	- 5	25.5	35.7
Kodaikanal	61.3	265	26 54	?	—	—	31.2	41.5
Pulkovo	68.9	330	i 11 10	—	e 1 20 13	0	33.0	48.4
Tiflis	70.7	310	—	—	e 20 37	+ 3	e 35.4	39.8
Uppsala	73.9	334	e 11 38	- 3	e 21 5	- 8	e 38.0	46.8
Bergen	77.5	340	—	—	—	—	e 37.0	—
Hamburg	81.3	333	e 12 21	- 6	1 22 37	- 1	e 41.0	49.1
Vienna	82.6	326	12 29	- 5	22 39	-14	44.0	53.0

Continued on next page.

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Belgrade	83-0	322	e 12 36	0	e 23 2	+ 5	e 41-1	—
Edinburgh	83-7	340	—	—	1 23 6	—	43-0	50-0
De Bilt	84-2	334	e 12 40	- 3	e 22 47	[- 4]	e 44-0	51-6
Sarajevo	84-7	323	—	—	—	—	—	39-3
Innsbruck	85-5	328	e 12 54	+ 3	e 23 12	- 13	e 44-0	54-9
Uccle	85-5	334	e 12 43	- 8	e 23 10	- 15	e 42-0	52-2
Strasbourg	86-1	330	12 44	- 10	23 13	- 18	43-0	52-5
Kew	86-6	337	49 0	?L	—	—	(49-0)	55-0
Zurich	86-7	329	e 12 48	- 9	e 23 17	[+ 11]	—	—
Paris	87-9	333	—	—	—	—	e 46-0	54-0
Besançon	87-9	330	—	—	—	—	—	50-0
Florence	88-2	325	12 0	- 66	23 40	- 14	44-0	52-0
Pompeii	88-9	321	e 23 50	?S	(e 23 50)	- 12	—	57-0
Rocca di Papa	89-1	323	e 12 34	- 37	18 0	?PR ₁	1 49-4	58-3
Chicago	91-9	33	—	—	—	—	48-0	—
Toronto E.	93-7	27	—	—	—	—	e 49-8	—
Barcelona	94-1	329	—	—	—	—	e 53-3	59-7
Tortosa	95-3	330	—	—	22 0	?	39-3	60-5
Algiers	97-5	326	e 13 37	- 20	25 25	- 6	—	66-0
Toledo	97-9	333	—	—	—	—	e 48-4	61-7
Coimbra	99-2	335	19 46	?	31 56	?	48-2	57-5
San Fernando	101-7	333	—	—	56 0	?	66-0	71-0
Cape Town	132-1	254	70 0	?L	—	—	(70-0)	—
La Paz	149-2	60	20 0	[+ 6]	—	—	72-9	75-3

Additional readings and notes : Osaka gives also MN = +2.5m. Kobe MN = +1.9m. Mizusawa PE = +1m.13s. Hokodate MN = +4.8m. Zi-ka-wei MN = +9.1m. Ekaterinburg MN = +31.5m., MZ = +36.6m. Pulkovo SR₁ = +24m.23s. Tiflis eLN = +34.4m., MN = +38.9m. Uppsala MN = +47.6m. Hamburg MN = +50.3m., MZ = +55.3m. Belgrade L = +51.7m. De Bilt MN = +51.3m., MZ = +53.7m. Innsbruck MNW = +55.0m. Uccle MN = +52.7m. Strasbourg PR₁ = +15m.50s. Chicago reading has been increased by 1h. Toronto iLN = +52.8m. Tortosa MN = +65.6m. Coimbra ePE = +7m.16s., PN = +10m.36s., e = +24m.41s., MN = +59.3m. La Paz iN = +20m.12s., MN = +83.1m.

The following additional shocks are presumed to be from the same epicentre, 35°-0N, 139°-5E. :-

The numeration in the first column is that of Kobe (Mem. Imp. Mar. Obs., Vol. 1, No. 4, Table 1). Shocks not observed at Kobe have been assigned a letter.

	d.	h.	m.	s.	
1.	Sept. 1	3 24	20		Nagoya P = +54s., Osaka L = +2.7m., Kobe P = +42s., Hakodate eP = +2m.22s., Vienna PZ = +12m.1s., La Paz iP = +19m.35s.
2.	1	3 34	6		Osaka L = +3.1m., Kobe P = +56s.
3.	1	3 39	30		Osaka P = +1m.24s., Nagasaki P = +1m.29s., Vienna PZ = +14m.0s., La Paz iP = +20m.29s.
4.	1	3 40	30		Osaka L = +2.3m., Kobe P = +52s., La Paz iP = +27m.22s.
5.	1	3 48	15		Nagoya P = +1m.3s., Osaka P = +1m.28s., Kobe P = +51s., Manila e = +6m.12s., Nagasaki P = +33s., Vienna ePZ = +14m.8s.
6.	1	4 11	0		Kobe P = +56s., Vienna PZ = +12m.28s., La Paz P = +21m.53s.
7.	1	4 13	30		Kobe P = +57s.
8.	1	4 20	20		Nagoya P = +1m.12s., Kobe P = +1m.0s., Mizusawa P = +1m.12s., La Paz P = +20m.0s., Osaka L = 2.3m.
9.	1	4 27	0		Kobe M = +3.3m., Mizusawa P = +0m.24s.
10.	1	4 31	0		Kobe P = +59s., Osaka L = +2.2m., Mizusawa P = +53s., Nagasaki P = +2m.20s., Rocca di Papa LZ = +45.7m., La Paz P = +20m.2s.
11.	1	4 45	20		Kobe P = +54s., Osaka L = +1.7m.
12.	1	4 58	40		Nagoya P = +1m.19s., Osaka L = +2.0m., Kobe M = +2.2m., Hakodate P = +1m.53s., Vienna ePZ = +12m.10s., La Paz eP = +19m.31s.

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	d. h. m. s.	
13.	Sept. 1 5 12 50	Kobe P = +54s., Osaka L = +1.8m., Mizusawa S = +2m.13s., Ootomari P = +1m.39s., La Paz P = +19m.42s.
14.	1 5 22 30	(See full details above)
15.	1 5 41 (0)	Kobe M = +2.4m.
16.	1 5 54 0	Kobe P = +32m., Mizusawa P = +1m.43s., Osaka L = +1.3m.
17.	1 6 5 5	Kobe = +56s., Mizusawa P = +1m.10s., Hakodate P = +1m.48s., La Paz eP = +19m.42s., Osaka P = +16s.
18.	1 6 13 50	Kobe = +42s., Mizusawa S = +1m.19s., Osaka L = +1.5m.
19.	1 6 19 0	Kobe = +1m.20s., Mizusawa P = +1m.2s., Hakodate eP = +1m.11s., Nagasaki P = +2m.32s., Zi-ka-wei e = +3m.44s., Taihoku e = +9m.25s., Vienna ePZ = +12m.27s., La Paz i = +19m.54s., Osaka P = +57s.
20.	1 6 40 0	Kobe M = +1.0m., Mizusawa S = +1m.0s., La Paz eP = +18m.44s.
21.	1 6 43 2	Kobe P = +1m.7s., Osaka P = +1m.13s.
22.	1 6 56 25	Kobe P = +1m.16s., Mizusawa P = +1m.8s., Hakodate P = +1m.41s., La Paz P = +19m.58s.
23.	1 7 23 40	Mizusawa P = +1m.8s., Kobe M = +1.7m.
24.	1 7 38 0	(See full details above).
25.	1 8 1 30	Kobe M = +1.9m.
26.	1 8 11 20	Osaka P = +1m.28s., Kobe P = +50s., Mizusawa P = +49s.
27.	1 8 32 30	Kobe M = +1.8m.
28.	1 9 0 0	Osaka L = +1.1m., Kobe M = +0.8m., Batavia e = +5m.6s.
29.	1 9 31 0	Kobe M = +1.9m.
29a.	1 11 41 50	Mizusawa P = +1m.11s.
30.	1 12 47 0	Kobe M = +1.8m.
31.	1 12 58 20	Kobe M = +1.7m., Osaka L = +2.0m.
31a.	1 13 3 30	Mizusawa S = +1m.12s.
31b.	1 13 22 10	Mizusawa P = +1m.8s.
31c.	1 13 33 40	Mizusawa S = +1m.5s.
31d.	1 13 39 25	Mizusawa S = +1m.8s.
32.	1 13 52 15	Nagoya P = +39s., Osaka P = +55s., Kobe P = +56s., Mizusawa P = +1m.21s., Hakodate P = +2m.1s., Zi-ka-wei e = +3m.55s., Manila e = +5m.45s., Ekaterburg P = +9m.40s., S = +17m.25s., Pulkovo eL = +35.8m., De Bilt eL = +41.8m., Uccle eL = +41.8m., Eskdalemuir = +40.8m., Bidston M = +50.8m., Strasbourg eL = +45.8m., La Paz eP = +18m.7s.
33.	1 14 30 0	Osaka P = +55s., Kobe P = +53s., Mizusawa S = +2m.13s.
34.	1 15 0 30	Kobe M = +1.9m.
35.	1 15 40 30	Osaka P = +37s., Kobe M = +3.0m., Mizusawa P = +1m.31s., Zi-ka-wei e = +7m.30s. (=S1), Ekaterinburg L = +27.5m., Pulkovo = +40.6m., De Bilt eL = +50.5m., Strasbourg eL = +53.5m.
36.	1 16 12 10	Kobe M = +1.9m., Mizusawa P = +0m.58s.
36a.	1 16 35 50	Mizusawa P = +1m.7s., Manila e = +1m.10s., Ekaterinburg P = +9m.32s., S = +18m.59s.

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	d. h. m. s.	
37.	Sept. 1 16 52 30	Kobe M = +1.6m.
38.	1 17 0 0	Kobe M = +1.5m., Mizusawa S = +1m.46s.
39.	1 17 2 30	Osaka P = +1m.18s., Kobe P = +1m.6s., Mizusawa P = +1m.19s., Hakodate P = +1m.30s., Zi-ka-wei e = +3m.50s., Ekaterinburg P = +9m.31s., S = +17m.17s., Pulkovo eL = +27.5m., De Bilt eL = +47.5m., Uccle M = +48.5m., Strasbourg eL = +50.5m., La Paz iP = +20m.8s.
40.	1 17 13 30	Kobe M = +2.7m., Mizusawa P = +1m.2s.
41.	1 18 0 20	Osaka P = +1m.10s., Kobe M = +1.7m., Mizusawa P = +1m.20s., Ekaterinburg L = +30.7m.
41a.	1 18 37 0	Mizusawa P = +1m.2s., Ekaterinburg L = +29.0m.
42.	1 19 8 40	Osaka P = +1m.14s., Kobe P = +56s., Mizusawa P = +53s., Hakodate P = +1m.42s., Zi-ka-wei e = +3m.49s., Ekaterinburg iP = +9m.20s., S = +17m.4s., Pulkovo e = +12m.49s., De Bilt eL = +48.3m., Strasbourg e = +26m.20s., La Paz iP = +19m.43s.
43.	1 19 14 0	Kobe M = +1.1m., Mizusawa S = +1m.21s.
43a.	1 20 14 50	Mizusawa P = +1m.10s.
44.	1 21 8 40	Kobe M = +1.8m., Mizusawa P = +1m.8s.
45.	1 21 12 0	Kobe M = +1.8m., Mizusawa P = +1m.13s.
46.	1 21 48 40	Osaka P = +1m.24s., Kobe P = +1m.12s., Mizusawa P = +54s., Hakodate eP = +1m.37s., Zi-ka-wei e = +4m.8s., Ekaterinburg P = +9m.22s., S = +17m.13s., Pulkovo eL = +36.3m., De Bilt eLN = +49.3m., eLE = +50.3m., Eskdalemuir L = +46.3m., Strasbourg eL = +52.3m., Rocca di Papa eL = +56.6m., Azores P = +29m.8s.
47.	1 22 11 0	Osaka P = +1m.17s., Mizusawa P = +49s., Hakodate eP = +2m.1s., Zi-ka-wei e = +7m.20s.
47a.	1 22 11 40	Zi-ka-wei e = +6m.40s.
48.	1 22 29 0	Kobe M = +1.9m.
49.	1 22 35 0	Kobe M = +0.6m.
49a.	1 22 50 40	Mizusawa P = +1m.5s., Ekaterinburg L = +31.3m., Eskdalemuir L = +43.3m.
50.	1 23 1 20	Kobe M = +6.9m., Mizusawa S = +1m.4s.
51.	1 23 14 0	Kobe M = +1.9m.
51a.	1 23 36 0	Zi-ka-wei e = +3m.51s., Ekaterinburg L = +31.0m.
51b.	1 23 47 0	Zi-ka-wei e = +3m.47s.

Sept. 1d. Readings also at 3h. (Vienna (2) and La Paz (3)), 8h. (Sarajevo and La Paz), 12h. (Sarajevo, Eskdalemuir, Bidston (2), Strasbourg (2), Edinburgh (2), and De Bilt (2)), 13h. (Sarajevo and Vienna), 14h. (Bidston and Sarajevo).

Sept. 2d. 0h. 59m. 54s. (I)
 4h. 47m. 58s. (II)
 5h. 10m. 10s. (III)
 6h. 32m. 30s. (IV)
 9h. 48m. 50s. (V) } Epicentre 35°-0N. 139°-5E. (as on Sept. 1d.).

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	m. s.	s.	m. s.	s.	m.	m.
III Nagoya	2.1	274	1 5	‡S	(1 5)	+ 7	1.8	2.0
I Osaka	3.4	266	0 55	+ 2	—	—	1.8	3.1
II	3.4	266	1 26	‡S	(1 26)	- 8	2.4	2.6
III	3.4	266	1 26	‡S	(1 26)	- 8	2.2	2.5
IV	3.4	266	0 45	- 8	—	—	1.7	2.7
V	3.4	266	—	—	—	—	2.5	4.3

Continued on next page.

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
I Kobe	3.6	266	0 42	-14	(1 36)	- 3	1.6	1.7
II	3.6	266	1 7	+11	1 32	- 7	2.0	2.8
III	3.6	266	1 6	+10	—	—	2.1	2.4
IV	3.6	266	0 54	- 2	1 27	-12	1.7	1.9
V	3.6	266	1 4	+ 8	1 29	-10	2.1	3.8
I Mizusawa E.	4.3	17	1 4	- 3	2 5	+ 7	—	—
II	4.3	17	1 1	- 6	2 3	+ 5	—	—
III	4.3	17	1 6	- 1	1 56	- 2	—	—
IV	4.3	17	1 8	+ 1	2 6	+ 8	—	—
V	4.3	17	1 8	+ 1	2 7	+ 9	—	—
II Hakodate	6.8	7	e 1 41	- 3	—	—	e 3.4	—
III	6.8	7	1 46	+ 2	(3 11)	+ 6	3.2	4.6
V	6.8	7	e 1 41	- 3	—	—	—	4.0
v Nagasaki	8.4	257	2 1	- 6	—	—	4.3	5.3
I Zi-ka-wei	15.6	261	—	—	e 6 54	+ 8	—	17.6
I Manila	26.4	224	—	—	e 11 46	+76	—	—
I Fulkovo	68.9	330	—	—	—	—	43.1	53.3
I De Bilt	84.2	334	—	—	—	—	e 55.1	60.2
I Eskdalemnir	84.2	340	—	—	—	—	e 50.1	—
I Strasbourg	86.1	330	—	—	—	—	e 55.1	—
I Florence	88.2	325	—	—	—	—	14.1	25.1
I Rocca di Papa	89.1	323	—	—	—	—	e 57.4	64.9
I Azores	106.0	349	30 6	?	—	—	—	—
II La Paz	149.2	60	e 19 56	[+ 2]	—	—	—	—
III	149.2	60	e 19 57	[+ 3]	—	—	—	—
V	149.2	60	e 19 46	[- 8]	—	—	68.1	94.2

Nagoya readings have been diminished by 2min.

1923. Sept. 2d. 2h. 46m. 40s. Epicentre 35°-0N. 139°-5E.
(as at 0h.).

A = - .623, B = + .532, C = + .574; D = + .649, E = + .760;
G = - .436, H = + .372, K = - .819.

Depth of focus 0.010, not agreeing with Sept. 1d. See long note preceding Sept. 1d.

Station and Component	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Nagoya	+0.2	2.1	274	2 0	+84	—	—	2.6	—
Osaka	+0.1	3.4	266	1 13	+18	—	—	2.2	3.8
Kobe	+0.1	3.6	266	1 4	+ 6	—	—	2.0	2.6
Mizusawa E.	0.0	4.3	17	1 7	0	—	—	—	—
Hakodate	0.0	6.8	7	1 40	- 4	—	—	—	—
Nagasaki	-0.1	8.4	257	2 5	- 1	—	—	3.4	5.2
Ootomari	-0.1	11.9	11	2 44	-12	—	—	4.0	5.4
Zi-ka-wei	-0.2	15.6	261	i 3 51	+ 7	e 6 46	+ 5	5.4	6.1
Taihoku	-0.3	18.4	242	4 20	+ 2	(7 50)	+ 8	7.8	11.4
Hokoto	-0.4	20.8	242	i 5 8	+22	(e 8 50)	+18	e 8.8	13.7
Hong Kong	-0.5	25.5	247	5 31	- 7	10 3	0	12.7	17.3
Manila	-0.6	28.4	224	e 5 25	-21	—	—	12.8	14.4
Calcutta E.	-0.9	46.0	270	7 39	-55	14 29	-47	22.4	26.4
N.	-0.9	46.0	270	7 46	-48	14 34	-42	22.6	—
Dehra Dun	-1.0	51.1	282	8 28	-40	15 40	-40	20.2	29.2
Batavia	-1.0	51.4	223	i 9 14	+ 5	i 16 21	- 3	24.7	36.9
Simla E.	-1.0	51.5	284	8 14	+ 4	18 44	+19	26.6	28.5
N.	-1.0	51.5	284	8 56	-14	18 20	- 5	26.7	—
Ekaterinburg	-1.1	55.5	320	i 9 36	+ 1	17 19	+ 5	25.3	—
Honolulu E.	-1.1	55.8	87	9 40	+ 3	17 20	+ 3	e 28.0	29.3
N.	-1.1	55.8	87	9 44	+ 7	17 25	+ 9	26.8	26.9
Sitka E.	-1.2	58.7	40	10 0	+ 4	e 18 12	+19	28.1	39.9
N.	-1.2	58.7	40	10 5	+ 9	18 6	+13	28.3	35.0
Bombay	-1.2	60.5	275	10 16	+ 9	18 31	+16	31.9	—
Colombo	-1.2	61.3	280	10 20	+ 7	18 20	- 4	31.3	44.8
Kodaiakanal	-1.2	61.3	285	15 32	? PR ₁	(18 38)	+14	18.6	40.0
Apia	-1.2	67.2	128	—	—	—	—	—	36.3
Victoria E.	-1.3	68.9	45	11 4	+ 2	20 9	+12	29.9	33.0
N.	-1.3	68.9	45	11 7	+ 5	20 7	+10	29.7	—
Fulkovo	-1.3	68.9	330	i 11 8	+ 6	20 11	+14	30.3	43.5
Riverview	-1.3	69.7	176	e 11 4	- 3	i 20 13	+ 6	e 32.7	41.4
Sydney	-1.3	69.7	170	11 14	+ 7	20 20	+13	35.1	43.8

Continued on next page.

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Station and Component.	Corr. for Focus	Δ	Az.		P.		O-C.		S.		O-U.		L.	M.
			m.	s.	m.	s.	s.	m.	s.	m.	m.			
Adelaide	-1.3	70.0	181	e 11	8	-1	i 20	14	+4	27.8	30.5			
Perth	-1.3	70.6	201					(20 16)	-2	20.3				
Tifis	R. -1.3	70.7	310	e 10	56	-17	e 20	8	-11	33.3	45.0			
Melbourne	-1.3	73.0	176	(e 11 56)		+28	e 11	56	? P	25.3	38.1			
Uppsala	-1.3	73.9	334	e 11	32	-2	21	9	+12	e 37.8	46.0			
Berkeley	-1.3	74.9	54	11	35	-5	21	8	-1	e 31.2	32.6			
Bergen	-1.3	77.5	340	8	55	-181	18	45	-174	31.3	43.3			
Lemberg	-1.3	77.8	324	e 12	1	+3	e 21	55	+12	e 27.0	47.1			
Hamburg	-1.3	81.3	333	i 12	19	0	i 22	35	+12	e 43.3	51.8			
Budapest	-1.3	81.9	325	11	41	-42				18.4				
Vienna	-1.4	82.6	328	e 12	26	0	22	48	+11	e 41.3	53.3			
Wellington	-1.4	82.9	154	e 12	32	+4	i 22	38	-3	36.5	43.3			
Belgrade	-1.4	83.0	322	i 12	49	+21	i 22	50	+8	43.0	54.2			
Edinburgh	-1.4	83.7	340	12	31	-1	22	50	+1	40.3	51.3			
Christchurch	-1.4	84.2	158	12	32	-3	24	32	+97	44.1	48.5			
Eskdalemuir	-1.4	84.2	340	i 12	35	0	22	55	0	40.8	50.0			
De Bilt	-1.4	84.2	334	12	35	0	i 23	0	+5	e 43.3	49.5			
Sarajevo	-1.4	84.7	323	e 12	39	+1	i 23	4	+4	e 44.6	54.4			
Mostar	-1.4	85.3	324							e 40.3	54.3			
Uccle	-1.4	85.5	334	12	40	-3	i 23	7	-2	e 41.3	54.8			
Innsbruck	-1.4	85.5	328	e 12	48	+5	e 23	7	-2	e 43.3	55.4			
Travnik	-1.4	85.5	324				(e 24 45)		+96	e 24.8				
Tucson	R. -1.4	85.8	53	e 16	15	? PR ₁	23	13	+1	42.2	45.3			
Bidston	-1.4	85.8	339	12	42	-2	23	6	6		58.5			
Strasbourg	-1.4	86.1	330	i 12	46	0	i 23	10	-6	44.3	52.4			
West Bromwich	-1.4	86.3	338	e 12	43	-4	i 23	9	-9					
Helwan	-1.4	86.4	304	12	45	-3	i 23	10	-9		55.9			
Venice	-1.4	86.5	328				i 23	10	-10		49.2			
Kew	-1.4	86.6	337	12	20	-29					52.3			
Zurich	-1.4	86.7	329	e 12	46	-4	e 23	8	-14					
Oxford	-1.4	87.0	337	12	50	-1	i 23	13	-13	41.7	52.9			
Besançon	-1.4	87.9	330	12	54	-2	23	21	-15		43.3			
Paris	-1.4	87.9	333	i 12	53	-3	i 23	22	-14	39.3	52.3			
Florence	-1.4	88.2	325	e 12	52	-6	23	27	-12	43.3	46.3			
	-1.4	88.2	325	12	56	-2	23	50	+11	46.3	56.3			
Pompeii	-1.4	88.9	321	e 16	10	? PR ₁					57.3			
Rocca di Papa	R. -1.4	89.1	323	e 13	5	+2	23	20	[+7]	44.1				
	N. -1.4	89.1	323	e 13	7	+4	23	39	[+26]	44.6	53.3			
Puy de Dôme	-1.4	90.3	332	e 13	5	-5	e 23	39	[+9]	43.6	50.8			
Marseilles	-1.4	91.2	329	e 14	44	+89	e 23	29	[+6]	47.3	55.1			
Chicago	-1.4	91.9	33	13	16	-3	23	36	[+3]	46.3				
Ann Arbor	-1.4	93.2	30	e 13	20	-6	23	44	[+3]	43.3	54.1			
Ottawa	-1.4	93.6	23	13	12	-16	23	50	[+1]	e 45.3	61.3			
Toronto	R. -1.4	93.7	27	e 13	20	-9	i 23	50	0	144.0	60.0			
	N. -1.4	93.7	27	e 13	20	-9	i 23	53	[+3]	44.0	52.6			
Barcelona	-1.4	94.1	329	e 13	20	-11	e 23	59	[+6]	e 34.6	56.5			
Tortosa	R. -1.4	95.3	330	13	30	-7	24	7	[+8]	e 44.6	58.3			
	N. -1.4	95.3	330	13	30	-7	24	6	[+7]	e 42.6	58.4			
Northfield	-1.4	95.6	22	e 18	20	? PR ₁	24	4	[+4]	e 53.3				
Ithaca	-1.4	95.8	26	e 17	20	? PR ₁	23	58	[+5]	49.3				
Algiers	-1.4	97.5	326	e 13	40	-10	24	14	[+3]	46.3	62.8			
Toledo	-1.4	97.9	333	e 13	39	-13	i 41	28	? L	(i 41.5)	63.8			
Georgetown	R. -1.4	98.7	28	17	45	? PR ₁	24	18	[+2]	47.4	55.1			
	N. -1.4	98.7	28	17	19	? PR ₁	24	13	[+3]	e 30.0				
Washington	-1.4	98.7	28				24	16	[+1]	39.7				
Cheltenham	R. -1.4	98.9	28				25	5	-26	e 48.8	70.7			
	N. -1.4	98.9	28				24	34	[+16]	e 49.1	69.2			
Coimbra	-1.4	99.2	335	e 13	40	-19	24	32	[+12]	51.5	58.3			
Granada	-1.5	100.1	331	14	20	+17	26	10	+28	e 50.4	65.9			
Rio Tinto	-1.5	100.7	334	15	50	+104					68.8			
Lisbon	-1.5	100.8	335	18	2	? PR ₁					51.9			
San Fernando	-1.5	101.7	333	13	42	-30	24	47	[+15]	48.3	67.3			
Porto Rico		121.8	27							e 62.5	66.7			
Accra		124.5	308	22	50	? PR ₁					87.8			
Cape Town		132.1	254	23	0	? PR ₁					91.0			
Ascension		143.8	311	12	20	?					133.3			
La Paz		149.2	60	i 19	49	[-5]	33	58	?	71.3	78.2			
Andalgala		156.8	78	17	44	?				73.4	78.5			
Mendoza		156.9	93	25	32	? PR ₁				45.8	141.1			
Cipolletti		157.7	109	19	8	[-56]				75.8	84.3			
Pilar	R. -1.4	160.2	87	23	20	?				84.2	104.6			
	N. -1.4	160.2	87	24	50	?				84.8	103.0			
Rio de Janeiro		167.7	11	e 20	35	[+21]				45.5				

For Notes see next page.

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NOTES TO SEPT. 2d. 2h. 46m. 40s.

Additional readings and notes: Osaka gives also MN = +3.7m. Mizusawa PN = +1m.6s. (O-C. = -1). Hakodate MN = +4.9m. Nagasaki MN = +6.3m. Zi-ka-wei iSN = +7m.1s., iSE = +7m.3s. Batavia e = +8m.57s. Ekaterinburg PR₁ = +11m.45s., PR₂ = +13m.0s. Honolulu e = +22m.48s., eE = +25m.48s. T₀ = 2h.46m.45s. Sitka eN = +24m.50s., eE = +27m.12s. T₀ = 2h. 46m. 45s. Pulkovo PR₁ = +13m.41s., PS = +20m.56s., SR₁ = +24m.32s., SR₂ = +28m.14s., MN = +42.9m., MZ = +47.2m. Riverview PS = +20m.56s. and +21m.25s., MZ = +40.3m., MN = +41.5m. T₀ = 2h.46m.27s. Sydney SR₁ = +26m.32s., SR₂ = +29m.20s., SR₃ = +32m.20s. Adelaide PR₁ = +14m.8s. Perth S? = +18m.14s. Tifis MN = +39.2m. Melbourne SR₂ = +21m.2s. Upsala SR₁ = +26m.7s., MN = +46.1m. Berkeley iSEN = +21m.13s., iN = +21m.25s. and +21m.33s., SR₁N = +26m.11s. Lemberg MN = +44.2m. Bergen PR₁ = +11m.45s., SR₁ = +23m.45s., SR₂ = +27m.15s. Hamburg PR₁ = +15m.36s., iSN = +22m.34s., iSR₁ = +27m.25s., iSR₂ = +30m.41s., i = +35m.55s., eL = +40.3m., MZ = +52.7m., MN = +55.7m. Vienna ePN = +12m.27s., iP = +12m.30s., PR₁ = +15m.41s., SR₁ = +28m.24s., iN = +32m.18s., SR₂? = +46m.31s., MN = +48.8m. Wellington eSR₁ = +27m.56s. T₀ = 2h.46m.51s. Belgrade PR₁ = +14m.54s., eL = +31.7m. Edinburgh PR₁ = +15m.50s., SR₁ = +28m.50s. Christchurch SR₁? = +29m.50s. Eskdalemuir PR₁ = +15m.54s., PR₂ = +17m.49s., SR₁ = +27m.54s., SR₂ = +32m.24s., MN = +49.7m. De Bilt PR₁ = +15m.53s., ePR₂ = +19m.32s., MN = +58.1m., MZ = +57.2m. Uccle PR₁ = +15m.44s., SR₁ = +28m.50s., SR₂ = +32m.50s., MN = +53.9m., MZ = +55.0m. Innsbruck MNW = +50.7m. Travnik L = +55.2m. Tucson eE = +36m.7s. T₀ = 2h.46m.23s. Bidston S = +16m.10s. (?PR₁). Strasbourg iPR₁ = +16m.13s., iPR₂ = +17m.54s., SR₁ = +29m.1s., SR₂ = +32m.47s., MN = +55.6m., MZ = +57.9m. West Bromwich PR₁N = +16m.9s. Oxford PR₁ = +16m.15s. Paris PR₁ = +16m.24s., MN = +54.3m., MN = +54.3m. Florence P = +16m.50s. (?PR₁). Rocca di Papa iPZ = +12m.58s. (O-C. = -5s.), eSN = +23m.26s. (O-C. = [+3s.]), iLE = +50.4m., iLN = +51.4m. Chicago L = +41.3m. Ann Arbor PR₁ = +16m.56s., SR₁ = +30m.56s., SR₂ = +34m.20s. T₀ = 2h.47m.30s. Ottawa PR₁ = +17m.9s., i = +25m.37s., SR₁ = +30m.50s. T₀ = 2h.47m.11s. Toronto eE = iN = +17m.4s., SR₁ = +30m.53s., L = +44.1m. Barcelona PR₁ = +17m.8s., MN = +62.4m. Northfield L = +58.3m. Ithaca e = +21m.8s., +31m.8s., and several L's. Algiers MN = +63.8m. Toledo PR₁NW = +17m.45s., PR₁NE = +17m.46s., PR₁NW = +20m.1s., PR₂NE = +20m.2s., PR₁NW = +21m.33s., PR₂NE = +21m.42s., MNW = +56.6m. Washington PR₁ = +17m.24s. Cheltenham ePR₁ = +17m.45s., ePR₂ = +20m.35s., SR₁ = +32m.13s. T₀ = 2h.46m.12s. Coimbra PR₁ = +17m.56s. and several i's. T₀ = 2h.47m.24s. Granada MN = +67.4m. San Fernando PR₁ = +18m.12s., MN = +70.3m. Rio de Janeiro LN = +45.7m. La Paz PR₁N = +25m.46s., eSN? = +33m.56s., SR₁N = +42m.26s., SR₁E = +42m.30s., SR₁N = +48m.6s., L = +70.4m., MN = +74.6m.

1923. Sept. 2d. 9h. 26m. 56s. Epicentre 35° 0N. 139° 5E.

(as at 2h.).

A = -623, B = +532, C = +574; D = +649, E = +760;
G = -436, H = +372, K = -819.

The depth of focus 0.010 of 2h. has been retained.

Station and Component.	Corr. for Focus	Δ	Az.	P.		O-C.	S.	O-C.	L.	M.
				m.	s.					
Nagoya	+0.2	2.1	274	2	5	+89	—	—	3.0	5.1
Osaka	+0.1	3.4	268	1	8	+13	—	—	2.2	3.3
Kobe	+0.1	3.6	268	1	4	+6	1 30	-12	1.9	2.6
Mizusawa	n. 0.0	4.3	17	0	59	-8	1 57	-1	—	—
Hakodate	0.0	6.8	7	1	38	-6	—	—	3.4	3.7
Nagasaki	-0.1	8.4	257	2	6	0	—	—	4.1	8.1
Ootomari	-0.1	11.9	11	2	40	-18	—	—	5.6	8.1
Zi-ka-wei	-0.2	15.6	261	13	48	+4	e 8 56	+15	—	10.9
Taihoku	-0.3	18.4	242	4	38	+20	(8 5)	+23	8.1	13.3
Hong Kong	-0.5	25.5	247	5	40	+2	9 57	-6	—	17.6
Manila	-0.6	28.4	224	e 6	16	+30	—	—	—	—
Calcutta	n. -0.9	46.0	270	7	42	-52	—	—	—	—

Continued on next page.

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Station and Component.	Corr. for Focus	Δ	Az.	P.		O-C.		S.		O-C.		L.	M.
				m.	s.	s.	s.	m.	s.	s.	m.		
Batavia	-1.0	51.4	223	9	6	-3	i16	25	+1	31.3	—	—	—
Simla	E. -1.0	51.5	284	9	10	0	e18	58	+33	32.4	—	—	—
	N. -1.0	51.5	284	8	46	-24	16	22	-3	32.3	—	—	—
Ekaterinburg	-1.1	55.5	320	i9	25	-10	i17	17	+3	25.1	35.7	—	—
Honolulu	E. -1.1	55.8	87	9	34	-3	17	16	-1	27.3	29.5	—	—
	N. -1.1	55.8	87	—	—	—	—	—	—	28.2	30.3	—	—
Sitka	-1.2	58.7	40	—	—	—	e17	52	-1	e31.4	—	—	—
Bombay	-1.2	60.5	275	10	23	+16	18	33	+18	31.5	—	—	—
Kodaikanal	-1.2	61.3	285	(19	58)	?S	19	58	+94	36.1	40.5	—	—
Colombo	-1.2	61.3	280	10	40	+27	19	22	+58	40.1	41.8	—	—
Victoria	E. -1.3	68.9	45	11	0	-2	20	0	+3	30.0	34.0	—	—
	N. -1.3	68.9	45	11	0	-2	20	0	+3	29.6	29.7	—	—
Pulkovo	-1.3	68.9	330	i11	4	+2	i20	8	+11	34.1	39.0	—	—
Riverview	-1.3	69.7	170	e11	15	+8	e20	14	+7	e32.7	39.7	—	—
Tifis	E. -1.3	70.7	310	e8	28	-165	e17	52	-147	e35.1	41.8	—	—
Melbourne	-1.3	73.0	176	—	—	—	(21	16)	+30	21.3	41.6	—	—
Upsala	-1.3	73.9	334	e11	30	-4	e21	1	+4	36.6	45.0	—	—
Bergen	-1.3	77.5	340	—	—	—	—	—	—	e43.1	—	—	—
Hamburg	-1.3	81.3	333	i12	15	-4	e22	27	+4	e41.1	53.7	—	—
Budapest	-1.3	81.9	325	11	35	-48	21	48	-42	44.8	—	—	—
Vienna	-1.4	82.6	326	i12	23	-3	—	—	—	e42.1	49.1	—	—
Wellington	-1.4	82.9	154	—	—	—	e22	52	+11	e39.9	43.1	—	—
Belgrade	-1.4	83.0	322	i12	29	+1	i23	48	+66	50.3	—	—	—
Edinburgh	-1.4	83.7	340	12	29	-3	22	50	+1	41.1	52.4	—	—
De Bilt	-1.4	84.2	334	12	30	-5	22	53	-2	42.1	50.9	—	—
Eskdalemuir	-1.4	84.2	340	12	29	-6	i22	48	-7	39.1	47.0	—	—
Innsbruck	-1.4	85.5	328	e12	45	+2	e22	58	-11	e41.1	49.4	—	—
Uccle	-1.4	85.5	334	12	36	-7	i23	0	-9	e42.1	51.5	—	—
Bidston	-1.4	85.6	339	12	34	-10	22	59	-13	—	53.0	—	—
Strasbourg	-1.4	86.1	330	i12	39	-7	i23	4	-12	43.1	53.8	—	—
Helwan	-1.4	86.4	304	12	44	-4	i23	5	-14	—	55.8	—	—
Kew	-1.4	86.6	337	—	—	—	—	—	—	—	58.1	—	—
Zurich	N. -1.4	86.7	329	i12	42	-8	e23	6	-16	—	—	—	—
Oxford	-1.4	87.0	337	12	42	-9	i23	8	-18	39.5	51.1	—	—
Paris	-1.4	87.9	333	i12	50	-6	i23	15	-21	45.1	52.1	—	—
Besançon	-1.4	87.9	330	13	10	+14	23	17?	-19	—	47.1	—	—
Florence	-1.4	88.2	325	12	4	-54	23	19	-20	—	48.1	—	—
Pompeii	-1.4	88.9	321	15	54	?PR ₁	22	54	-53	50.1	—	—	—
Rocca di Papa	E. -1.4	89.1	323	i12	58	-5	23	40	-9	e47.7	57.7	—	—
	N. -1.4	89.1	323	i12	56	-7	23	46	-3	e47.9	—	—	—
Marseilles	-1.4	91.2	329	—	—	—	e39	4	?	e51.1	—	—	—
Chicago	-1.4	91.9	33	13	2	-17	23	36	[-3]	e42.6	—	—	—
Ann Arbor	-1.4	93.2	30	e16	52	PR ₁	i24	16	-17	e46.1	—	—	—
Ottawa	-1.4	93.6	23	10	4	?	20	58	?	e37.1	55.1	—	—
Toronto	E. -1.4	93.7	27	e13	11	-18	23	34	[-16]	e42.3	—	—	—
	N. -1.4	93.7	27	—	—	—	i23	37	[-13]	e42.2	—	—	—
Barcelona	-1.4	94.1	329	—	—	—	—	—	—	e48.1	58.7	—	—
Tortosa	E. -1.4	95.3	330	e13	27	-10	e23	34	[-25]	e41.1	58.3	—	—
	N. -1.4	95.3	330	e13	21	-16	e23	58	[-1]	e40.1	60.9	—	—
Northfield	-1.4	95.6	22	—	—	—	e56	0	?L	56.1	—	—	—
Ithaca	-1.4	95.8	26	—	—	—	e24	4	[+4]	59.1	—	—	—
Algiers	-1.4	97.5	326	—	—	—	e24	10	[-1]	54.1	63.1	—	—
Toledo	-1.4	97.9	333	e13	16	-36	24	10	[-2]	e43.7	57.0	—	—
Georgetown	N. -1.4	98.7	28	—	—	—	e24	28	[+11]	—	—	—	—
Washington	-1.4	98.7	28	14	32	+36	24	25	[+8]	57.1	—	—	—
Coimbra	-1.4	99.2	335	e17	40	PR ₁	—	—	—	46.2	57.3	—	—
Rio Tinto	-1.5	100.7	334	26	4	?S	(26	4)	+16	—	69.1	—	—
Lisbon	-1.5	100.8	335	—	—	—	—	—	—	e51.7	—	—	—
San Fernando	-1.5	101.7	333	14	21	+9	24	41	[+9]	58.1	67.1	—	—
Accra	—	124.5	308	—	—	—	—	—	—	—	78.1	—	—
La Paz	—	149.2	60	i19	47	[-7]	33	50	?	71.0	74.4	—	—
Cipolletti	—	157.7	109	78	28	?	—	—	—	82.7	86.1	—	—
Rio de Janeiro	—	167.7	11	—	—	—	e45	34	SR ₁	—	—	—	—

Additional readings and notes: Osaka gives also MN = +3.1m. Kobe
 MN = +3.9m. Ootomari MN = +7.9m. Zi-ka-wei MN = +10.7m.
 Calcutta PN = +7m.41s. Ekaterinburg MN = +35.0m., MZ = +35.6m.
 Honolulu eN = +19m.22s., SR₁N = +22m.41s., eE = +25m.12s., eN =
 +25m.4s., T₀ = 9h.26m.53s., Pulkovo iPR₁ = +13m.34s., PR₂ =
 +15m.16s., PS = +20m.46s., SR₁ = +24m.40s., SR₂ = +27m.40s., MN =
 +42.5m., MZ = +45.4m. Riverview MN = +38.9m. Tifis MN =
 +25.4m. Upsala MN = +44.8m. Hamburg iZ = +15m.21s., MZ =
 +51.7m., MN = +52.2m. Vienna PR₁ = +15m.38s., PS = +23m.55s.

Continued on next page.

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Wellington eSR₁ = +28m.22s. Belgrade PR₁ = +15m.44s., L = +43.3m. and +56.0m. De Bilt PR₁Z = +15m.46s., eSR₁ = +29m.23s., MN = +52.9m., MZ = +52.6m. Eskdalemuir PR₁ = +15m.48s., SR₁ = +28m.39s., MN = +53.4m. Uccle PR₁ = +15m.58s., SR₁ = +28m.52s., MN = +49.9m. Strasbourg iPR₁ = +16m.0s., iPR₂ = +17m.55s., eSR₂ = +32m.57s. Zurich ePZ = +12m.39s., eSE = +23m.2s. Oxford iPR₁ = +16m.19s., SR₁ = +29m.14s. Paris iS = +23m.46s., MN = +56.1m. Rocca di Papa PR₁ = +16m.30s., eL = +47.1m., iL = +57.3m. Chicago L = +51.1m. Ottawa PR₁ = +13m.46s., SR₁ = +27m.16s., SR₂ = +31m.22s. T₂ = 9h.24m.6s. The time marks on film failed. Toronto eN = +17m.4s., eE = +17m.11s., LE = +49.1m., LN = +57.1m. Barcelona MN = +60.9m. Algiers PR₁ = +17m.32s. Toledo MNW = +57.3m. Northfield readings have been increased by 1h. Washington PR₁ = +17m.38s. San Fernando PR₁ = +18m.6s., MN = +68.6m.

Sept. 2d. 13h. 9m. 10s. Epicentre 35°·0N. 139°·5E. (as at 9h.).

Corrected for focal depth 0·010, as before.

Station and Component.	Corr. for Focus	Δ	Az.	P.		O-C.	S.	O-C.	L.	M.
				m.	s.					
Nagoya	+0.2	2.1	274	1	48	+72	—	—	2.5	3.4
Osaka	+0.1	3.4	266	0	58	+3	—	—	1.8	2.6
Kobe	+0.1	3.6	266	0	50	-8	(1 38)	-4	1.6	2.0
Mizusawa	0.0	4.3	17	1	8	+1	2 5	+7	—	—
Hakodate	0.0	6.8	7	1	52	+8	—	—	3.7	4.0
Nagasaki	-0.1	8.4	257	1	50	-16	—	—	4.0	4.5
Otomari	-0.1	11.9	11	3	0	+4	—	—	—	—
Zi-ka-wei	-0.2	15.6	261	3	40	-4	e 6 47	+6	9.7	—
Taihoku	-0.3	18.4	242	7	53	?S	(7 53)	+11	—	—
Hong Kong	-0.5	25.5	247	—	—	—	9 54	-9	13.9	—
Manila	-0.6	26.4	224	e 6	1	+15	—	—	—	—
Ekaterinburg	-1.1	55.5	320	i 9	32	-3	17 10	-4	28.8	35.8
Pulkovo	-1.3	68.9	330	11	6	+4	20 4	+7	35.8	45.2
Tiflis	-1.3	70.7	310	—	—	—	—	—	e 25.9	32.6
Upsala	-1.3	73.9	334	—	—	—	—	—	e 39.8	—
Hamburg	-1.3	81.3	333	e 12	19	0	—	—	e 42.6	47.8
Vienna	-1.4	82.6	326	e 12	23	-3	22 36	-1	e 44.8	54.8
Edinburgh	-1.4	83.7	340	—	—	—	i 22 28	-21	—	—
De Bilt	s. -1.4	84.2	334	—	—	—	22 57	+2	e 41.8	51.5
	n. -1.4	84.2	334	—	—	—	—	—	e 44.8	51.1
	z. -1.4	84.2	334	12	34	-1	—	—	—	59.2
Eskdalemuir	-1.4	84.2	340	—	—	—	—	—	40.8	—
Sarajevo	-1.4	84.7	323	—	—	—	—	—	—	22.7
Uccle	-1.4	85.5	334	e 23	9	?S	(e 23 9)	0	e 43.8	—
Innsbruck	-1.4	85.5	328	—	—	—	—	—	e 45.8	—
Bidston	-1.4	85.8	339	—	—	—	43 50	?L	(43.8)	53.6
Strasbourg	-1.4	86.1	330	12	45	-1	23 12	-4	44.8	—
Zurich	-1.4	86.7	329	e 13	7	+17	e 23 7	-15	—	—
Oxford	-1.4	87.0	337	—	—	—	23 15	-11	44.2	52.5
Paris	-1.4	87.9	333	e 13	2	+6	—	—	47.8	57.8
Florence	-1.4	88.2	325	3	50	?S	15 50	?S	23.8	48.8
Rocca di Papa	-1.4	89.1	323	e 15	20	+137	e 23 50	+1	e 58.0	—
Ottawa	-1.4	93.6	23	—	—	—	—	—	e 47.8	—
Tortosa	n. -1.4	95.3	330	—	—	—	—	—	e 51.8	60.1
Toledo	-1.4	97.9	333	—	—	—	—	—	e 50.8	—
La Paz	—	149.2	60	i 19	36	[-18]	—	—	—	—

Additional readings and notes: Osaka gives also MN = +3.2m. Kobe MN = +1.9m. Hakodate MN = +4.2m. Zi-ka-wei MN = +9.1m., MZ = +9.8m. Hong Kong L = +16.3m. Ekaterinburg MN = +30.8m. Pulkovo SR₁ = +24m.26s., SR₂ = +28m.32s., MN = +45.5m., MZ = +48.0m. Tiflis eN† = +24m.32s. Paris e = +16m.14s. (iPR₁). Rocca di Papa ePN = +15m.38s., ePV = +16m.32s. Ottawa e = +41m.50s., L = +52.8m. Tortosa eLE = +52.8m. La Paz eP = +16m.50s.

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Sept. 2d. 14h. 16m. 28s. Epicentre 35°·0N. 139°·5E. (as at 13h.).

Corrected for 0·010 depth of focus, as before.

Station and Component.	Corr. for Focus	Δ	Az.	P.		O-C.		S.	O-C.		L.	M.
				m.	s.	s.	s.		m.	s.		
Osaka	+0·1	3·4	286	0	51	-	4	(1 39)	+ 2	1·8	2·3	
Kobe	+0·1	3·6	266	0	52	-	6	(1 43)	+ 1	1·7	1·8	
Mizusawa	E. 0·0	4·3	17	1	9	+ 2		2 1	+ 3	—	—	
	N. 0·0	4·3	17	1	8	+ 1		2 0	+ 2	—	—	
Hakodate	0·0	6·8	7	1	46	+ 2		—	—	—	—	4·2
Nagasaki	-0·1	8·4	257	1	52	-14		—	—	4·0	—	4·2
Zi-ka-wei	-0·2	15·6	261	e 3	43	- 1		e 6 49	+ 8	—	—	10·0
Taihoku	-0·3	18·4	242	7	52	?S		(7 52)	+10	—	—	—
Hong Kong	-0·5	25·5	247	—	—	—		10 5	+ 2	—	—	—
Manila	-0·6	28·4	224	e 7	15	+89		—	—	—	—	—
Ekaterinburg	-1·1	55·5	320	i 9	29	- 6		1 17 14	0	29·5	—	35·4
Pulkovo	-1·3	68·9	330	11	4	+ 2		2 20 4	+ 7	32·5	—	43·0
Tiflis	E. -1·3	70·7	310	—	—	—		—	—	e 29·5	—	32·0
Upsala	-1·3	73·9	334	—	—	—		—	—	e 39·5	—	—
Vienna	-1·4	82·6	328	e 12	27	+ 1		e 22 25	-12	—	—	54·5
Edinburgh	-1·4	83·7	340	—	—	—		19 2	?	—	—	—
De Bilt	-1·4	84·2	334	—	—	—		—	—	e 42·5	—	59·7
Eskdalemuir	-1·4	84·2	340	—	—	—		—	—	40·5	—	—
Uccle	-1·4	85·5	334	—	—	—		—	—	45·5	—	—
Bidston	-1·4	85·8	339	—	—	—		—	—	—	—	54·8
Straasbourg	-1·4	88·1	330	e 12	30	-16		e 23 3	-13	43·5	—	—
Paris	-1·4	87·9	333	—	—	—		—	—	e 49·5	—	53·5
Florence	-1·4	88·2	325	35	32	?		—	—	—	—	49·5
Rocca di Papa	-1·4	89·1	323	e 11	26	-97		e 22 50	-59	e 48·8	—	58·4
Ottawa	-1·4	93·6	23	—	—	—		e 50 14	?L	53·5	—	—
Tortosa	N. -1·4	95·3	330	—	—	—		—	—	e 52·5	—	60·5
Toledo	-1·4	97·9	333	—	—	—		—	—	e 49·5	—	—
Azores	-1·5	108·0	349	54	33	?L		—	—	(54·6)	—	—
La Paz	—	149·2	60	i 19	51	[- 3]		—	—	—	—	—

Additional readings: Osaka gives also MN = +2·5m. Hakodate MN = +3·8m. Zi-ka-wei MZ = +10·8m., MN = +11·3m. Ekaterinburg MN = +30·7m., MZ = +35·7m. Pulkovo MN = +39·2m. Tiflis eLN = +55·1m., MN = +60·6m. De Bilt eLN = +45·5m.

1923. Sept. 2d. 22h. 38m. 0s. Epicentre 15°·0S. 66°·0W.

A = +·393, B = -·882, C = -·259; D = -·914, E = -·407;

G = -·105, H = +·236, K = -·966.

Station and Component.	Δ	Az.	P.		O-C.		S.	O-C.		L.	M.
			m.	s.	s.	s.		m.	s.		
La Paz	2·6	226	i 0	37	-	4	—	—	—	—	—
La Quiaca	7·1	178	2	24	+36	—	—	—	—	3·5	5·3
Andalgala	N. 12·6	181	5	24	?S		(5 24)	-10	9·6	10·0	—
Pilar	E. 16·8	174	3	54	- 8		(6 42)	-31	6·7	16·0	—
	N. 16·8	174	4	0	- 2		(6 48)	-25	6·8	11·5	—
Mendoza	18·0	186	8	48	?L		—	—	10·9	17·5	—
La Plata	E. 21·2	161	i 4	30	-25		8 1	-47	10·1	15·0	—
	N. 21·2	161	i 4	26	-29		8 0	-48	13·9	14·3	—
Rio de Janeiro	E. 22·9	114	e 5	15	- 1		9 20	- 3	11·0	14·5	—
	N. 22·9	114	i 5	15	- 1		9 23	0	11·0	11·1	—
Cipolletti	24·0	184	3	12	?		—	—	6·9	8·2	—
Porto Rico	33·2	0	i 12	5	?S		i 12 5	-22	14·5	22·1	—
Georgetown	N. 54·9	351	e 9	31	- 7		i 17 8	-12	27·5	—	—
Washington	54·9	351	9	31	- 7		17 5	-15	—	—	—
Ann Arbor	59·6	346	—	—	—		i 18 0	-18	e 26·0	—	—
Toronto	E. 59·9	350	10	7	- 4		i 18 9	-13	e 34·5	—	—
	N. 59·9	350	10	8	- 3		i 18 11	-11	30·9	—	—
Chicago	60·2	342	11	33	+80		i 19 46	+80	—	—	—
Ottawa	61·1	353	10	30	+10		18 24	-13	e 27·0	—	31·0
Azores	64·9	35	14	48	?		—	—	—	—	28·7
Accra	68·3	78	—	—	—		—	—	—	27·8	—

Continued on next page.

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		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Lick	E.	74.0	318	21 15	?S	(21 15)	+ 1	—	—
Lisbon		75.5	43	11 56	+ 4	21 42	+10	—	—
San Fernando		76.3	46	12 2	+ 5	i 21 57	+16	33.5	24.0
Rio Tinto		76.6	45	11 0	-59	—	—	—	21.0
Coimbra		76.8	42	12 5	+ 5	i 21 58	+11	—	45.1
Cape Town		77.2	122	12 6	+ 4	21 40	-11	—	21.7
Granada		78.4	47	i 12 20	+11	i 22 17	+12	e 35.0	—
Toledo		79.5	44	i 12 15	- 1	i 22 26	+ 8	e 34.2	44.1
Victoria	E.	81.3	326	12 11	-16	22 6	-32	34.5	40.2
Algiers		83.0	50	12 36	0	22 46	-11	40.0	44.0
Tortosa	E.	83.0	44	12 37	+ 1	i 22 49	- 8	e 36.0	42.9
	N.	83.0	44	12 41	+ 5	i 22 51	- 6	34.4	35.4
Barcelona		84.4	44	—	—	i 23 12	0	36.5	43.3
Bidston		86.9	34	12 45	-13	23 6	-34	—	23.7
Oxford		87.0	35	i 12 52	- 7	i 24 8	+27	—	38.5
Marseilles		87.3	43	—	—	e 23 34	-10	—	—
Stonyhurst		87.4	34	16 0	?	23 0	-45	—	45.5
Kew		87.4	35	23 0	?S	(23 0)	-45	—	56.0
Eskdalemuir		87.7	30	e 12 54	- 9	i 23 12	-37	—	—
Paris		87.8	39	e 12 52	-12	i 23 13	-37	41.0	51.0
Uccle		89.0	38	e 13 4	- 6	23 26	-37	e 43.0	—
Besançon		89.3	41	13 4	- 8	23 22	-44	—	45.0
De Bilt		90.7	36	13 10	-10	i 23 32	[0]	e 39.0	51.2
Strasbourg		90.9	40	i 13 11	-10	23 33	[0]	46.0	—
Zurich		91.0	42	13 10	-11	23 30	[-4]	—	—
Florence		91.5	45	e 12 0	-84	23 30	[-7]	—	40.0
Rocca di Papa		91.8	47	e 13 15	-11	(e 23 42)	[+3]	e 23.7	24.5
Innsbruck		92.7	41	i 13 22	- 9	i 23 47	[+3]	e 37.0	—
Hamburg		94.0	36	e 13 24	-14	i 23 51	[-1]	e 41.0	57.0
Vienna		96.2	41	i 13 35	-15	24 0	[-3]	e 42.0	62.0
Honolulu	N.	97.3	291	—	—	e 24 0	[-10]	—	—
Upsala		99.8	30	—	—	e 24 11	[-12]	e 42.0	—
Wellington		100.6	222	—	—	24 0	[-27]	e 41.5	47.0
Helwan		103.6	63	e 14 10	-18	i 24 33	[-8]	—	64.1
Pulkovo		106.1	31	18 47	?PR ₁	(i 24 42)	[-10]	44.0	49.6
Tiflis		115.4	49	—	—	—	—	e 27.6	—
Ekaterinburg		122.2	31	18 51	?PR ₁	—	—	46.0	56.4
Kodaikanal		144.0	92	—	—	29 24	?	—	—
Colombo		145.5	99	19 36	[-13]	29 24	?	81.0	88.3
Mizusawa		146.2	319	19 29	[-21]	—	—	—	—
Batavia		157.6	161	e 20 1	[- 5]	—	—	—	—
Taihoku		167.7	326	45 44	?SR ₁	—	—	e 99.0	—
Hong Kong		172.7	359	85 5	?L	—	—	(85.1)	—
Manila		173.3	267	e 20 4	[-12]	—	—	20.1	—

Additional readings and notes : La Quiaca gives also LN = +3.6m. Andalgala readings have been increased by 10min. La Plata E = +5m.21s. N = +5m.17s., SN = +13m.55s. T₁ = 22h.37m.58s. Porto Rico eN = +11m.43s., eE = +12m.2s., LN = +14.6m. Georgetown eLEN = +24.0m. Ann Arbor i = +19m.36s. Toronto PR,N = +10m.46s., eN = +17m.48s. and +18m.3s., iE = +18m.12s., SR,E = +19m.21s., SR,N = +19m.39s., SR,E = +19m.40s., iE = +19m.45s., +20m.53s., and +23m.20s. Chicago iS = +17m.58s. True S is given as i only. Ottawa SR₁ = +23m.42s. T₂ = 22h.38m.6s. Lick ePE = +20m.13s., SEN = +29m.41s., SE = +29m.51s. Lisbon readings have been increased by 37min. San Fernando MN = +23.0m. Toledo MNW = +36.2m. Barcelona PR₁ = +16m.42s. Marseilles i = +23m.21s. Paris PR₁ = +17m.13s. Uccle PR₁ = +16m.42s. De Bilt eZ = +13m.51s., ePR,Z = +16m.25s., MN = +46.8m., MZ = +54.7m. Strasbourg PR₁ = +16m.49s. Zurich iS = +23m.32s. Rocca di Papa i = +13m.20s., eSE = +16m.45s., eSN = +17m.0s., eS = +17m.5s., iL = +24.3m. Vienna PS = +24m.59s., i = +27m.46s. Wellington ePR₁ = +17m.30s. Pulkovo iPR₁ = +24m.42s., SR₁ = +33m.48s. Ekaterinburg i = +20m.43s., +21m.28s., +25m.41s., +26m.58s., +28m.24s., and +30m.5s., MN = +58.0m., MZ = +61.8m. Mizusawa PN = +19m.31s. Manila reading has been increased by 10min.

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Sept. 2d. Readings also at 0h. (Strasbourg, Zi-ka-wei (2), and near Mizusawa), 1h. (Strasbourg (2) and Kobe), 2h. (Ekaterinburg and Mizusawa), 4h. (near Kobe), 5h. (near Kobe and near Mizusawa (2)), 6h. (Kobe and near Berkeley), 9h. (Sarajevo (2) and Nagasaki), 10h. (Kobe, near Mizusawa (3) and near Berkeley), 11h. (Mizusawa and near Kobe (2)), 12h. (Kobe), 13h. (near Mizusawa), 14h. (near Nagoya), 15h. (Mizusawa), 16h. (Ascension and near Mizusawa), 17h. (Ekaterinburg and near Mizusawa), 18h. (Ekaterinburg (2) and near Mizusawa (3)), 21h. (Ekaterinburg, Kobe, and near Mizusawa (3)), 23h. (Rocca di Papa).

Of the above the following seem to be after shocks of the great earthquakes on Sept. 1d. and 2d. The Kobe numeration is retained :-

d. h. m. s.	d. h. m. s.
52. 2 0 59 54 (see above)	61. 2 9 48 50 (see above)
53. 2 2 46 40 (see above)	62. 2 10 21 0
54. 2 4 37 32	63. 2 11 11 0
55. 2 4 47 58 (see above)	64. 2 11 43 30
56. 2 5 5 42	65. 2 12 54 30
57. 2 5 10 10 (see above)	66. 2 13 9 10 (see above)
58. 2 6 2 0	67. 2 14 16 28 (see above)
59. 2 6 32 30 (see above)	68. 2 21 2 0
60. 2 9 26 56 (see above)	

Sept. 3d. 0h. 9m. 18s. (I)
 0h. 40m. 16s. (II)
 1h. 47m. 12s. (III)
 5h. 21m. 36s. (IV)
 6h. 2m. 0s. (V)
 8h. 13m. 40s. (VI)
 9h. 23m. 54s. (VII)
 14h. 30m. 30s. (VIII)

Epicentre 35°-0N. 139°-5E.
 (as on 2d.)

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°		m. s.	s.	m. s.	s.	m.	m.
I Osaka	3-4	266	1 36	+43	(1 36)	+ 2	2-4	3-8
II	3-4	266	1 31	+38	(1 31)	- 3	2-4	3-0
III	3-4	266	1 28	+35	(1 28)	- 6	2-3	2-6
IV	3-4	266	0 55	+ 2	—	—	—	1-9
V	3-4	266	—	—	(1 46)	+12	1-8	3-1
VI	3-4	266	0 54	+ 1	(1 41)	+ 7	1-7	2-9
VIII	3-4	266	1 8	+15	—	—	—	2-6
I Kobe	3-6	266	1 23	+27	—	—	2-2	2-6
II	3-6	266	e 1 47	+51	—	—	—	2-5
III	3-6	266	1 8	+12	1 33	- 6	2-0	2-5
V	3-6	266	0 56	0	—	—	—	1-9
VI	3-6	266	0 54	- 2	(1 38)	- 1	1-6	1-8
VIII	3-6	266	0 49	- 7	(1 39)	0	1-6	1-7
I Mizusawa	4-3	17	1 9	+ 2	1 58	0	—	—
II	4-3	17	1 6	- 1	1 58	0	—	—
III	4-3	17	1 2	- 5	2 0	+ 2	—	—
IV	4-3	17	1 4	- 3	2 2	+ 4	—	—
V	4-3	17	1 4	- 3	2 55	+57	—	—
VI	4-3	17	1 9	+ 2	1 55	- 3	—	—
VII	4-3	17	1 8	+ 1	1 58	0	—	—
VIII	4-3	17	1 13	+ 6	2 1	+ 3	—	—
I Hakodate	6-8	7	1 54	+10	—	—	—	—
III	6-8	7	1 38	- 6	—	—	—	—
III Zi-ka-wei	15-6	261	e 3 55	+ 8	e 6 47	+ 1	—	10-8
I Ekaterinburg	55-5	320	9 40	- 3	—	—	—	—
III	55-5	320	19 32	-11	17 17	-11	28-8	35-3
VII	55-5	320	(10 6)	+23	—	—	10-1	—
VIII	55-5	320	9 33	-10	17 14	-14	27-5	—
III De Bilt	84-2	334	—	—	—	—	e 45-8	—
VIII	84-2	334	—	—	—	—	e 48-5	—
III Uccle	85-5	334	—	—	—	—	e 46-8	—
III Bidston	85-8	339	—	—	—	—	—	53-8
III Strasbourg	86-1	330	—	—	—	—	e 49-8	—

Where N and E components are given the E has usually been entered. The differences are negligible. Kobe I readings have been diminished by 10min.

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Sept. 3d. Readings also at 1h. (2) and 2h. (Azores), 7h. (Florence), 8h. (Manila), 10h. (Florence and near Nagasaki), 11h. (Ekaterinburg), 12h. (De Bilt, Uccle, and Strasbourg), 13h. (Nagasaki and Kobe), 14h. (Ekaterinburg (2) and Mizusawa), 18h., 20h., and 21h. (Ekaterinburg).

Sept. 4d. 4h. 0m. 32s. (I)
5h. 57m. 30s. (II)
10h. 10m. 34s. (III)
15h. 24m. 42s. (IV)
18h. 15m. 36s. (V)
22h. 22m. 48s. (VI) } Epicentre 35°·0N. 139°·5E.
(as on 3d.).

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
I Osaka	3·4	266	2 3	+70	—	—	2·9	3·8
II	3·4	266	2 4	+71	—	—	—	—
IV	3·4	266	0 0	-53	—	—	0·9	2·4
VI	3·4	266	0 43	-10	—	—	1·6	3·5
IV Kobe	3·6	266	1 3	+7	—	—	1·8	1·8
VI	3·6	266	1 15	+19	—	—	2·1	2·6
I Mizusawa	4·3	17	1 7	0	1 58	0	—	—
II	4·3	17	1 11	+4	1 56	-2	—	—
III	4·3	17	1 9	+2	1 56	-2	—	—
IV	4·3	17	1 10	+3	1 58	0	—	—
V	4·3	17	1 5	-2	2 2	+4	—	—
VI	4·3	17	1 13	+6	1 52	-6	—	—
VI Hakodate	6·8	7	2 1	+17	—	—	3·7	—
VI Zi-ka-wei	15·6	261	e 3 56	+9	—	—	—	—
I Ekaterinburg	55·5	320	9 45	+2	17 29	+1	28·5	37·3
II	55·5	320	—	—	—	—	28·5	—
III	55·5	320	—	—	—	—	51·4	—
IV	55·5	320	—	—	—	—	34·3	—
V	55·5	320	—	—	—	—	33·4	—
VI	55·5	320	i 9 42	-1	17 29	+1	29·2	36·4
I Pulkovo	68·9	330	—	—	—	—	e 32·5	40·7
VI	68·9	330	e 11 4	-6	e 19 55	-18	30·7	46·4
I De Bilt	84·2	334	—	—	—	—	e 48·5	—
VI	84·2	334	—	—	—	—	e 47·2	—
I Uccle	85·5	334	—	—	—	—	—	49·5
I Strasbourg	86·1	330	—	—	—	—	e 49·5	—
VI	86·1	330	—	—	—	—	e 49·2	—
I Florence	88·2	325	—	—	—	—	—	49·5
I Rocca di Papa	89·1	323	—	—	—	—	e 45·8	53·7
I Marselles	91·2	329	—	—	—	—	e 53·5	—

Where E and N readings are given practically the same, the E has been entered.

Sept. 4d. Readings also at 0h. (Taihoku), 1h. (near Ootomari), 2h. (Ekaterinburg), 3h. (near Manila), 4h. (Colombo), 9h. (Ekaterinburg), 11h. (Taihoku), 16h. (Florence), and La Paz), 17h. (Ekaterinburg and near Mizusawa), 18h. (Paris), 19h. (Algiers and Florence), 20h. (San Fernando and near Mizusawa), 21h. (Algiers and Florence).

Sept. 5d. 9h. 34m. 34s. (I)
11h. 12m. 36s. (II)
18h. 29m. 40s. (III)
18h. 46m. 4s. (IV) } Epicentre 35°·0N. 139°·5E.
(as on 4d.).

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
I Osaka	3·4	266	1 20	+27	(1 20)	-14	2·3	3·2
II	3·4	266	1 39	+46	(1 39)	+5	2·5	2·8
III	3·4	266	1 25	+32	(1 25)	-9	2·3	3·0
IV	3·4	266	1 51	+58	(1 51)	+17	2·7	3·6
II Kobe	3·6	266	1 33	+37	(1 33)	-6	2·5	2·8
III	3·6	266	1 22	+26	(1 22)	-17	2·2	2·6
IV	3·6	266	—	—	—	—	—	2·8
I Mizusawa	4·3	17	1 8	+1	1 57	-1	—	—
II	4·3	17	1 6	-1	2 5	+7	—	—
III	4·3	17	1 6	-1	2 0	+2	—	—
IV	4·3	17	1 6	-1	1 58	0	—	—

Continued on next page.

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
III Hakodate	6.8	7	e 1 32	-12	—	—	—	4.0
III Nagasaki	8.4	257	2 15	+ 8	—	—	4.3	—
III Zi-ka-wei	15.6	261	e 3 57	+10	—	—	—	—
III Manila	26.4	224	e 6 40	+48	—	—	—	—
II Ekaterinburg	55.5	320	—	—	—	—	33.4	—
III Pulkovo	55.5	320	19 47	+ 4	17 29	+ 1	27.3	35.7
III De Bilt	68.9	330	11 10	0	20 34	+21	37.3	43.4
III Uccle	84.2	334	—	—	—	—	e 48.3	—
III Strasbourg	85.5	334	—	—	—	—	e 47.3	—
III Paris	86.1	330	—	—	—	—	e 52.3	—
III Florence	87.9	333	—	—	—	—	—	33.3
III Rocca di Papa	88.2	325	—	—	—	—	—	57.6
III Toledo	89.1	323	—	—	—	—	e 53.3	—
	97.9	333	—	—	—	—	e 55.4	—

Where E and N readings are practically the same the former have been entered in the table. Hakodate readings have been increased by 4min.

Sept. 5d. 15h. 20m. 0s. Epicentre 1°.5S. 93°.5E.

A = -.061, B = +.998, C = -.026 ; D = +.998, E = +.061 ;
G = +.002, H = -.026, K = -1.000.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Calcutta N.	24.5	348	10 21	?S	(10 21)	+27	—	—
Hong Kong	31.2	41	12 18	?S	(12 18)	+24	—	—
Manila	31.6	60	e 6 43	0	—	—	15.0	—
Zi-ka-wei	42.1	37	—	—	e 14 23	-13	—	—
Ekaterinburg	64.0	343	13 8?	?	19 0	-13	24.0	27.2
Pulkovo	78.2	334	e 11 3	-65	—	—	31.0	40.6
De Bilt E.	90.2	323	—	—	—	—	e 44.0	—

Additional readings and notes: Calcutta gives also PE = +10m.40s.
Ekaterinburg MZ = +30.6m. Pulkovo MN = +37.4m. De Bilt
eLN = +42.0m.

Sept. 5d. Readings also at 0h. (Mizusawa), 1h. (La Paz), 2h. (Florence and Hakodate), 4h. (Florence), 6h. (near Manila), 17h. (Ekaterinburg), 20h. (Kobe and San Fernando), 22h. (Taihoku).

Sept. 6d. Readings at 0h. (Ekaterinburg), 6h. (Lick), 11h. (near Mizusawa and Kobe), 18h. (La Paz), 23h. (Azores).

Sept. 7d. 14h. 30m. 16s. (I) } Epicentre 35°.0N. 139°.5E.
15h. 16m. 50s. (II) }
17h. 32m. 30s. (III) } (as on Sept. 5d.).
23h. 39m. 32s. (IV) }

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
I Osaka	3.4	266	0 56	+ 3	—	—	1.7	2.4
II	3.4	266	1 31	+38	(1 31)	- 3	2.3	3.3
III	3.4	266	1 20	+27	(1 20)	-14	2.3	3.3
IV	3.4	266	1 58	+65	(1 58)	+24	2.9	3.2
I Kobe	3.6	266	0 51	- 5	—	—	1.7	1.8
II	3.6	266	1 26	+30	(1 26)	-13	2.5	2.8
III	3.6	266	1 13	+17	(1 13)	-26	2.0	2.5
IV	3.6	266	1 20	+24	(1 20)	-19	2.2	3.2

Continued on next page.

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
I Mizusawa	4.3	17	1 10	+ 3	1 54	- 4	—	—
II	4.3	17	1 15	+ 8	1 57	- 1	—	—
III	4.3	17	1 12	+ 5	2 24	+26	—	—
IV	4.3	17	1 8	+ 1	1 58	0	—	—
III Hakodate	6.8	7	e 1 23	-21	—	—	2.8	3.9
II Nagasaki	8.4	257	4 55	?L	—	—	(4.9)	—
III	8.4	257	4 27	?L	—	—	(4.4)	—
III Zi-ka-wei	15.6	261	—	—	e 5 50	-56	—	—
I Ekaterinburg	55.5	320	—	—	—	—	34.7	—
II	55.5	320	—	—	—	—	29.2	35.8
III	55.5	320	i 9 41	- 2	—	—	28.5	36.4
IV	55.5	320	—	—	—	—	34.0	—
IV Colombo	61.3	260	10 28	+ 7	—	—	—	—
III Pulkovo	68.9	330	—	—	—	—	e 35.5	—
II De Bilt	84.2	334	—	—	—	—	e 44.2	—
III	84.2	334	—	—	e 33 30	? e	46.5	—
III Uccle	85.5	334	—	—	—	—	—	108.5
III La Paz	149.2	60	e 19 56	[+ 2]	—	—	—	—

When E and N readings are given practically the same E readings have been entered. Kobe III are given as at 16h.

Sept. 7d. Readings also at 1h. (Tifis and Ekaterinburg), 4h. (Denver), 6h. and 9h. (La Paz), 12h. (Nagasaki and Strasbourg), 14h. (near Mizusawa), 18h. (Ekaterinburg), 19h. (San Fernando), 20h. (Ekaterinburg).

Sept. 8d. 9h. 8m. 42s. Epicentre 35°.0N. 139°.5E. (as on Sept. 7d.).

A = - .623, B = + .532, C = + .574 ; D = + .649, E = + .760 ;
G = - .436, H = + .372, K = - .819.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Nagoya	2.1	274	0 50	+17	—	—	1.3	1.8
Osaka	3.4	266	0 59	+ 6	—	—	1.8	2.1
Kobe	3.6	266	0 50	- 6	—	—	1.6	1.7
Mizusawa	4.3	17	1 9	+ 2	1 56	- 2	—	—
Hakodate	6.8	7	e 1 36	- 8	—	—	—	3.5
Nagasaki	8.4	257	4 14	+27	—	—	—	—
Zi-ka-wei	15.6	261	e 4 14	+27	—	—	—	—
Manila	26.4	224	e 7 18	+36	—	—	—	—
Ekaterinburg	55.5	320	i 9 30	-13	e 17 30	+ 2	28.3	—
Strasbourg	86.1	330	—	—	—	—	e 52.9	—
Rocca di Papa	89.1	323	—	—	—	—	1 53.2	57.2

Additional readings and notes: Osaka gives also MN = +2.0m. Kobe MN = +1.9m. Mizusawa PN = +1m.8s. Zi-ka-wei readings are given for 9d. Ekaterinburg readings have been increased by 6min.

Sept. 8d. Readings also at 4h. (near Mizusawa (2) and Kobe), 7h. (San Fernando, Manila, Ekaterinburg, near Taihoku, and near La Paz), 8h. (Strasbourg), 9h. (Rocca di Papa), 10h. (Sarajevo), 11h. (Sarajevo and near Kobe), 12h. (Kobe and Taihoku), 14h. (Sarajevo (3)), 16h. (Nagasaki, Rocca di Papa, and near Zante and Athens), 19h. (Ekaterinburg, Kobe, and near Mizusawa (2)), 20h. (De Bilt and Colombo), 23h. (Nagasaki (2)).

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Sept. 9d. 4h. 16m. 44s. Epicentre 5°·0S. 80°·0W.

A = +·173, B = -·981, C = -·087 ; D = -·985, E = -·174 ;
G = -·015, H = +·086, K = -·996.

Rough. See note at end.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
La Paz	16·4	136	i 3 59	+ 2	i 7 7	+ 3	8·5	9·0
Chicago	47·3	354	e 13 59	?	17 49	+124	21·8	—
Ann Arbor	47·4	357	8 46	- 4	14 28	-78	e 19·3	—
Toronto	E. 48·6	1	e 10 46	+108	17 58	+117	23·3	—
Ottawa	50·5	6	9 8	- 2	15 8	-77	e 19·8	—
Victoria	E. 65·4	330	11 15	+28	19 11	-19	33·4	38·4
De Bilt	91·0	38	i 12 41	-40	e 22 53	-91	37·9	—
Strasbourg	92·3	41	—	—	e 22 56	-102	—	—
Ekaterinburg	119·6	24	—	—	—	—	34·3	—

Victoria SN = +19m.1s. The above is about the best that can be done on the hypothesis of a single shock, but there are indications of more than one. If we form Δ and T_0 from the S and P of all the stations which observe both, we get

	Δ	T_0		Δ	T_0
	°	m. s.		°	m. s.
La Paz	16·5	0 0	Ann Arbor	35·0	+1 33
Chicago	20·9	+9 7	Toronto	50·0	+1 37
De Bilt	81·4	+0 14	Ottawa	38·0	+1 30
			Victoria	57·4	+1 20

As regards Chicago its readings have been altered by 1 hour (given as 3h.) and may not be relevant. But there are four consistent values of T_0 about 1min.30sec. later than that adopted. From these, however, the Toronto value must be omitted, since the corresponding value of Δ is inconsistent with those from the other American stations. Thus we might have the following solution :—

Sept. 9d. 4h. 18m. 10s. Epicentre 7°·5N. 79°·0W. (as on 1922 May 22d.).

A = +·189, B = -·973, C = +·130.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
La Paz	26·3	156	i 2 33	-198	i 5 39	-289	7·0	7·5
Ann Arbor	35·1	354	7 18	+ 4	13 0	+ 3	e 17·8	—
Toronto	36·1	0	e 9 18	+115	16 30	+199	21·8	—
Ottawa	38·0	4	7 40	+ 2	13 40	+ 2	e 18·3	—
Victoria	E. 55·3	326	9 47	+ 6	17 43	+13	31·9	36·9
De Bilt	80·5	38	i 11 13	-69	e 21 25	-64	36·4	—
Strasbourg	87·4	41	—	—	e 21 28	?	—	—

Here Ann Arbor, Ottawa, and Victoria are in good accord, but we must suppose that both De Bilt and Strasbourg are 1 minute in error and that Toronto is 2min. wrong in P and 3min. in S. (The La Paz observation must refer to a separate shock.)

Finally we may perhaps assume that there were two shocks from the same epicentre, the first so faint that P was registered only at La Paz, but that S was registered at other stations. Hence we should take the Δ for these other stations from S only. We might then adopt a solution as follows :—

Sept. 9d. 4h. 16m. 25s. Epicentre 0°·0 75°·0W.

A = +·259, B = -·966, C = -·000.

	Δ	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
La Paz	17·8	i 4 18	+ 3	i 7 26	-10	8·8	9·3
Ann Arbor	43·0	9 5	+47	14 47	- 1	e 19·6	—
Toronto	43·8	e 11 5	+161	18 17	+198	23·6	—
Ottawa	45·4	9 27	+51	15 27	+ 7	e 20·1	—
Victoria	63·8	11 34	+57	19 30	+19	33·7	38·7
De Bilt	84·0	i 13 0	+18	e 23 12	+ 4	38·2	—
Strasbourg	85·2	—	—	e 23 15	- 6	—	—

The second shock would thus seem to follow the first after about 46sec., on the evidence of the P of Ann Arbor, Ottawa, and Victoria, though P for De Bilt is discordant.

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Sept. 9d. 17h. 11m. 0s. Epicentre 35°·0N. 139°·5E. (as on 8d.).

A = -·623, B = +·532, C = +·574; D = +·649, E = +·760;
G = -·436, H = +·372, K = -·819.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	m. s.	m. s.	s.	m.	m.
Osaka	3·4	266	1 0	+ 7	—	—	1·8	2·9
Kobe	3·6	266	0 35	-21	(1 24)	-15	1·4	1·7
Mizusawa	4·3	17	1 5	- 2	2 0	+ 2	—	—
Hakodate	6·8	7	1 50	+ 6	—	—	—	—
Zi-ka-wei	15·6	261	e 5 30	+103	—	—	—	—
Manila	26·4	224	8 0	1PR ₁	—	—	—	—
Lick	75·7	55	58 2	?L	—	—	(58·0)	—
De Bilt	84·2	334	—	—	—	—	e 46·0	—
Uccle	85·5	334	—	—	—	—	e 45·0	—
Ottawa	93·6	23	—	—	—	—	e 52·7	—

Additional readings: Mizusawa gives also SN = +1m.59s. Ottawa L = +57·0m.

1923. Sept. 9d. 22h. 3m. 42s. Epicentre 25°·5N. 91°·5E.

A = -·024, B = +·902, C = +·431; D = +1·000, E = +·026;
G = -·011, H = +·430, K = -·903.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	m. s.	m. s.	s.	m.	m.
Calcutta	E. 4·2	225	0 15	- 5	—	—	—	—
Dehra Dun	12·9	295	3 48	+36	6 3	+21	7·4	9·0
Simla	E. 13·8	298	3 12	-11	5 42	-21	7·6	8·0
Bombay	N. 13·8	298	3 12	-11	5 36	-27	7·5	8·0
Kodaikanal	18·5	253	4 14	- 9	7 21	-30	e 8·8	—
Hong Kong	20·3	223	4 30	-15	(8 36)	+ 7	8·6	13·5
Colombo	20·9	94	4 46	- 6	8 49	+ 7	11·0	15·6
Hokoto	21·7	213	(5 0)	- 1	(8 54)	- 5	8·9	21·3
Zi-ka-wei	25·5	88	i 5 33	-10	i 10 1	-12	i 14·5	—
Taihoku	26·8	71	e 5 46	-10	e 10 28	- 9	e 11·8	19·1
Manila	27·1	84	e 5 42	-17	10 42	- 1	e 15·0	18·3
Nagasaki	29·7	106	e 6 16	- 9	—	—	15·5	20·6
Batavia	34·0	70	e 5 36	-89	—	—	e 20·4	23·3
Malabar	35·0	154	e 6 52	-21	—	—	e 25·2	—
Osaka	36·3	154	i 7 1	-23	—	—	17·5	—
Tiflis	38·8	68	7 44	0	13 44	- 5	19·2	23·7
Hakodate	E. 41·5	307	8 12	+ 5	14 26	- 2	24·6	28·4
Mizusawa	N. 41·5	307	e 7 45	-22	13 59	-29	23·8	36·9
Helwan	43·4	57	8 21	0	—	—	—	—
Mizusawa	E. 43·5	60	8 15	- 7	13 51	-64	19·4	—
Otomari	N. 43·5	60	8 14	- 8	13 46	-69	19·4	—
Helwan	45·5	50	8 41	+ 4	(15 24)	+ 3	15·4	26·4
Fulkovo	52·9	290	i 9 18	- 7	16 40	-15	—	35·9
Lemberg	53·8	328	i 9 28	- 4	i 17 1	- 7	25·3	32·1
Athens	56·5	315	e 10 2	+13	17 33	+174	e 31·1	32·6
Belgrade	57·8	300	e 9 55	- 3	20 50	+174	e 22·1	40·8
Uppsala	59·3	311	i 10 10	+ 3	118 15	0	e 34·6	37·7
Sarajevo	60·1	328	10 14	+ 1	i 18 24	0	27·8	41·9
Vienna	60·8	310	10 21	+ 3	(18 35)	+ 2	18·6	—
Pompeii	Z. 61·6	315	e 10 24	+ 1	19 8	+25	e 32·3	41·3
Hamburg	64·2	306	e 10 56	+17	20 6	+51	—	—
Venice	64·8	321	i 10 46	+ 2	i 19 27	+ 4	e 33·3	42·9
Rocca di Papa	64·8	313	i 10 34	-10	—	—	—	—
Florence	E. 65·3	308	i 10 43	- 4	e 19 51	+22	e 37·1	44·1
Bergen	N. 65·3	308	i 10 46	- 1	e 19 39	+10	—	—
Zurich	65·9	310	10 50	0	19 38	+ 2	31·3	37·3
Strasbourg	66·2	330	—	—	23 18	?	35·3	—
De Bilt	E. 66·9	314	e 10 58	+ 1	e 19 48	- 1	—	—
Besançon	N. 67·2	316	10 58	- 1	19 49	- 3	35·3	43·4
Uccle	E. 68·0	320	—	—	1 20 5	+ 3	e 34·3	44·0
Besançon	N. 68·0	320	—	—	—	—	e 33·3	37·7
Uccle	Z. 68·0	320	i 11 6	+ 2	—	—	—	44·0
Besançon	68·7	315	11 7	- 2	19 58?	-12	—	34·3
Uccle	68·8	319	e 11 9	- 1	20 13	+ 1	e 31·3	44·0

Continued on next page.

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	'	'	m. s.	s.	m. s.	s.	m.	m.
Marseilles	70.2	310	e 11 24	+ 6	e 20 27	- 1	35.3	40.3
Paris	70.5	318	i 11 22	+ 2	i 20 32	0	35.3	45.3
Puy de Dôme	71.1	315	11 26	+ 2	—	—	—	—
Kew	71.4	320	21 18	?S	(21 18)	+35	—	52.3
Edinburgh	71.6	325	11 39	+12	20 46	+ 1	35.3	48.6
Eskdalemuir	71.8	325	e 11 31	+ 3	20 46	- 2	33.3	38.4
Oxford	71.9	320	11 28	- 1	20 45	- 4	36.9	47.7
Stonyhurst	71.9	322	11 30	+ 1	20 42	- 7	—	48.3
Bidston	72.4	322	11 40	+ 8	20 54	- 1	—	40.9
Barcelona	73.0	310	e 11 37	+ 1	21 0	- 2	38.2	46.6
Algiers	73.9	305	11 41	0	21 8	- 5	35.3	42.8
Tortosa	E. 74.4	310	(11 44)	- 1	21 8	-11	e 36.3	42.8
	N. 74.4	310	11 47	+ 2	21 16	- 3	34.6	42.8
Adelaide	75.1	143	e 11 48	- 2	e 21 24	- 3	e 35.7?	52.4
Toledo	77.9	310	i 12 5	- 1	i 21 55	- 4	e 35.8	45.2
Granada	78.7	307	i 12 15	+ 4	22 21	+13	e 37.8	43.6
Johannesburg	80.1	235	—	—	—	—	30.0	—
Rio Tinto	80.6	309	14 18	+115	—	—	—	22.3
Melbourne	80.8	141	11 36?	-48	22 48?	+15	33.1?	49.6
Coimbra	E. 80.9	312	e 12 19	- 5	i 22 27	- 7	42.8	52.0
	N. 80.9	312	—	—	—	—	40.2	45.6
San Fernando	80.9	308	12 18	- 6	22 26	- 8	44.3	55.3
Lisbon	82.0	311	10 27	-123	20 42	-124	e 38.3	—
Sydney	82.4	134	—	—	44 48	?L	55.1	56.7
Sitka	E. 88.5	25	e 23 49	?S	(23 49)	- 9	e 46.8	58.3
	N. 88.5	25	e 23 44	?S	(23 44)	-14	e 48.5	49.3
Accra	89.1	276	—	—	—	—	—	66.3
Cape Town	91.3	233	23 30	?S	(23 30)	[- 6]	—	50.8
Honolulu	E. 97.8	63	24 30	?S	(24 30)	[+18]	e 43.2	58.1
	N. 97.8	63	—	—	—	—	e 43.0	45.8
Victoria	E. 99.8	24	18 8	?PR ₁	24 52	[+29]	42.1	62.5
	N. 99.8	24	18 8	?PR ₁	24 33	[+10]	41.0	66.8
Wellington	101.9	131	—	—	i 37 6	?SR ₁	56.3	59.3
Ottawa	108.1	350	19 3	?PR ₁	26 37	-34	34.4	56.3
Berkeley	109.1	27	28 31	?S	(28 31)	+71	56.5	65.5
Toronto	E. 110.4	352	—	—	i 27 0	-32	e 61.4	61.4
	N. 110.4	352	e 19 25	?PR ₁	25 14	-138	e 62.6	66.9
Ithaca	111.1	350	—	—	e 28 18	+40	52.3	—
Ann Arbor	111.0	355	e 20 0	?PR ₁	e 29 24	+98	59.3	—
Chicago	112.7	359	23 51	?	35 35	?	48.8	—
Georgetown	114.6	349	e 19 4	?PR ₁	25 34	[+ 6]	e 56.4	—
Washington	114.6	349	e 19 51	?PR ₁	29 14	+67	e 56.3	—
Rio de Janeiro	138.8	264	e 23 11	?PR ₁	—	—	45.3	78.8
Cipolletti	158.3	227	32 30	?	—	—	86.1	89.2
La Paz	159.0	291	i 20 10	[+ 3]	33 59	?	74.2	80.7
Andalgalá	160.1	261	31 42	?	—	—	75.8	80.8

Additional readings and notes : Zi-ka-wei gives also MN = +16.8m. Taihoku MN = +17.6m. Manila MN = +19.9m. Batavia i = +8m.23s. iN = +10m.59s., i = +15m.1s. Malabar i = +8m.23s. Tiflis PR₁E = +9m.49s., eN? = +13m.41s., eE = +19m.17s., eL = +21.6m. Pulikovo SR₁ = +21m.6s., MZ = +34.6m. Athens iP = +10m.6s., i = +10m.40s., MN = +38.9m. Belgrade PR₁ = +11m.15s., PR₂ = +12m.45s., SR₁ = +20m.14s., SR₂ = +25m.15s. Upsala iN = +20m.28s., SR₁ = +22m.32s., SR₂ = +25m.15s., SR₃ = +25m.53s., MN = +38.6m. Vienna iPZ = +10m.25s., iZ = +10m.31s. Hamburg iSN = +19m.32s., SR₁ = +24m.18s., MN = +35.9m. Venice gives several other readings following closely on P. Rocca di Papa E = +10m.57s., N = +11m.1s., eS = +19m.30s. Florence iPEN = +10m.58s., SN = +19m.41s., S = +19m.48s. Bergen PR₂ = +19m.18s. Readings given as for 21h. Zurich i = +11m.10s. Strasbourg MN = +38.8m. De Bilt PR,Z = +13m.39s., PR,Z = +15m.33s., SR₁ = +24m.49s. Uccle PR₁ = +13m.48s., SR₁ = +25m.0s., SR₂ = +23m.18s., MN = +38.2m. Paris +21m.18s., MN = +38.3m. Oxford PR₁ = +14m.21s. Stonyhurst reading is given for 10d. Barcelona ? = +24m.52s., MN = +45.8m. Tortosa PZ has been entered in the E line. Adelaide ePR₁ = +15m.18s.?, e = +18m.18s.?, and +30m.18s.?. Toledo MNW = +45.4m. Sitka eSE = +30m.5s., eSN = +29m.40s. Honolulu SE = +32m.7s., SN = +32m.8s. Wellington ePR₁ = +30m.18s., e = +40m.18s., +46m.48s., and +49m.36s. Berkeley ePR,EZ = +19m.6s., ePR,N = +19m.11s., and Toronto iE = +27m.0s. and +35m.11s., iN = +28m.40s., eLE = +31.8m., LN = +34.6m., LE = +58.3m. Ithaca e = +34m.18s., L = +55.3m., and +70.3m. Ann Arbor eL = +35.7m. Chicago PR₁ = +27m.23s., L = +57.3m. Georgetown LN = +69.7m., LE = +70.5m. Washington L = +67.3m. La Paz LN = +71.2m. and +78.5m., MN = +97.9m.

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Sept. 9d. Readings also at 3h. (Nagasaki, Kobe, and near Osaka and Mizusawa), 5h. (Sarajevo (2)), 6h. (Sarajevo (3), Kobe, and near Osaka), 7h. (Batavia, near Malabar, and near Mizusawa), 9h. (Ekaterinburg (2) and De Bilt), 11h. (near Barcelona and Tortosa), 13h. and 14h. (Mizusawa), 16h. (Sarajevo), 17h. (Kobe (2) and Lick), 19h. and 21h. (Nagasaki), 22h. (Rocca di Papa), 23h. (Sarajevo).

Sept. 10d. 9h. 37m. 12s. Epicentre 72° 0N. 8° 5W. (as on 1922 April 8d.).

A = +.306, B = -.046, C = +.951; D = -.148, E = -.989;
G = +.941, H = -.141, K = -.309.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Upsala	15.9	126	—	—	—	—	e 7.8	—
Edinburgh	16.2	169	—	—	e 6 48	-12	—	9.8
Eskdalemuir	16.8	170	—	—	(7 18)	+ 5	7.3	—
Bidston	18.7	170	4 48	+23	—	—	—	11.0
Hamburg	20.1	147	—	—	e 7 48	-37	—	14.6
Oxford	20.5	167	—	—	e 8 29	+ 5	—	12.3
De Bilt	20.8	156	4 45	+ 3	8 41	+ 1	e 9.9	15.8
Uccle	21.8	158	e 5 6	+ 3	e 9 0	- 1	e 10.3	—
Paris	23.7	162	—	—	—	—	e 12.8	12.8
Strasbourg	24.6	154	e 5 45	+11	9 49	- 6	13.8	—
Besançon	25.7	157	—	—	—	—	16.8	—
Tortosa N.	31.5	168	—	—	—	—	e 13.8	21.6
Coimbra N.	31.8	180	e 9 18	?	e 11 48	-17	15.8	—
Rocca di Papa	32.0	150	—	—	—	—	10.8	23.5
Rio Tinto	34.2	178	17 48	?L	—	—	(17.8)	19.8
Ottawa	40.4	267	—	—	e 14 18	+ 5	21.8	—
Toronto	43.1	270	—	—	—	—	23.0	—
Chicago	47.4	276	—	—	—	—	e 18.8	—
Victoria E.	51.3	310	—	—	—	—	26.1	31.5
N.	51.3	310	—	—	—	—	28.3	31.8

Additional readings: Hamburg gives also MN = +16.4m. De Bilt MZ = 13.6m., MN = +17.9m. Tortosa eLE = +12.8m. Coimbra eE = +12m.48s. Rocca di Papa eL = +7.5m. Ottawa eL = +16.8m. Toronto eE = +18m.20s., eN = +17m.7s., eLN = +25.0m.

Sept. 10d. Readings also at 2h. (Rocca di Papa and near Mizusawa), 4h. (Strasbourg and near Zurich), 5h. (Nagasaki), 8h. (Florence, Bergen, and Calcutta), 9h. (Calcutta), 10h. (Sarajevo and La Paz), 11h. (Sarajevo and La Paz), 12h. (Paris and Ottawa), 13h. and 14h. (Sarajevo), 15h. (Sarajevo and Edinburgh), 19h. (Ekaterinburg and Rocca di Papa), 21h. (Rocca di Papa and Sarajevo), 22h. (Nagasaki).

Sept. 11d. 9h. 7m. 50s. Epicentre 46° 5N. 28° 3W. (as on 1922 Feb. 16d.).

A = +.606, B = -.326, C = +.725; D = -.474, E = -.880;
G = +.639, H = -.344, K = -.688.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Bidston	17.5	58	3 39	-32	7 16	-13	—	8.3
Eskdalemuir	17.9	52	—	—	7 10	-28	—	—
Edinburgh	18.2	50	1 4 22	+ 3	—	—	—	10.5
Kew	18.9	84	—	—	—	—	—	11.2
Paris	20.7	72	1 4 56	+ 7	—	—	e 10.2	11.2
Tortosa	21.5	95	5 9	+10	8 57	+ 2	10.6	13.7
Uccle	21.8	67	e 5 3	0	9 2	+ 1	e 10.3	12.2
De Bilt	22.3	63	5 2	- 7	9 12	+ 1	e 10.2	12.6
Strasbourg	24.2	72	e 5 29	- 1	9 47	- 1	—	11.7
Hamburg	25.2	60	e 5 40	0	—	—	e 13.2	14.2
Algiers	25.2	101	e 5 38	- 2	—	—	12.2	—
Florence	27.7	81	—	—	—	—	13.2	15.2
Rocca di Papa	29.4	84	e 6 22	0	—	—	15.9	17.0
Ottawa	32.5	286	e 8 2	+69	1 12 18	+ 2	e 16.2	—
Toronto E.	35.6	284	—	—	e 14 10	-22	e 20.4	—
Chicago	41.8	285	—	—	—	—	24.2	—
Ekaterinburg	42.1	45	8 25	-56	15 49	-56	23.2	—

Additional readings: Tortosa gives also SN = +9m.9s. De Bilt MN = +13.4m., MZ = +14.2m. Ottawa L = +19.2m. Toronto eLN = +21.7m.

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Sept. 11d. 10h. 14m. 48s. Epicentre 38°-0N. 29°-5E. (as on 1920 Sept. 28d.).

A = +.686, B = +.388, C = +.616; D = +.492, E = -.870;
G = +.536, H = +.303, K = -.788.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	4.5	271	e 1 19	+ 9	2 2	- 2	e 2.2	3.8
Pompeii	11.9	288	5 0	?S	(5 0)	-17	—	—
Rocca di Papa	13.4	292	e 3 6	-12	—	—	e 7.4	8.3
Strasbourg	18.9	311	4 37	+ 9	—	—	e 11.2	—
Pulkovo	21.8	1	5 38	+35	—	—	—	—
Uccle	21.9	314	—	—	e 9 6	+ 3	e 12.4	—
De Bilt	22.1	318	—	—	e 9 12	+ 5	e 12.6	—
Ekaterinburg	27.8	37	—	—	(11 12)	+ 17	11.2	—

Additional readings: Athens gives also MN = +2.3m. Pompeii S = +12.0m. Rocca di Papa eN = +3m.12s.

Sept. 11d. Readings also at 5h. (Sarajevo and near Kobe), 6h. (near Osaka and Kobe), 8h. (Florence and near Osaka), 10h. (Pompeii), 12h. (Nagasaki), 14h. (Sarajevo), 15h. (Sarajevo and Fordham), 16h. (Sarajevo), 18h. (near Manila).

Sept. 12d. 5h. 53m. 48s. Epicentre 17°-0S. 177°-5W. (as on 1923 Mar. 4d.).

A = -.955, B = -.042, C = -.292; D = -.044, E = +.999;
G = +.292, H = +.013, K = -.956.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Apia	6.3	61	i 1 40	+ 4	—	—	—	2.8
Wellington	25.2	194	6 12	+32	—	—	—	—
Melbourne	38.9	230	—	—	—	—	—	20.8
Honolulu	42.8	29	14 2	?S	(14 2)	-43	e 17.3	19.7
Manila	68.4	295	e 11 21	+14	—	—	—	—
Batavia	74.5	269	i 11 51	+ 5	i 21 11	- 9	—	—
Hong Kong	77.5	299	12 3	- 1	(21 49)	- 6	21.8	—
Victoria	81.2	33	13 44	+78	—	—	—	21.9
La Paz	102.7	112	18 0	?PR ₁	e 23 19	[-78]	26.4	29.7
Toronto	107.3	49	15 42	+57	i 26 23	-41	50.4	—
	N.	107.3	49	i 18 20	?PR ₁	126 22	-42	—
Ottawa	110.1	46	e 20 12	?PR ₁	i 26 42	-47	61.2	—
Ekaterinburg	121.4	327	—	—	—	—	—	—
Pulkovo	132.7	341	e 13 33	?	21 38	?PR ₁	30.2	—
Hamburg	143.0	353	i 19 31	[-14]	—	—	79.2	—
De Bilt	144.8	357	i 19 36	[-12]	—	—	—	—
Vienna	146.8	343	19 39	[-12]	—	—	—	—
Strasbourg	148.1	351	19 41	[-12]	e 37 12	?	e 40.2	—
Innsbruck n.w.	148.8	348	i 19 55	+ 1]	—	—	—	—
Rocca di Papa	153.7	343	e 19 50	[-11]	—	—	e 33.8	37.3
Toledo	156.4	13	19 12	[-52]	—	—	—	—

Additional readings and notes: Wellington reading is given as 6h. simply. Honolulu MN = +17.7m. Batavia i = +13m.24s. and +23m.9s. Victoria PN = +13m.57s. La Paz LN = +27.4m. Toronto eN = +25m.51s., iN = +25m.54s., +33m.12s., and +33m.27s., LE = +56.8m. Ottawa e = +29m.12s., Pulkovo PS = +22m.19s. De Bilt iZ = +21m.13s. Vienna iPZ = +19m.43s., i = +20m.36s. Rocca di Papa ePE = +19m.55s., iN = +20m.17s., iE = +20m.19s., L = +36.8m.

Sept. 12d. Readings also at 8h. (Ekaterinburg, Manila, and near Kobe and Mizusawa), 12h. (Apia), 13h. (Tortosa), 14h. (Florence, Nagasaki, and near Osaka, Kobe, and Mizusawa), 18h. (near Athens), 21h. (Ekaterinburg).

Sept. 13d. Readings at 2h. (Ekaterinburg, Lick, and Nagasaki), 8h. (Zi-ka-wei), 10h. (Florence), 12h. (Florence and Venice), 16h. (La Paz), 17h. (Sarajevo), 18h. (Zi-ka-wei and Hong Kong), 19h. (Sarajevo and Ekaterinburg), 20h. (Apia), 22h. (Ekaterinburg and Zi-ka-wei).

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Sept. 14d. 8h. 10m. 30s. Epicentre 29°·5N. 59°·5E.

A = +·442, B = +·750, C = +·492; D = +·862, E = -·508;
G = +·250, H = +·424, K = -·870.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Simla	E.	15·3	80	6 48	?S	(6 48)	+ 9	e 10·6	—
	N.	15·3	80	6 54	?S	(6 54)	+15	(8·5)	—
Bombay		16·1	128	3 56	+ 3	—	—	—	—
Tiflis		17·0	320	e 6 47	?S	(e 6 47)	-31	e 9·1	11·5
Helwan		24·4	278	i 5 32	0	9 53	+ 1	—	17·2
Kodaikanal		25·5	135	14 48	?L	—	—	(14·8)	—
Calcutta	N.	26·7	98	10 36	?S	(10 36)	+ 1	—	—
Ekaterinburg		27·4	1	i 6 3	+ 1	10 51	+ 3	14·5	19·3
Colombo		29·6	136	8 12	?PR ₁	—	—	—	26·8
Pulkovo		36·1	336	7 18	- 5	113 2	- 9	16·5	25·5
Innsbruck		40·9	311	e 8 10	+ 8	—	—	e 20·7	—
Upsala		41·3	329	—	—	—	—	e 19·5	29·2
Hamburg		42·9	320	e 8 16	- 1	—	—	e 26·5	35·1
De Bilt	N.	45·6	316	—	—	—	—	e 26·5	—
Victoria	E.	102·1	2	—	—	—	—	57·2	65·9

Additional readings: Tiflis gives also eN = +3m.10s., eE = +3m.20s., MN = +12·2m. Ekaterinburg MN = +18·2m., MZ = +18·3m. Pulkovo SR₁ = +15m.30s. Hamburg MN = +33·6m. De Bilt eZ = +10m.36s., eE = +19m.6s.

Sept. 14d. 12h. 57m. 24s. Epicentre 47°·0N. 95°·0E.

A = -·059, B = +·679, C = +·731; D = +·996, E = +·089;
G = -·064, H = +·728, K = -·682.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Simla	E.	20·9	227	—	—	e 8 48	+ 6	—	—
Ekaterinburg		23·0	308	i 5 16	- 1	19 29	+ 4	11·1	14·7
Calcutta	E.	25·0	195	5 45	+ 7	—	—	—	—
Zi-ka-wei		25·7	119	e 5 38	- 7	—	—	—	—
Hong Kong		29·1	141	9 44	?S	(9 44)	-95	15·1	18·3
Bombay		33·4	221	12 8	?S	(12 8)	-22	—	—
Tiflis		35·6	280	—	—	e 12 25	-39	16·6	23·6
Otomari		38·5	74	14 31	?S	(14 31)	+46	17·1	—
Pulkovo		38·8	315	17 35	- 9	i 13 35	-14	17·6	21·9
Manila		39·0	139	—	—	—	—	e 17·1	—
Kodaikanal		39·6	209	21 18	?L	—	—	(21·3)	—
Colombo		42·1	204	18 36	?L	—	—	(18·6)	33·6
Upsala	N.	45·0	317	—	—	—	—	e 20·6	—
Budapest		49·3	300	—	—	e 17 4	+54	—	—
Vienna		50·5	303	19 12	+ 2	—	—	127·0	28·0
Hamburg		51·4	312	19 17	+ 1	—	—	e 24·6	34·6
Athens		51·5	286	(9 18)	+ 1	—	—	9·3	—
Innsbruck		53·9	305	e 9 39	+ 7	—	—	e 27·6	—
De Bilt		54·7	311	—	—	e 21 54	?SR ₁	e 29·6	35·3
Strasbourg		55·2	308	e 27 36	? 4	29 28	? 4	30·6	35·9
Zurich		55·4	305	e 9 46	+ 4	—	—	28·6	—
Uccle		55·8	310	e 9 48	+ 3	e 17 43	+12	e 28·6	35·8
Rocca di Papa		56·2	298	9 18	-29	—	—	e 34·3	36·1
Eskaudemuir		56·9	319	—	—	—	—	29·6	—
Besangon		57·0	307	—	—	—	—	—	31·6
Kew		57·8	314	—	—	—	—	—	38·6
Bidston		57·9	316	20 6?	? 4	25 52	? 4	(28·3)	42·0
Oxford		58·1	315	—	—	—	—	32·4	37·7
Tortosa	N.	64·0	303	—	—	—	—	e 33·6	43·1
Toledo		67·2	306	e 10 2	-57	—	—	—	29·0
Rio Tinto		70·1	306	40 36	?L	—	—	(40·6)	45·6
San Fernando		70·8	305	33 36	? 4	39 42	? 4	46·1	43·1
Ottawa		87·2	354	—	—	—	—	e 50·6	—
Cape Town		108·0	236	—	—	—	—	—	96·6
La Paz		143·2	330	20 53	[+60]	—	—	—	—

Additional readings: Simla gives also eN = +8m.36s. Calcutta PN = +5m.42s. Hong Kong S = +13m.31s. Tiflis eS = +17m.45s., MN = +18·7m. Pulkovo SR₁ = +15m.48s., MZ = +24·6m. Hamburg MZ = +28·7m., MN = +29·7m. De Bilt MN = +31·3m., MZ = +35·4m. Uccle SR₁ = +22m.12s. Rocca di Papa eN = +7m.42s., eE = +8m.6s. Bidston L is given as an alternative S. San Fernando MN = +47·1m.

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Sept. 14d. Readings also at 3h. (Manila), 4h. and 5h. (Sarajevo), 6h. (Sarajevo and near Kobe, Osaka, Nagoya, and Mizusawa), 7h. (near Osaka and Mizusawa), 14h. (Colombo, Kodaikanal, Ekaterinburg, near Athens, and near Belgrade), 15h. (Sarajevo, Colombo, and Ekaterinburg), 17h. (Sarajevo, near Kobe, and Nagoya), 18h. (Ekaterinburg, Manila, and Florence), 22h. (Florence).

Sept. 15d. Readings at 2h. (Mizusawa), 6h. (Hakodate), 9h. and 10h. (Sarajevo), 11h. (Ekaterinburg), 12h. (Ekaterinburg and near Mizusawa), 14h. (Sarajevo (2) and Ekaterinburg), 15h. (near Mizusawa), 16h. (Sarajevo (2) and Ekaterinburg), 17h. (Florence), 18h. (Florence and La Paz), 19h. (Ekaterinburg and Kodaikanal), 23h. (La Paz).

Sept. 16d. 16h. 34m. 30s. Epicentre 3°-0S. 138°-0E.

A = -.742, B = +.668, C = -.052; D = +.669, E = +.743;
G = +.039, H = -.035, K = -.999.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	24.4	317	e 5 36	+ 4	(10 5)	+13	10.1	11.8
Batavia	31.2	263	i 6 42	+ 2	—	—	21.7	—
Adelaide	32.0	179	e 12 30	?S	(e 12 30)	+22	20.4	23.5
Sydney	33.2	160	12 12	?S	(12 12)	-15	(17.3)	22.1
Hong Kong	34.4	318	7 7	- 1	12 7	-39	—	20.5
Melbourne	35.4	170	—	—	12 42	-19	19.4	21.0
Zi-ka-wei	37.7	338	e 7 26	-10	e 13 10	-24	—	19.3
Kobe	37.7	358	(8 56)	+80	—	—	8.9	—
Wellington	50.6	144	e 8 36	-35	e 16 24	- 2	i 26.5	29.5
Kodaikanal	61.7	281	—	—	—	—	40.1	45.0
Honolulu	E. 67.0	66	e 19 44	?S	(e 19 44)	- 6	e 31.0	37.7
	N. 67.0	66	e 19 50	?S	(e 19 50)	0	e 31.8	35.8
Bombay	67.7	291	i 11 20	+18	20 5	+ 7	—	30.3
Ekaterinburg	85.6	328	i 12 50	- 1	i 23 22	- 4	36.5	52.4
Victoria	E. 98.0	41	24 22	?S	(24 22)	-74	44.8	50.4
	N. 98.0	41	25 3	?S	(25 3)	-33	40.5	49.6
Pulkovo	101.4	331	14 12	- 5	25 42	-27	45.0	57.4
Upsala	107.4	333	—	—	e 28 21	+76	e 52.5	66.9
Bergen	112.3	337	—	—	—	—	e 55.5	—
Cape Town	112.3	231	56 47	?L	—	—	(56.8)	—
Vienna	112.8	322	e 19 36	?PR ₁	e 29 30	+98	—	66.5
Hamburg	114.0	330	e 19 48	?PR ₁	—	—	e 54.5	64.4
Innsbruck n.w.	116.2	322	—	—	—	—	e 54.5	—
De Bilt	117.3	330	e 20 23	?PR ₁	e 29 54	+86	e 54.5	77.0
Rocca di Papa	117.7	316	e 19 43	?PR ₁	i 28 43	+11	e 63.7	79.2
Strasbourg	117.8	325	20 17	?PR ₁	—	—	e 55.5	73.5
Florence	117.9	319	e 19 45	?PR ₁	30 0	+87	—	63.5
Uccle	118.4	327	—	—	e 30 0	+83	e 55.5	72.9
Edinburgh	118.7	335	—	—	e 30 12	+92	59.5	72.5
Besançon	119.5	323	20 42	?PR ₁	—	—	—	60.5
Stonyhurst	119.7	333	e 26 30	?S	(e 26 30)	-137	—	76.5
Kew	120.4	331	65 30	?L	—	—	(65.5)	81.5
Paris	120.5	327	—	—	e 27 30	-83	64.5	76.5
Chicago	123.7	40	21. 0	?PR ₁	30 45	?	61.5	—
Ann Arbor	125.9	36	e 20 54	?PR ₁	—	—	e 62.0	—
Tortosa	E. 126.2	320	—	—	—	—	e 67.5	81.9
	N. 126.2	320	—	—	e 38 30	?SR ₁	e 60.5	80.9
Algiers	126.6	315	—	—	—	—	e 73.5	83.5
Toronto	E. 127.6	33	—	—	—	—	e 65.8	69.8
	N. 127.6	33	—	—	—	—	63.9	72.0
Ottawa	128.3	29	e 20 47	?PR ₁	e 28 10	-99	e 62.2	—
Toledo	129.6	321	—	—	e 21 43	?PR ₁	—	81.4
Cipolletti	131.6	152	68 0	?L	—	—	86.3	89.9
Colimra	132.0	324	e 23 0	?PR ₁	e 31 15	?	71.5	79.8
San Fernando	133.0	320	e 22 26	?PR ₁	34 46	?	—	—
Georgetown	133.7	36	e 21 26	?PR ₁	—	—	—	—
Washington	133.7	36	e 21 19	?PR ₁	—	—	e 65.5	—
La Paz	E. 147.7	128	i 20 3	[+11]	34 15	?	76.4	84.2
	N. 147.7	128	—	—	34 5	?	75.9	83.1
Rio de Janeiro	154.1	178	—	—	—	—	77.5	—

For Notes see next page.

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NOTES TO SEPT. 16d. 16h. 34m. 30s.

Additional readings and notes : Batavia readings are given for 15d. Adelaide e = +14m.30s., iS = +17m.30s. Sydney gives S as P and L as S, also L = +19.8m. Zi-ka-wei gives also MN = +21.1m. Wellington readings are given for 15d. Kodaikanal P = 16h.20m.12s. Ekaterinburg PR₁ = +16m.13s., SR₁ = +28m.55s., MN = +46.3m., MZ = +52.5m. Victoria SE = +32m.0s., SN = +31m.45s. Pulkovo i = +18m.19s., PR₁ = +18m.26s., Y = +24m.36s., SR₁ = +32m.42s., SR₂ = +36m.54s., MN = +57.9m., MZ = +60.4m. Upsala MN = +67.7m. Hamburg MZ = +68.5m., MN = +69.5m. De Bilt MNZ = +72.2m. Rocca di Papa ePN = +19m.53s., ePE = +20m.9s. Strasbourg ePR₁? = +29m.55s., MN = +74.5m. Uccle e = +35m.30s., MN = +72.2m. Paris MN = +71.5m. Toronto LN = +65.5m., LE = +71.5m. Ottawa i = +21m.29s., e = +32m.57s. and +39m.10s. Toledo MNW = +74.1m. Coimbra e = +35m.50s. Washington L = +70.5m. La Paz SR₁N = +42m.15s. T₀ = 16h.34m.32s.

Sept. 16d. Readings also at 7h. (Nagasaki), 8h. (Ekaterinburg, Osaka, Kobe, and near Mizusawa), 9h. (near Mizusawa), 13h. (Sarajevo), 14h. (Ekaterinburg and Cipolletti), 15h. (La Paz, Rio de Janeiro, Cape Town, Ekaterinburg (2) and Cipolletti), 16h. (De Bilt), 17h. and 18h. (San Fernando), 21h. (Manila, San Fernando, and La Paz), 22h. (La Paz and Ekaterinburg), 23h. (Nagasaki and Manila).

Sept. 17d. 1h. 2m. 10s. Epicentre 35° 0N. 139° 5E. (as on Sept. 9d.).

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Osaka	3.4	266	1 11	+18	—	—	2.1	2.5
Kobe	3.6	266	0 52	-4	(1 37)	-2	1.6	1.9
Mizusawa E.	4.3	17	1 7	0	2 2	+4	—	—
Ekaterinburg	55.5	320	—	—	—	—	29.3	—

Additional readings : Osaka gives also MN = +2.6m. Mizusawa PN = +1m.9s.

Sept. 17d. 3h. 39m.20s. Epicentre 31° 0N. 140° 0E.

A = -.657, B = +.551, C = +.515 ; D = +.643, E = +.766 ;
G = -.395, H = +.331, K = -.857.

Very rough. A negative correction to T₀ is suggested by the more distant stations.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Osaka	5.3	315	1 46	+24	(2 16)	-9	2.3	2.5
Kobe	5.5	313	1 46	+21	(2 33)	+2	2.6	3.0
Mizusawa E.	8.2	7	2 15	+11	3 47	+5	—	—
N.	8.2	7	2 16	+12	3 49	+7	—	—
Nagasaki	8.8	284	e 2 13	0	—	—	—	—
Hakodate	10.8	3	e 3 17	+36	—	—	e 5.2	6.3
Otomari	15.8	7	4 0	+11	—	—	—	—
Zi-ka-wei	15.9	276	e 3 58	+7	—	—	—	—
Taihoku	17.3	254	4 40	+31	e 8 2	+37	—	—
Manila	24.0	231	e 5 5	-23	—	—	—	—
Hong Kong	24.6	256	5 16	-18	9 40	-15	—	—
Batavia	48.9	228	1 8 58	-1	1 15 9	-56	—	—
Ekaterinburg	58.8	322	1 10 3	-1	1 8 6	-3	26.7	37.2
Bombay	61.2	276	1 8 29	18	(18 29)	-9	—	—
Victoria E.	71.4	45	20 23	18	(20 28)	-15	34.4	37.2
N.	71.4	45	20 31	18	(30 31)	-12	34.3	37.6
Pulkovo	72.6	331	1 11 28	-6	1 20 50	-7	33.7	52.0
Upsala	77.7	336	—	—	e 21 40	-17	—	—
Hamburg	85.1	334	—	—	e 22 40	-40	—	23.7

Continued on next page.

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Vienna	86.1	327	e 11 42	-74	22 56	[- 7]	e 45.7	55.7
Edinburgh	87.6	341	—	—	24 40	+52	—	—
De Bilt	88.0	334	—	—	e 23 9	[- 6]	e 43.7	—
Eskdalemuir	88.1	341	—	—	23 7	[- 9]	e 43.7	—
Uccle	89.3	334	—	—	23 15	[- 9]	e 43.7	—
Strasbourg	89.8	331	e 15 47	?	e 23 14	[-13]	e 50.7	—
Florence	91.8	326	e 19 40	?PR ₁	36 40	?	—	47.7
Rocca di Papa	92.6	325	e 17 27	?PR ₁	i 23 32	[-12]	e 50.1	61.6
Ottawa	97.0	24	—	—	e 23 50	[-18]	e 44.7	—
Toronto	N. 97.1	28	—	—	i 23 51	[-18]	—	—
La Paz	150.6	67	i 19 53	[- 4]	—	—	—	—

Additional readings: Osaka gives also MN = +3.4m. Kobe MN = +3.3m.
 Hakodate MN = +5.9m. Ekaterinburg MZ = +36.7m. Pulkovo
 PR₁ = +14m.53s., PR₂ = +16m.31s., PS = +21m.20s., SR₁ = +25m.28s.,
 SR₂ = +29m.58s., MN = +44.2m. Hamburg MN = +23.2m., MZ =
 +24.1m. Vienna PS = +24m.48s., i = +26m.46s. De Bilt e =
 +24m.33s. Eskdalemuir eN = +29m.32s. Strasbourg e = +29m.54s.
 Rocca di Papa eN = +17m.32s. Ottawa e = +32m.4s., L = +52.7m.
 Toronto eN = +24m.24s.

1923. Sept. 17d. 7h. 9m. 4s. Epicentre 35°5N. 55°0E.

A = +.467, B = +.667, C = +.581; D = +.819, E = -.574;
 G = +.333, H = +.476, K = -.814.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Tiflis	10.1	311	2 20	-11	e 4 24	- 8	e 5.3	—
Simla	N. 19.0	97	e 4 14	-15	7 32	-30	10.3	10.7
Helwan	20.6	261	e 5 16	+28	9 36	+60	—	—
Ekaterinburg	21.7	9	i 5 38	+37	i 9 3	+ 4	10.9	13.6
Bombay	22.9	132	5 8	- 8	9 53	+30	13.4	14.4
Athens	25.1	285	e 5 45	+ 6	e 10 30	+25	14.9	19.5
Lemberg	26.6	312	e 5 2	-52	e 9 53	-40	e 16.1	16.2
Belgrade	27.8	300	i 6 18	+12	i 11 19	+24	20.0	22.5
Pulkovo	29.1	334	i 6 9	-10	i 10 59	-20	12.9	19.5
Sarajevo	29.1	298	—	—	11 38	+19	28.0	—
Vienna	31.0	308	e 6 38	0	11 50	- 1	i 19.5	21.9
Calcutta	E. 31.7	105	6 43	- 1	11 33	-30	16.9	—
	N. 31.7	105	6 57	+13	—	—	17.3	—
Pompeii	32.0	290	e 6 52	+ 5	e 11 42	-26	27.9	—
Kodalkanal	32.5	139	15 26	?L	—	—	18.3	21.4
Rocca di Papa	33.3	295	i 7 3	+ 4	11 20	-69	e 16.6	26.0
Upsala	34.2	329	e 6 49	-18	e 12 21	-22	e 15.9	25.7
Innsbruck N.W.	34.3	306	e 7 10	+ 3	e 12 54	+10	e 20.9	—
Florence	34.3	300	7 26	+19	12 36	- 8	15.9	21.9
Hamburg	E. 36.0	316	—	—	i 13 1	- 9	20.3	26.5
	N. 36.0	316	—	—	i 13 6	- 4	—	27.3
	Z. 36.0	316	7 18	- 4	—	—	—	24.0
Zurich	36.2	303	7 23	- 1	—	—	—	—
Strasbourg	36.8	308	7 25	- 3	e 12 49	-32	19.9	29.2
Besançon	37.9	304	—	—	13 38	+ 1	—	20.9
De Bilt	38.7	313	—	—	13 44	- 4	e 19.9	26.1
Uccle	39.1	310	e 7 44	- 3	e 13 50	- 3	17.9	26.5
Fuy de Dôme	40.1	303	6 56?	-60	—	—	20.9	—
Bergen	40.1	326	—	—	13 55	-13	20.4	—
Paris	40.2	308	e 9 32	?PR ₁	e 13 53	-17	22.9	27.9
Barcelona	41.2	294	e 14 40	?S	(e 14 40)	+16	26.4	33.5
Kew	42.0	311	—	—	—	—	—	29.9
Tortosa	E. 42.5	295	e 8 0	-15	e 14 51	+ 9	25.9	34.0
	N. 42.5	295	—	—	e 14 45	+ 3	21.9	34.1
Stonyhurst	43.3	315	e 9 56	?PR ₁	—	—	—	29.4
Bidston	43.7	315	—	—	14 54	- 4	—	31.9
Edinburgh	43.8	317	10 56	?PR ₁	i 14 59	- 0	i 18.3	31.2
Toledo	46.1	293	8 49	+ 8	i 15 24	- 5	e 24.5	28.6
Granada	46.5	290	i 8 54	+10	—	—	25.9	—
San Fernando	48.7	291	9 17	+19	16 17	+15	30.9	40.9
Colimbra	49.2	297	e 9 11	+10	(1 16 27)	+18	e 26.9	35.6

Continued on next page.

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Hong Kong	52.7	89	16 37	?S	(16 37)	-15	—	33.4
Zi-ka-wei	54.6	75	—	—	—	—	e 47.0	—
Taihoku	57.4	82	30 27	?L	—	—	34.0	—
Acera	58.8	253	39 56	?L	—	—	(39.9)	43.7
Manila	62.2	92	e 10 56	+30	—	—	—	—
Ootomari	63.6	50	e 29 13	?L	—	—	31.5	—
Kobe	63.6	66	—	—	—	—	35.0	—
Cape Town	77.4	211	42 3	?L	—	—	(42.0)	44.4
Ottawa	87.8	328	—	—	i 23 41	-9	35.9	42.9
Toronto	E. 90.7	330	—	—	31 49	?	41.8	—
	N. 90.7	330	23 51	?	33 46	?	e 41.4	—
Ann Arbor	93.5	331	e 22 56	?	—	—	e 45.9	—
Chicago	95.4	334	—	—	e 23 56	[- 3]	45.9	—
Victoria	E. 96.0	359	25 31	?S	(25 31)	+15	42.9	54.8
	N. 96.0	359	25 1	?S	(25 1)	-15	—	52.9
Rio de Janeiro	109.4	256	—	—	—	—	e 50.4	—
Honolulu	N. 114.8	34	—	—	—	—	e 67.9	—
La Paz	126.3	275	e 26 3	?[S]	(e 26 3)	[+ 1]	65.8	70.4

Additional readings and notes : Tifis gives also PE = +2m.43s. (O-C. = +12s.). Ekaterinburg MZ = +14.2m. Readings have all been increased by 20min. Athens i = +5m.57s., iS = +10m.44s. MN = +16.9m. Belgrade PR₁ = +8m.4s., SR₁ = +11m.44s. Pulkovo MN = +19.8m. Vienna i = +7m.26s., PR₂ = +8m.6s., PR₃ = +9m.13s., i = +9m.52s., i = +12m.7s., +15m.2s., and +18m.55s. Rocca di Papa iPN = +7m.8s. Upsala MN = +23.3m. Hamburg SR₁ = +15m.16s. Strasbourg MN = +26.7m. De Bilt e = +16m.24s., MN = +28.3m. Uccle PR₁ = +9m.14s., SR₁ = +16m.26s. Bergen SR₁ = +17m.27s. Paris S = +17m.4s. Barcelona eS = +17m.47s. Eskdalemuir ($\Delta = 43^{\circ}.8$) gives simply 7h. Toledo PR₁ = +10m.44s., SR₁NW = +19m.36s., SR₁NE = +19m.47s., MNW = +28.4m. Granada i = +12m.42s., e = +17m.32s. Coimbra SR.E = +20m.21s., MN = +36.6m. S is given as iP. Nagasaki ($\Delta = 60^{\circ}.5$) gives 7h. 3min. Toronto eN = +24m.12s. and many L readings. Chicago eL = +40.9m. Victoria SE = +33m.50s.

Sept. 17d. Readings also at 1h. (Kingston and Calcutta), 5h. (Sarajevo (2), 8h. (Sydney), 15h. (Sarajevo), 20h. (Batavia and Malabar), 22h. (Ekaterinburg).

Sept. 18d. 6h. 34m. 25s. Epicentre $35^{\circ}.5N. 14^{\circ}.5E.$

A = +.788, B = +.204, C = +.581; D = +.250, E = -.968;
G = +.562, H = +.145, K = -.814.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Pompei	5.2	0	1 41	+21	—	—	—	—
Rocca di Papa	6.4	347	e 1 35	- 3	i 2 53	- 2	3.9	4.6
Athens	7.8	69	e 2 0	+ 2	—	—	e 2.1	—
Sarajevo	8.9	18	e 2 16	+ 1	e 3 41	-20	—	—
Innsbruck	12.0	350	e 3 15	+16	—	—	—	—
Strasbourg	14.0	341	—	—	—	—	9.6	—
De Bilt	17.9	341	—	—	—	—	e 11.6	—
Pulkovo	26.3	18	5 50	- 1	10 22	- 6	12.1	17.9

Rocca di Papa gives also S = +2m.59s.

Sept. 18d. Readings also at 4h. (Florence, La Paz, Ottawa, and De Bilt), 6h. (Florence and near Athens), 7h. (Marseilles), 10h. (Strasbourg), 12h. (Marseilles and Sarajevo), 14h. (Pulkovo, Florence, and near Belgrade), 16h. (near Hakodate), 18h. (Sarajevo (2)).

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Sept. 19d. 8h. 22m. 30s. Epicentre 12°·5N. 168°·0E.

A = -·955, B = +·203, C = +·216; D = +·208, E = +·978;
G = -·212, H = +·045, K = -·976.

	△	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Osaka	36·9	313	7 31	+ 2	—	—	18·6	22·2
Kobe	37·1	313	—	—	—	—	18·3	—
Manila	45·7	279	—	—	e 13 21	-123	18·4	—
Malabar	63·2	255	—	—	i 19 2	- 1	—	—
Batavia	63·5	256	—	—	i 19 18	+11	—	—
Victoria	66·6	42	—	—	—	—	20·7	20·8
Ekaterinburg	88·7	329	i 19 15	?PR ₁	i 23 56	- 4	43·5	—
Pulkawa	88·6	40	e 16 30	?	—	—	—	—
Pulkovo	100·2	340	i 21 26	?PR ₁	i 26 46	+48	30·5	—
Hamburg	111·3	345	i 18 17	[- 9]	i 27 52	+12	—	—
De Bilt	113·7	348	i 18 22	[-11]	e 19 59	?PR ₁	—	—
Innsbruck	116·7	342	e 18 35	[- 8]	e 28 19	- 5	—	—
Rocca di Papa z.	121·2	338	e 18 48	[- 8]	22 18	?PR ₁	—	—

Additional readings: Osaka gives also MN = +19·8m. Ekaterinburg e = +17m.33s., i = +20m.32s., +25m.33s., +26m.37s., and +28m.36s. Pulkovo e = +20m.48s., i = +27m.6s. Rocca di Papa iZ = +19m.0s.

Sept. 19d. 16h. 29m. 30s. Epicentre 38°·0N. 23°·7E. (Athens).

A = +·721, B = +·317, C = +·616; D = +·402, E = -·916;
G = +·564, H = +·247, K = -·788.

	△	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	0·0	—	e 1 4	+64	—	—	—	2·0
Zante	4·0	267	5 30	?	—	—	—	—
Sarajevo	7·1	328	e 1 44	- 4	e 2 57	-16	—	3·5
Belgrade	7·2	342	e 2 27	+38	e 3 26	+11	(4·4)	4·6
Pompeii	7·6	294	3 55	?L	—	—	(3·9)	—
Rocca di Papa E.	9·2	298	—	—	e 4 10	+ 2	—	4·7
De Bilt	19·1	323	—	—	—	—	e 10·5	—
Ekaterinburg	30·7	40	—	—	e 14 11	?SR ₁	16·5	18·2

Additional readings: Athens gives P = +1m.8s., MN = +1·9m. Belgrade L is given as SR₁. Pompeii S = +10m.15s. Rocca di Papa iE = +4m.14s., V = +8m.30s., eV = +15m.12s.

Sept. 19d. Readings also at 0h. (Nagasaki and Ekaterinburg), 1h. (Victoria), 2h. (La Paz), 4h. (Manila), 5h. (Sarajevo), 7h. (Johannesburg), 8h. (Apia), 10h. (Ekaterinburg), 15h. (Kobe and Ekaterinburg), 17h. (Ekaterinburg), 19h. (Rio Tinto, Ekaterinburg, Ottawa, and near Victoria), 20h. (Rocca di Papa), 21h. (Ekaterinburg), 22h. (Rocca di Papa, near Athens, and near Lick and Berkeley), 23h. (Ekaterinburg and Colombo).

Sept. 20d. Readings at 0h. (Nagasaki), 1h., 3h., and 8h. (Ekaterinburg), 9h. (Ekaterinburg, Ottawa, Toronto, and near Victoria), 12h. and 13h. (Sarajevo), 14h. (Florence), 16h. (Ottawa and Mostar (3)), 17h. (Sarajevo), 21h. (Ekaterinburg), 22h. (Nagasaki and near Nagoya), 23h. (Ekaterinburg, near Osaka, Mizusawa, and near Kobe).

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Sept. 21d. 20h. 1m. 22s. Epicentre 50°·5N. 86°·5E.

A = +·039, B = +·635, C = +·772; D = +·998, E = -·061;
G = +·047, H = +·770, K = -·636.

	△	Az.	P.		O-C.		S.		O-C.		L.	M.
			m. s.	s.	m. s.	s.	m. s.	s.				
Ekaterinburg	16·4	303	14	9	+12	17	27	+23	8·6	11·3		
Simla	E. 20·6	203	—	—	—	e 8	32	-4	—	—		
Tifis	E. 29·8	269	—	—	—	e 11	33	+2	—	20·8		
	N. 29·8	269	—	—	—	e 11	22	-9	19·7	21·8		
Zi-ka-wei	32·3	113	—	—	—	e 11	37	-36	—	—		
Pulkovo	32·4	309	6	46	-6	12	4	-10	17·1	20·4		
Bombay	33·4	204	e 12	29	?	18	—	-1	—	—		
Hong Kong	35·5	132	14	48	?	18	—	—	(14·8)	18·8		
Upsala	38·5	311	e 9	12	?	13	40	-5	—	24·8		
Kodaikanal	41·0	195	23	2	?	—	—	—	(23·0)	—		
Vienna	44·0	296	8	22	-4	—	—	—	e 22·4	25·6		
Colombo	44·0	190	21	50	?	—	—	—	e 26·3	26·6		
Bergen	44·0	316	—	—	—	—	—	—	e 23·6	30·6		
Hamburg	44·9	305	e 8	31	-1	—	—	—	e 22·6	25·6		
Manila	45·4	130	—	—	—	—	—	—	23·6	—		
Innsbruck	47·3	298	e 8	57	+8	15	54	+9	e 25·6	—		
De Bilt	48·1	305	—	—	—	e 16	5	+10	e 25·6	28·3		
Strasbourg	48·7	300	e 9	17	+19	—	—	—	e 28·6	—		
Uccle	49·2	304	—	—	—	—	—	—	e 24·6	28·5		
Rocca di Papa	49·7	289	i 9	20	+15	—	—	—	e 26·8	33·0		
Edinburgh	50·1	312	—	—	—	—	—	—	e 24·6	34·3		
Eskdalemuir	50·5	312	—	—	—	e 16	34	+9	24·6	—		
Paris	51·3	304	—	—	—	e 16	45	+10	27·6	28·6		
Kew	51·3	309	—	—	—	—	—	—	—	31·6		
Bidston	51·5	310	—	—	—	—	—	—	—	35·4		
Oxford	51·6	308	—	—	—	i 16	38	-1	e 26·9	34·3		
Tortosa	E. 57·4	296	—	—	—	—	—	—	e 31·6	34·2		
	N. 57·4	296	8	38	-77	—	—	—	e 30·6	34·5		
Algiers	58·7	290	e 10	10	+7	e 20	50	+163	e 37·6	—		
Toledo	60·7	299	e 13	25	?	—	—	—	e 25·5	35·9		
Coimbra	E. 62·9	301	e 13	25	?	—	—	—	33·1	36·4		
	N. 62·9	301	e 13	58	?	—	—	—	—	36·6		
Rio Tinto	63·5	299	36	38	?	—	—	—	(36·6)	38·6		
San Fernando	E. 64·3	297	—	—	—	—	—	—	—	39·6		
Victoria	E. 77·9	20	22	0	?	(22	0)	+1	40·2	51·2		
	N. 77·9	20	22	0	?	(22	0)	+1	43·5	51·9		
Ottawa	82·9	348	—	—	—	e 22	53	-3	e 47·6	—		
Toronto	N. 85·1	350	—	—	—	e 23	13	-7	e 53·0	—		

Additional readings and notes: Ekaterinburg gives also MN = +10·0m, MZ = +12·5m. Simla eN = +8m·56s. Tifis eE = +13m·53s. eN = +14m·7s. eE = +14m·38s. and +17m·38s. Pulkovo SR₁ = +13m·44s. MN = +19·0m. Upsala MN = +22·5m. Vienna e = +21m·34s. and +23m·8s. Innsbruck i has been increased by 5min. De Bilt MN = +28·2m. MZ = +32·1m. Strasbourg i = +27m·3s. Rocca di Papa eN = +8m·50s. eL = +20·8m. Eskdalemuir e = +20m·38s. Toledo MNW = +35·8m. San Fernando MN = +38·1m. Ottawa L = +58·6m.

Sept. 21d. Readings also at 2h. (Lick), 6h. (Sarajevo (3)), 9h. (Manila (2) and Sarajevo), 10h. (near Balboa Heights), 11h. (Apia), 13h. (Sarajevo (2) and Ekaterinburg), 14h. (Florence and Ekaterinburg), 15h. (Colombo), 16h. (Innsbruck, Strasbourg, and near Vienna), 19h. (Kobe), 20h. (near La Paz), 22h. (Ekaterinburg (2) and Sarajevo), 23h. (Sarajevo, Ekaterinburg, and Manila).

Sept. 22d. 2h. 52m. 56s. Epicentre 38°·5N. 135°·0E. (as on 1923 July 20d.).

A = -·553, B = +·553, C = +·623; D = +·707, E = +·707;
G = -·440, H = +·440, K = -·783.

	△	Az.	P.		O-C.		S.		O-C.		L.	M.
			m. s.	s.	m. s.	s.	m. s.	s.				
Osaka	3·9	175	1	10	+9	—	—	—	—	2·0	3·0	
Kobe	3·9	173	1	1	0	—	—	—	—	1·6	1·7	
Mizusawa	4·8	80	1	16	+2	2	1	-10	—	—	—	
Ekaterinburg	50·4	317	i 9	9	0	16	21	-3	21·1	—	—	
Pulkovo	64·0	327	e 10	40	+2	e 19	12	-1	28·6	—	—	

Additional readings: Mizusawa PN = +1m·17s. Osaka MN = +2·6m.

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Sept. 22d. 14h. 55m. 30s. Epicentre 3°-0S. 143°-5E. (as on 1917 Nov. 28d.).

A = -·803, B = +·594, C = -·052; D = +·595, E = +·804;
G = +·042, H = -·031, K = -·999.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°		m. s.	s.	m. s.	s.	m.	m.
Manila	28.4	309	—	—	—	—	e 13.1	—
Sydney	31.7	168	—	—	11 0?	-63	16.2	35.0
Adelaide	32.3	188	—	—	—	—	e 13.5	19.2
Melbourne	34.8	178	—	—	—	—	e 14.8	21.6
Hong Kong	38.2	314	—	—	13 50	+ 9	—	16.7
Perth	38.9	219	—	—	13 48	- 3	21.8	—
Honolulu	62.2	64	—	—	—	—	e 25.7	—
Ekaterinburg	85.6	328	13 5	- 3	23 36	-23	42.5	50.7
Victoria	84.4	42	24 30	?S	(24 30)	-30	43.9	56.6
Pulkovo	104.1	331	—	—	e 24 56	[+13]	43.5	60.4
Sarajevo	116.7	320	—	—	—	—	—	12.4
Mostar	117.3	320	e 15 52	+21	—	—	e 61.5	—
De Bilt	120.0	332	—	—	—	—	e 62.5	—
Strasbourg	120.8	330	—	—	—	—	—	—
Oxford	123.1	336	—	—	—	—	e 54.5	65.5
Ottawa	125.5	33	—	—	—	—	—	—
La Paz	143.1	123	e 19 43	[- 2]	—	—	—	—

Additional readings and notes : Adelaide gives also e = +17m.30s. Honolulu
eN = +26m.31s. Ekaterinburg MZ = +54.4m. Pulkovo MN = +55.1m.

1923. Sept. 22d. 20h. 47m. 33s. Epicentre 29°-5N. 56°-0E.

A = +·487, B = +·722, C = +·492; D = +·829, E = -·559;
G = +·275, H = +·408, K = -·870.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.	
	°		m. s.	s.	m. s.	s.	m.	m.	
Tiflis	E.	15.2	326	3 53	+11	6 52	+15	9.4	14.2
	N.	15.2	326	i 4 13	+31	i 7 15	+38	—	17.0
Simla	E.	18.3	79	4 9	-12	7 33	-14	10.6	11.4
	N.	18.3	79	4 15	- 6	7 27	-20	9.6	—
Bombay		18.6	120	4 25	+ 1	e 8 25	+32	11.6	15.0
Dehra Dun		19.1	83	3 44	-46	7 2	-62	9.4	12.4
Helwan		21.4	277	1 5 6	+ 8	9 7	+14	—	15.6
Ekaterinburg		27.6	4	i 5 58	- 6	i 10 45	- 7	15.4	—
Kodakanal		27.8	130	6 33	+27	(11 9)	+14	11.2	19.8
Athens		28.0	296	6 9	+ 1	11 21	+22	16.0	20.0
Calcutta	E.	29.8	96	6 11	-15	11 21	-10	16.5	19.4
	N.	29.8	96	6 9	-17	11 59	+28	16.7	19.3
Lemberg		31.5	320	e 6 38	- 5	e 11 39	-21	e 20.2	20.6
Colombo		31.8	132	6 57	+12	11 57	- 8	19.8	21.4
Belgrade		31.9	310	1 6 45	- 1	i 12 2	- 5	16.3	21.9
Pulkovo		34.9	339	1 7 5	- 7	i 12 39	-15	15.4	27.8
Pompeii		35.4	300	1 7 18	+ 1	13 3	+ 2	22.4	—
Vienna		35.6	316	e 7 8	-10	12 57	- 7	i 17.4	24.6
Rocca di Papa	E.	36.4	302	1 7 24	- 1	13 9	- 7	e 15.6	24.0
	N.	36.4	302	i 7 25	0	13 15	- 1	—	—
Venice		37.6	308	e 7 37	+ 2	—	—	—	11.4
Florence		38.1	307	7 42	+ 3	13 46	+ 7	19.4	20.4
Innsbruck		38.6	311	e 7 39	- 4	i 13 44	- 2	e 20.4	22.8
Upsala		39.8	332	e 7 45	- 8	e 13 52	-11	21.0	29.6
Zurich		40.5	310	e 7 49	-10	e 14 4	-10	—	—
Hamburg	Z.	41.0	320	e 7 57	- 6	e 14 27	+ 6	e 22.4	28.0
Strasbourg		41.2	312	1 8 2	- 3	e 14 9	-15	20.0	28.6
Besangon		42.2	310	8 7	- 5	—	—	21.4	—
Marseilles		42.5	303	8 21	+ 6	14 48	+ 6	22.4	—
De Bilt		43.5	317	i 8 24	+ 2	14 56	+ 1	e 20.4	24.6
Ucole		43.7	315	e 8 19	- 5	14 54	- 4	e 19.4	29.1
Puy de Dôme		44.1	309	e 8 27	0	14 47	-16	22.4	—
Algiers		44.4	294	8 26	- 3	15 0	- 7	21.4	33.4
Barcelona		44.7	301	8 34	+3	e 15 5	- 6	e 21.1	29.8
Paris		44.8	313	i 8 30	- 2	i 15 9	- 3	20.4	25.4
Bergen		45.6	329	7 32	-65	15 27	+ 5	22.3	—
Tortosa	E.	46.0	300	8 38	- 2	15 25	- 3	19.1	19.6
	N.	46.0	300	8 39	- 1	15 27	- 1	19.1	32.3

Continued on next page.

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		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.	
		\circ	\circ	m. s.	s.	m. s.	s.	m.	m.	
Oxford		47.4	315	i 8	55	+ 5	15 51	+ 5	33.6	39.6
West Bromwich		47.8	317	8	41	-12	15 51	0	—	—
Edinburgh		49.2	320	e 9	12	+11	16 10	+ 1	19.4	35.6
Toledo		49.5	299	i 9	5	+ 1	i 16 15	+ 2	e 19.2	27.7
Granada		49.6	295	i 9	13	+ 9	i 16 22	+ 8	—	—
San Fernando		51.8	295	9	24	+ 5	16 14	-27	21.0	38.4
Rio Tinto		51.8	297	9	27	+ 8	—	—	—	17.4
Hong Kong		52.3	84	9	17	- 5	16 44	- 4	—	29.7
Coimbra	E.	52.8	300	9	36	+11	i 17 1	+ 7	e 31.0	40.1
	N.	52.8	300	e 9	32	+ 7	—	—	e 29.4	29.8
Lisbon		53.6	298	9	40	+10	17 13	+ 9	e 25.5	—
Zi-ka-wei		55.6	70	9	44	+ 1	e 17 26	- 3	—	36.7
Taihoku		57.7	78	21	37	?	—	—	31.1	33.7
Accra		58.0	257	—	—	—	—	—	32.4	38.7
Batavia		60.4	119	e 10	12	- 3	—	e 27.9	—	—
Manila		61.3	89	e 10	45	+24	—	—	—	—
Johannesburg		61.8	210	18	27	?S	(18 27)	-19	34.4	36.4
Nagasaki		62.0	67	e 26	52	?L	—	—	(e 26.9)	—
Osaka		65.7	63	19	3	?S	(19 3)	-30	35.1	42.4
Hakodate		67.2	54	10	57	- 2	—	—	—	—
Otomari		66.9	49	e 32	58	?L	—	—	35.5	37.4
Mizusawa	E.	68.4	56	11	12	+ 5	20 1	- 6	—	—
	N.	68.4	56	11	14	+ 7	20 6	- 1	—	—
Cape Town		72.6	213	20	59	?S	(20 59)	+ 2	39.0	40.1
Sitka	E.	93.0	6	—	—	—	—	e 55.6	—	—
Ottawa		93.2	328	16	47	?PR ₁	e 23 51	[+ 4]	41.4	—
Ithaca		95.8	326	e 16	57	?PR ₁	e 24 9	[+ 8]	45.4	—
Toronto	E.	96.4	330	17	38	?PR ₁	24 52	-28	e 39.1	56.8
	N.	96.4	330	17	38	?PR ₁	i 24 55	-25	e 38.8	56.8
Georgetown		98.9	324	—	—	—	—	e 48.4	—	—
Ann Arbor		99.2	331	e 18	57	?PR ₁	—	—	40.4	—
Adelaide		100.9	124	—	—	—	e 27 15	+71	54.4	61.0
Chicago		101.2	333	18	12	?PR ₁	27 17	+70	50.4	—
Victoria	E.	102.1	359	18	29	?PR ₁	—	—	41.6	56.5
	N.	102.1	359	18	20	?PR ₁	27 26	+70	40.8	64.0
Melbourne		106.7	125	—	—	—	—	e 22.2	65.4	—
Rio de Janeiro		108.6	254	e 19	20	?PR ₁	—	—	42.6	62.0
Sydney		109.8	119	49	57	?L	56 33	?	61.0	65.5
Berkeley		112.6	358	—	—	—	—	e 62.4	72.4	—
Honolulu		119.5	36	—	—	—	—	e 53.9	68.4	—
La Paz		127.5	271	i 21	30	?PR ₁	—	—	59.8	64.8
Pilar	E.	128.8	250	65	33	?L	—	—	70.8	81.0
	N.	128.8	250	65	39	?L	—	—	70.4	73.0
Wellington		129.8	120	—	—	—	—	48.4	—	—
Mendoza		132.8	250	23	21	?PR ₁	—	—	75.8	92.0
Cipolletti		133.5	242	65	45	?L	—	—	77.2	82.0

Additional readings and notes: Athens gives also iE = +6m.15s., PR₁NE = +7m.31s., PR₂N = +8m.15s., i = +11m.51s., MN = +17.8m. Belgrade PR₁ = +8m.12s., SR₁ = +13m.43s. Pulkovo iPR₁ = +8m.24s., iSR₁ = +14m.33s., MN = +21.2m. Vienna iP = +7m.17s., iE = +7m.44s., PR₁ = +8m.43s., iPR₂ = +8m.52s., iN = +10m.28s., and +11m.53s., SR₁ = +15m.57s. Innsbruck MNW = +26.2m. Upsala iP = +7m.52s., iPR₁ = +9m.27s., MN = +28.7m. Zurich iP = +7m.53s., iPR₁E = +9m.42s. Hamburg PR₁ = +9m.50s., SR₁ = +17m.27s., MN = +24.4m., ME = +32.4m. Strasbourg MN = +25.6m., MZ = +28.4m. De Bilt PR₁Z = +10m.13s., MN = +24.1m., MZ = +29.0m. Uocle iP = +8m.26s., PR₁ = +10m.9s., MN = +30.1m. Algiers MN = +32.4m. Barcelona PR₁E = +10m.14s., SR₁ = +18m.27s., MN = +29.2m. Paris = +15m.27s., MN = +28.4m. Bergen PR₁ = +10m.17s. Oxford iPR₁ = +10m.48s., SR₁ = +19m.42s. Edinburgh i = +11m.2s. Eskdalemuir gives simply 21h. Toledo PR₁ = +11m.10s., PR₂ = +11m.49s., PR₃ = +12m.13s., SR₁ = +16m.40s., MNW = +28.1m. Hong Kong SR₁ = +20m.27s. Coimbra iE = +9m.43s., SR₁E = +20m.50s. T. = 20h.47m.42s. Zi-ka-wei SR₁E = +22m.22s., MN = +37.0m. San Fernando PR₁ = +11m.4s., MN = +37.0m. Batavia i = +13m.40s., +19m.46s., and +20m.8s. Osaka S = +27m.13s., MN = +38.7m. Hakodate reading has been increased by 30min. Sitka eN = +55m.4s. Ottawa i = +27m.55s., eL = +38.4m. Ithaca e = +27m.27s., +33m.27s., L = +51.4m. Toronto iN = +24.8m., iE = +24m.10s., and several L's. Georgetown eLN = +49.0m. and several L readings. Ann Arbor e = +21m.57s., and +29m.9s. Adelaide e = +31m.57s., eS = +39m.27s., SR₁ = +45m.27s. Chicago L = +43.4m. Berkeley iPR₁NZ = +19m.36s., iPR₁E = +19m.58s., LN = +64.4m. Honolulu ePE = +40m.19s., eLN = +54.9m., MN = +78.0m. La Paz L = +56.4m.

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Sept. 22d. Readings also at 0h. (Belgrade), 5h. (Nagasaki and Sarajevo), 9h. (Colombo and Ekaterinburg), 11h. (Ekaterinburg), 12h. (Ekaterinburg, Chicago, Pulkovo, Ithaca, Ottawa, Toronto, Washington, and near Victoria), 13h. (near Malabar), 14h. (Tiflis), 15h. (Mostar (3)), 17h. (Lick), 18h. (Ekaterinburg).

Sept. 23d. 3h. 18m. 58s. Epicentre 29°·5N. 56°·0E. (as on 22d.).

A = +·487, B = +·722, C = +·492; D = +·829, E = -·559;
G = +·275, H = +·408, K = -·870.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Tiflis	15·2	326	e 6 20	?S	e 6 44	+ 7	(e 9·7)	—
Bombay	18·6	120	4 31	+ 7	7 57	+ 4	9·6	13·8
Helwan	21·4	277	e 5 5	+ 7	9 7	+14	—	15·4
Ekaterinburg	27·6	4	5 58	- 6	10 40	-12	13·5	17·9
Pulkovo	34·9	339	i 7 6	- 6	12 35	-19	20·0	25·8
Upsala	39·8	332	e 9 19	?PR ₁	—	—	—	30·4
Hamburg	41·0	320	e 9 35	?PR ₁	—	—	e 31·0	33·0
De Bilt	43·5	317	—	—	e 18 17	?	e 26·0	—
Coimbra	52·8	300	e 10 22	?PR ₁	e 17 2	+ 8	21·0	—
Manila	61·3	89	e 31 53	?L	—	—	32·8	—
Ottawa	93·2	328	—	—	—	—	e 45·0	—
Toronto	E. 96·4	330	—	—	—	—	e 45·9	—
Victoria	E. 102·1	359	—	—	—	—	38·3	39·9

Additional readings and notes: Tiflis gives also eL = +12·0m. All readings have been diminished by 10min. Ekaterinburg i = +6m.0s., MN = +17·2m. Pulkovo PR₁ = +8m.17s., SR₂ = +15m.8s., MN = +24·3m. Toronto eE = +44m.10s., LN = +44·0m. Victoria LN = +38·4m., M = +39·8m.

Sept. 23d. 17h. 28m. 44s. Epicentre 56°·0N. 150°·0W.

A = -·484, B = -·280, C = +·829; D = -·500, E = +·866;
G = -·718, H = -·415, K = -·559.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Sitka	E. 8·1	76	—	—	—	—	e 4·6	18·8
	N. 8·1	76	—	—	—	—	e 3·7	6·5
Victoria	E. 17·9	104	4 27	+11	8 13	+35	13·2	18·6
	N. 17·9	104	4 26	+10	8 11	+33	13·5	19·7
Honolulu	35·2	193	—	—	—	—	e 15·3	—
Chicago	41·8	84	14 31	?S	(14 31)	- 1	21·9	—
Ann Arbor	43·6	80	—	—	—	—	e 22·7	—
Toronto	E. 45·0	76	—	—	e 15 18	+ 3	23·6	—
	N. 45·0	76	—	—	e 15 31	+16	e 23·7	—
Ottawa	45·8	70	—	—	i 15 24	- 1	e 24·0	28·8
Georgetown	49·5	78	e 12 8	?	—	—	e 26·4	—
Washington	49·5	78	—	—	—	—	e 26·8	—
Pulkovo	64·2	0	e 10 41	+ 2	e 19 18	+ 3	35·3	45·0
Ekaterinburg	64·5	344	i 10 38	- 4	19 13	- 6	33·3	40·7
Edinburgh	64·9	20	—	—	—	—	e 38·3	—
Eskdalemuir	65·4	20	—	—	e 19 34	+ 4	31·3	—
De Bilt	70·0	16	—	—	—	—	e 37·3	—
Batavia	102·5	277	i 12 19	-124	—	—	—	—

Additional readings: Sitka gives its earlier phases as eN = 17h.21m.22s., ePN = 17h.22m.45s., ePE = 17h.23m.11s., eE = 17h.29m.27s. Chicago S₁ = +17m.43s. Toronto iN = +23m.27s., LN = +25·3m., LE = +25·9m., iN = +39m.54s. Ottawa e = +19m.4s. Georgetown eE = +12m.26s., eLN? = +21·3m., LE = +32·3m. Ekaterinburg iP₁ = +20m.40s., S₂ = +30m.49s., MN = +43·1m., MZ = +45·0m. Batavia i = +15m.44s.

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Sept. 23d. 20h. 56m. 38s. Epicentre 52°·8N. 155°·2E.

A = -·549, B = +·254, C = +·797; D = +·419, E = +·908;
G = -·723, H = +·334, K = -·605.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Ekaterinburg	50·2	315	9 7	- 1	16 22	+ 1	25·4	33·6
Pulkovo	59·1	331	10 4	- 2	18 7	- 5	33·4	—
De Bilt	72·2	340	—	—	—	—	e 40·4	—
Ottawa	72·6	35	—	—	e 34 52	?	e 39·0	—
Vienna	z. 73·1	333	i 11 37	0	—	—	—	—
Sarajevo	76·5	330	—	—	—	—	—	47·3
Florence	76·8	335	—	—	—	—	e 17·4	25·9
Rocca di Papa	80·1	333	e 11 56	-24	—	—	—	—

Additional readings and notes: Ekaterinburg gives also MZ = +33·7m. Sarajevo reading has been diminished by 1h. Rocca di Papa iPN = +12m.12s., iPE = +12m.14s.

Sept. 23d. Readings also at 3h. (Nagasaki, near Osaka, and near Tucson), 17h. (Florence), 23h. (Vienna).

Sept. 24d. Readings at 1h. (near Port au Prince), 3h. (Sydney and near Mostar), 4h. (Sarajevo), 5h. (Colombo), 6h. (La Paz), 7h. (Sydney), 8h. (Simla, Batavia, Ekaterinburg (2), and near Osaka), 10h. (Florence), 11h. (Nagasaki and near Osaka and Kobe), 12h. (Florence), 13h. (Ekaterinburg and Sarajevo), 14h. and 15h. (3) (Sarajevo), 16h. (Ottawa and Sarajevo), 17h. (Nagasaki), 18h. (Uccle, Strasbourg, Nagasaki, and Ekaterinburg), 21h. (Ekaterinburg), 22h. (Manila).

Sept. 25d. Readings at 10h. (near Malabar and Batavia), 13h. and 14h. (Ekaterinburg), 16h. (Alicante and Sarajevo), 17h. (Sarajevo), 20h. (Berkeley), 22h. (Ekaterinburg), 23h. (Sydney and Ekaterinburg).

Sept. 26d. 1h. 18m. 48s. Epicentre 43°·8N. 15°·7E. (as given by Strasbourg).

A = +·695, B = +·195, C = +·692; D = +·271, E = -·963;
G = +·666, H = +·187, K = -·722.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Sinj	0·7	96	10 10	- 1	10 20	0	—	0·5
Travnik	1·5	112	10 21	- 2	10 40	- 2	—	0·7
Mostar	1·6	106	10 23	- 1	10 45	0	—	0·9
Sarajevo	2·0	88	10 38	+ 7	11 7	+12	—	1·3
Venice	2·9	304	10 48	+ 3	10 53	-27	—	3·8
Rocca di Papa	3·0	228	10 45	- 2	—	—	1·6	2·3
Pompeii	3·1	197	1 6	+17	1 52	+26	—	2·7
Florence	3·2	272	0 44	- 6	1 50	+22	—	2·4
Belgrade	3·6	71	e 0 55	- 1	1 55	+16	—	2·3
Vienna	4·5	6	i 1 9	- 1	1 49	-15	i 2·5	2·8
Innsbruck	4·6	322	1 12	+ 1	e 2 33	?L	(e 2·6)	—
Moncalieri	5·8	285	1 40	+10	3 0	+21	3·6	—
Zurich	6·1	309	e 1 31	- 2	1 24	+ 2	—	—
Strasbourg	7·3	314	e 1 45	- 6	e 3 12	- 6	3·9	—
Marseilles	7·5	270	1 12?	-42	—	—	—	—
Besançon	7·6	300	1 49	- 6	3 15	-11	—	—
Athens	8·5	131	e 1 55	-14	1 3 28	-22	—	—
Paris	10·4	304	e 2 24	-12	e 4 57	+17	5·2	6·2
Hamburg	10·5	341	—	—	e 4 42	- 1	15·7	7·4
Uccle	10·5	317	e 3 54	?S	(e 3 54)	-49	—	—
De Bilt	10·9	323	—	—	—	—	e 5·8	—
Upsala	E. 16·1	4	—	—	—	—	e 8·9	—
Pulkovo	18·2	24	14 9	-10	7 35	- 9	10·2	12·2
Ekaterinburg	30·8	49	16 16	-20	—	—	16·7	—

Additional readings and notes: Mostar gives also iP = +26s. Venice MN = +1·6m., MZ = +1·8m. Rocca di Papa E = +57s., N = +59s. Florence eP? = +1m.2s. Belgrade iP = +1m.7s. Vienna P = +1m.24s., i = +1m.30s., and +1m.44s., S = +2m.9s. Strasbourg P? = +2m.16s. Athens eSE = +6m.16s. Paris eP has been diminished by 2min. Hamburg iN = +5m.36s., MZ = +6·9m., MN = +7·1m.

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Sept. 26d. 2h. 29m. 10s. Epicentre 1°0N. 30°0W.

A = +.866, B = -.500, C = +.017; D = -.500, E = -.866;
G = +.015, H = -.006, K = -1.000.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Río de Janeiro	27.1	208	e 6 5	+ 6	10 20	-23	11.8	14.8
La Paz	41.5	242	1 8 9	+ 2	14 17	-11	20.7	23.6
San Fernando	41.8	28	(8 25)	+16	14 25	- 7	23.8	28.8
Granada	43.6	30	8 16	- 7	15 23	+27	—	—
Coimbra	43.9	24	—	—	e 14 41	-20	20.4	22.7
Toledo	45.5	28	8 27	-10	15 8	-13	e 22.5	27.4
Pilar	E. 45.8	221	14 44	?S	(14 44)	-41	24.0	25.7
	N. 45.8	221	14 38	?S	(14 38)	-47	23.9	24.5
Algiers	47.1	37	e 8 35	-13	15 31	-11	22.8	33.8
Tortosa	N. 48.5	30	e 8 50	- 7	—	—	e 22.8	31.3
Mendoza	49.5	223	16 14	?S	(16 14)	+ 1	27.4	28.2
Barcelona	49.8	31	—	—	e 15 52	-24	—	35.8
Marselles	52.8	31	—	—	—	—	20.8	—
Cipolletti	53.1	218	24 38	?L	—	—	28.6	31.8
Moncalieri	55.2	31	10 35	+55	i 17 37	+13	26.4	34.4
Paris	55.4	26	—	—	e 17 32	+ 6	24.8	29.8
Besançon	55.8	29	—	—	—	—	—	43.8
Rocca di Papa	56.0	39	e 9 48	+ 2	17 40	+ 6	e 30.8	34.6
Oxford	56.2	21	—	—	—	—	i 23.9	28.8
Florence	56.3	35	e 9 50	+ 2	17 50	+12	23.8	28.8
Zurich	57.2	30	e 9 49	- 4	—	—	—	—
Strasbourg	57.6	28	e 10 4	+ 8	18 4	+10	27.5	—
Stonyhurst	57.6	20	e 17 50	?S	(17 50)	- 4	—	25.8
Uccle	57.7	26	—	—	17 50	- 5	23.8	29.8
Eskdalemuir	58.5	18	—	—	17 58	- 7	24.8	—
De Bilt	59.0	25	—	—	18 25	+14	e 24.8	30.3
Edinburgh	59.0	18	—	—	e 18 26	+15	—	28.8
Ottawa	E. 59.9	324	e 13 50	?PR ₁	1 18 32	+10	25.1	—
	N. 61.2	322	—	—	1 18 58	+20	31.2	—
Toronto	61.2	322	—	—	1 18 42	+ 4	25.7	—
Vienna	61.8	33	10 27	+ 3	—	—	—	35.8
Hamburg	62.1	26	e 10 40	+14	—	—	25.8	—
Chicago	65.7	317	14 48	?PR ₁	19 30	- 3	30.8	—
Uppsala	N. 69.3	24	—	—	—	—	30.8	—
Pulkovo	74.7	27	11 48	+ 1	21 25	+ 3	31.8	40.2
Tiflis	E. 78.0	48	—	—	—	—	e 24.8	—
Ekaterinburg	89.6	34	13 8	- 6	24 9	- 1	37.8	43.4
Victoria	E. 91.5	320	—	—	—	—	43.9	48.2
	N. 91.5	320	—	—	—	—	39.7	42.4
Colombo	109.6	82	49 50	?L	—	—	(49.8)	65.8
Zi-ka-wei	137.9	38	e 21 56	?PR ₁	—	—	—	—

Additional readings and notes: San Fernando gives also MN = +26.3m. P is given as PR₁. Coimbra eL = +18.0m, MN = +21.2m. Toledo MNW = +26.5m. Algiers MN = +32.3m. Tortosa ePN has been increased by 20min. Mendoza readings have been diminished by 3min. Rocca di Papa eV = +6m.56s., eN = +9m.32s., ePE = +9m.52s., iN = +10m.2s., PR₁ = +13m.14s. Zurich ePZ = +9m.55s. De Bilt MN = +31.3m. Ottawa L = +40.8m. Toronto gives several other L's. Vienna P reading has been diminished by 10min. Pulkovo SR₁ = +26m.8s., SR₂ = +29m.38s., MN = +34.8m. Ekaterinburg MZ = +52.3m.

1923. Sept. 26d. 8h. 23m. 40s. Epicentre 35°0N. 139°5E.

(as on Sept. 17d.)

A = -.623, B = +.532, C = +.574; D = +.649, E = +.760;
G = -.436, H = +.372, K = -.819.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Nagoya	2.1	274	1 0	+27	(1 0)	+ 2	—	—
Osaka	3.4	266	1 1	+ 8	—	—	1.9	3.4
Kobe	3.6	266	0 59	+ 3	—	—	1.7	3.1
Mizusawa	4.3	17	1 15	+ 8	2 41	?L	2.7	—
Hakodate	6.8	7	2 1	+17	—	—	3.7	5.1
Nagasaki	8.4	257	1 57	-10	—	—	4.1	5.0
Ootomari	11.9	11	2 55	- 3	—	—	5.9	7.4

Continued on next page.

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Zi-ka-wei	15.6	261	i 3 41	-6	e 6 30	-16	—	11.0
Taihoku	18.4	242	3 15	-67	(6 44)	-65	6.7	12.4
Hong Kong	25.5	247	5 29	-14	10 7	-6	13.0	14.8
Manila	26.4	224	e 6 11	+19	—	—	—	—
Batavia	51.4	223	i 9 5	-11	i 16 21	-15	32.4	—
Simla	E. 51.5	284	16 20	?S	(16 20)	-18	28.2	29.4
	N. 51.5	284	16 20	?S	(16 20)	-18	27.3	28.9
Ekaterinburg	55.5	320	i 9 43	0	i 17 24	-4	24.3	41.2
Honolulu	E. 55.8	87	—	—	17 32	+1	25.0	26.5
	N. 55.8	87	—	—	—	—	25.1	28.0
Sitka	E. 58.7	40	e 10 55	+52	—	—	e 38.8	—
Bombay	60.5	275	10 18	+2	18 48	+18	32.3	38.7
Colombo	61.3	260	51 20	?	—	—	—	99.9
Kodalkanal	61.3	265	25 56	?	—	—	32.1	39.9
Victoria	E. 68.9	45	11 14	+4	20 25	+12	33.6	46.7
	N. 68.9	45	11 13	+3	20 25	+12	30.4	38.2
Pulkovo	68.9	330	11 18	+8	20 10	-3	32.8	44.5
Sydney	69.7	170	20 8	?S	(20 8)	-14	33.8	36.3
Tiflis	E. 70.7	310	—	—	—	—	39.0	42.3
Melbourne	73.0	176	—	—	(i 19 38)	-84	i 19.6	40.3
Upsala	73.9	334	e 11 45	+4	e 21 11	-2	e 35.3	47.5
Bergen	77.5	340	—	—	—	—	e 36.3	—
Hamburg	81.3	333	i 12 29	+2	e 22 39	+1	e 40.3	44.3
Vienna	82.6	326	i 12 31	-3	22 56	+3	e 42.3	54.3
Wellington	82.9	154	—	—	—	—	36.3	—
Belgrade	83.0	322	e 12 36	0	e 22 46	-11	e 41.5	—
Edinburgh	83.7	340	e 12 58	+18	23 8	+2	40.3	47.0
Eskdalemuir	84.2	340	e 13 20	+37	23 9	-1	38.3	44.2
De Bilt	84.2	334	—	—	23 5	-5	e 39.3	47.7
Stonyhurst	85.3	339	e 23 38	?S	(e 23 38)	+16	44.8	60.3
Uccle	85.5	334	e 12 46	-5	—	—	e 38.3	47.4
Innsbruck	85.5	328	e 12 50	-1	e 23 20	-5	e 43.3	—
Strasbourg	86.1	330	i 12 51	-3	i 23 29	-2	41.3	49.4
Helwan	86.4	304	e 12 53	-2	23 15	-19	—	—
Kew	86.6	337	—	—	—	—	—	53.3
Zurich	86.7	329	e 12 53	-4	—	—	e 45.3	—
Oxford	87.0	337	—	—	i 23 34	-7	37.3	51.5
Paris	87.9	333	e 13 0	-4	e 23 28	-23	45.3	58.3
Besangon	87.9	330	—	—	—	—	—	46.3
Florence	88.2	325	12 20?	-46	23 50	-4	—	44.8
Moncalieri	88.9	328	13 25	+15	24 4	+2	41.0	56.8
Pompeii	88.9	321	12 0	-70	23 0	-62	51.3	—
Rocca di Papa	89.1	323	e 12 45	-26	23 53	-11	45.8	60.6
Marselles	91.2	329	—	—	—	—	49.3	—
Chicago	91.9	33	16 54	?PR ₁	23 38	[-1]	e 44.3	—
Ann Arbor	93.2	30	—	—	e 23 56	[+9]	47.3	—
Ottawa	93.6	23	—	—	e 24 32	-20	e 47.3	55.3
Toronto	E. 93.7	27	—	—	e 23 52	[+2]	49.5	56.8
	N. 93.7	27	10 39	?	i 23 55	[+5]	52.8	63.6
Barcelona	94.1	329	—	—	e 23 51	[-1]	—	53.0
Tortosa	N. 95.3	330	—	—	—	—	e 49.3	55.0
Ithaca	95.8	26	—	—	e 37 50	?	52.3	—
Algers	97.5	326	—	—	e 24 39	[+28]	—	63.3
Toledo	97.9	333	—	—	e 28 2	?SR ₁	—	57.1
Georgetown	N. 98.7	28	—	—	—	—	—	57.1
Colmbra	99.2	335	e 17 51	?PR ₁	e 25 13	[+53]	e 44.2	59.0
Rio Tinto	100.7	334	24 20	?S	(24 20)	[-7]	—	62.3
Lisbon	100.8	335	—	—	—	—	e 46.1	—
San Fernando	101.7	333	—	—	52 38	?L	61.3	64.3
La Paz	149.2	60	i 19 58	[+4]	—	—	76.2	80.3
Cipolletti	157.7	109	75 26	?L	—	—	84.4	85.8

Additional readings and notes: Kobe gives also MN = +4.2m. Mizusawa SN = +2m.40s. Hakodate MN = +4.7m. Nagasaki MN = +6.0m. Ootomari MN = +7.6m. Zi-ka-wei MN = +9.6m. Taihoku MN = +15.1m. Simla eSEN = +20m.38s. Ekaterinburg MN = +31.3m., eE = +35.5m. Honolulu eE = +14m.28s., eN = +15m.37s. and +23m.31s. Sitka ePE = +6m.27s., eLN = +37.3m. Pulkovo PR₁ = +15m.48s., PS = +21m.10s., SR₁ = +25m.20s., SR₂ = +28m.2s., SR₃ = +29m.32s., MN = +38.0m. Tiflis eN = +3m.56s., eE = +9m.14s., eN = +12m.38s., eE = +13m.38s., eN = +27m.8s., eE = +34m.14s., MN = +35.9m. Upsala MN = +43.3m. Hamburg PR₁ = +15m.34s., eE = +55.4m. Vienna PR₁ = +15m.41s., PS₁ = +26m.11s. Belgrade IP = +12m.39s., L = +51.3m. Eskdalemuir MN = +45.5m. De Bilt MN = +53.4m.,

Continued on next page.

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MZ = +57.1m. Strasbourg MN = +54.2m. Paris MN = 50.3m. Moncalieri MN = +52.2m. Rocca di Papa ePN = +12m.47s., iN = +14m.59s., eE = +15m.14s., S = +16m.26s., iS = +16m.41s. Ottawa eL? = +41.3m. Toronto PN = +11m.26s. and several other L's. Barcelona MN = +53.5m. Algiers PR, = +17m.44s., readings given for 30d. Toledo MNW = +57.0m. Georgetown LN = +66.4m. Coimbra eN = +25m.1s. La Paz MN = +85.0m., all readings have been increased by 6m.

Sept. 26d. Readings also at 4h. (near Mizusawa), 5h. (Sarajevo), 7h. (Rocca di Papa), 9h. (near Osaka and Mizusawa), 11h. (Florence and Nagasaki), 13h. and 14h. (Ekaterinburg), 16h. and 17h. (Sarajevo), 20h. (near Mizusawa), 22h. (Belgrade).

Sept. 27d. 7h. 1m. 0s. Epicentre 8°-0N. 126°-5E.

A = -589, B = +796, C = +139 ; D = +804, E = +595 ;
G = -083, H = +112, K = -990.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	o	s.	m. s.	s.	m. s.	s.	m.	m.
Manila	8.5	321	e 2 22	+13	—	—	6.3	6.8
Taihoku	17.7	345	—	—	e 7 34	+ 1	—	—
Hong Kong	18.6	322	4 22	- 2	8 5	+12	9.7	10.7
Zi-ka-wei	23.7	349	e 5 19	- 6	e 9 19	-19	—	—
Batavia	24.2	235	1 5 35	+ 5	i 10 4	+16	—	—
Malabar	24.2	232	i 5 29	- 1	—	—	—	—
Adelaide	44.4	166	—	—	—	—	—	26.4
Kolombo	46.2	271	8 42	+ 1	—	—	—	30.0
Kodaikanal	48.5	276	29 0	?L	—	—	(29.0)	—
Melbourne	48.9	160	—	—	(15 1)	-64	15.1	31.0
Bombay	53.1	287	e 9 24	- 3	16 54	- 3	26.9	38.2
Ekaterinburg	70.2	328	i 11 21	+ 3	20 27	- 1	34.0	40.1
Honolulu	73.6	70	21 13	?S	(21 13)	+ 4	—	—
Tiflis	78.5	311	—	—	e 21 12	-54	49.3	51.3
Pulkovo	86.3	330	12 48	- 7	23 23	-10	40.0	54.2
Upsala	92.4	332	—	—	—	e 51.0	60.6	—
Victoria E.	97.0	39	24 20	?S	(24 20)	-66	45.8	52.5
Hamburg	98.6	327	—	—	—	e 54.0	—	—
De Bilt	102.0	327	—	—	—	e 52.0	57.8	—
Florence	102.0	318	23 0	?	—	—	41.0	57.0
Strasbourg	102.2	323	—	—	—	—	55.0	—
Uccle	102.7	326	—	—	—	e 51.0	—	—
Edinburgh	103.9	333	—	—	—	e 61.0	68.0	—
Ottawa	123.0	17	—	—	e 35 48	?	64.0	—
Toronto E.	123.3	21	25 21	?S	(25 21)	?	e 70.2	—
N.	123.3	21	25 15	?S	(25 15)	?	41.0	—
La Paz	163.4	122	20 27	[+17]	—	—	—	—

Additional readings and notes : Manila gives also MN = +6.6m. Ekaterinburg PR, = +14m.0s., MZ = +44.0m. Tiflis eN? = +17m.24s. Pulkovo MN = +48.4m. Victoria MN = +56.8m. De Bilt MN = +57.2m., MZ = +67.6m. Strasbourg e = +44m.0s. Ottawa eL? = +40.6m. Toronto 1E = +36m.30s., SN = +37m.38s., SE = +37m.40s., eSN = +39m.45s., LE = +78.0m. and +88.0m., iN = +99m.8s.

Sept. 27d. 22h. 57m. 30s. Epicentre 41°-0N. 19°-5E.

A = +711, B = +252, C = +656 ; D = +334, E = -943 ;
G = +618, H = +219, K = -755.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	o	s.	m. s.	s.	m. s.	s.	m.	m.
Mostar	2.6	332	10 41	0	i 11 13	+ 1	—	1.5
Sarajevo	3.0	345	i 0 38	- 9	i 2 6	+43	—	2.2
Athens	4.5	131	—	—	e 2 4	0	2.6	—
Rocca di Papa E.	5.2	281	e 1 20	0	e 1 53	-29	—	4.0
N.	5.2	281	e 1 26	+ 6	e 1 55	-27	—	3.6
Venice	6.8	312	e 3 25	?L	3 48	?L	(3.4)	4.7
Vienna	7.6	344	e 2 28	+33	—	—	—	4.5
Innsbruck	8.5	321	—	—	e 3 17	-33	—	—
De Bilt	14.8	324	—	—	—	e 9.5	—	—

Additional readings : Mostar gives also iP = +47a. Venice MN = +5.1m.

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Sept. 27d. Readings also at 0h. (near Lick), 3h. (near La Paz), 9h. (near Athens), 11h. (Sarajevo and Ekaterinburg), 12h (2), 13h., 15h. (2), and 17h. (Sarajevo), 20h. (Nagasaki and near Athens), 21h. (Mizusawa, Osaka, and Ekaterinburg), 22h. (Nagoya).

Sept. 28d. 21h. 0m. 12s. Epicentre 3°-0N. 85°-0W.

A = +.087, B = -.995, C = +.052; D = -.996, E = -.087;
G = +.005, H = -.052, K = -.999.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Balboa Heights	E.	8-1	42	1 46	-17	3 34	- 6	4-5	5-0
	N.	8-1	42	1 54	- 9	3 42	+ 2	4-7	4-7
La Paz		25-6	140	15 39	- 5	1 10 4	-10	13-3	16-3
Chicago		38-9	357	12 29	?	16 46	?	SR ₁	—
Mendoza		39-2	157	17 18	?	—	—	20-6	21-5
Ann Arbor		39-3	2	—	—	e 15 24	+88	e 22-8	—
Toronto	E.	41-0	7	e 12 41	?	e 14 38	+17	e 20-8	21-1
	N.	41-0	7	e 12 43	?	e 14 37	+16	e 25-6	26-6
Ottawa		43-2	11	—	—	e 14 58	+ 7	e 18-6	22-8
Cipolletti		44-7	162	18 18	?	—	—	21-7	23-6
Rio de Janeiro		48-3	125	—	—	e 15 56	- 2	24-3	—
Victoria	E.	56-0	331	18 8	?	18 8	+34	28-5	35-4
	N.	56-0	331	18 18	?	18 18	+44	29-8	35-0
Honolulu	E.	73-1	291	—	—	—	—	e 34-2	—
Paris		86-2	41	—	—	—	—	e 43-8	—
Uccle		87-3	40	—	—	e 23 48	+ 4	e 41-8	44-8
De Bilt	E.	87-7	39	—	—	e 24 5	+16	e 42-8	45-8
Strasbourg		89-6	42	—	—	—	—	e 43-8	—
Pulkovo		99-8	27	—	—	e 31 43	?	SR ₁	48-8
Ekaterinburg		114-1	20	—	—	29 44	+101	46-8	61-8

Additional readings: La Paz gives also MN = +19-9m., T₁ = 21h.0m.18s.
Toronto e = +17m.40s., eSN = +17m.51s., LE = 29-6m., eLE = +37-8m.
Rio de Janeiro S = +20m.40s. Uccle e = +30m.0s. (SR₁). De Bilt
eLN = +39-8m.

Sept. 28d. Readings also at 0h. (Athens), 3h. (Apia, Moncalieri, and Rocca di Papa), 11h. (La Paz and Colombo), 15h. (Ekaterinburg), 18h. (Ekaterinburg and near Taihoku), 19h. (Ekaterinburg), 20h. (near Osaka, Kobe, and Nagoya).

Sept. 29d. 3h. 0m. 40s. Epicentre 36°-0N. 133°-0E. (as on 1918 Nov. 24d.).

A = -.601, B = +.541, C = +.588.

		Δ	P.	O-C.	S.	O-C.	L.	M.
		°	m. s.	s.	m. s.	s.	m.	m.
Nagoya		1-2	0 34	+16	—	—	0-9	1-2
Kobe		2-7	0 50	+ 8	—	—	1-6	1-7
Mizusawa	E.	4-0	1 3	+ 1	1 49	- 1	—	—
	N.	4-0	1 4	+ 2	1 47	- 3	—	—

No additional readings.

Sept. 29d. 6h. 49m. 30s. Epicentre 22°-0N. 123°-5E. (as on 1923 Feb. 20d.).

A = -.512, B = +.773, C = +.375; D = +.834, E = +.552;
G = -.207, H = +.312, K = -.927.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Taihoku		3-5	330	1 1	+ 6	—	—	1-6	1-7
Hokoto		4-0	293	1 7	+ 5	—	—	1-1-3	—
Manila		7-8	198	—	—	e 3 30	- 1	—	—
Hong Kong		8-6	274	1 44	-26	3 30	-23	3-9	4-5
Zi-ka-wai		9-4	348	e 3 0	+38	—	—	—	5-2
Bombay		47-4	275	e 18 28	?	SR ₁	—	—	—
Ekaterinburg		57-0	325	9 46	- 6	17 29	-17	25-5	30-5

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Pulkovo	72.7	329	—	—	e 20 30	-28	35.5	39.4
Vienna	84.4	321	e 12 38	-6	—	—	—	51.5
De Bilt	88.6	328	—	—	—	—	e 46.5	48.7
Strasbourg	89.2	324	—	—	—	—	e 46.5	—
Florence	89.6	320	e 56 0	?	—	—	—	86.5
Uccle	89.7	327	—	—	—	—	e 46.5	—
Rocca di Papa	89.8	317	e 13 15	0	—	—	—	54.3
Edinburgh	90.0	337	—	—	—	—	—	46.5
Moncalieri	91.2	321	e 11 19	-123	22 56	-90	35.1	—
Paris	91.9	326	—	—	—	—	e 51.5	53.5
Ottawa	110.3	14	—	—	—	—	e 56.5	—

Additional readings and notes : Zi-ka-wei gives also MN = +6.5m. Ekaterinburg MZ = +36.4m. De Bilt MN = +48.6m.

Sept. 29d. Readings also at 0h. and 3h. (Nagasaki), 5h. (Taihoku, Rocca di Papa, Moncalieri, Sarajevo, and Venice), 12h. (Vienna and Apia), 13h. (Ekaterinburg and near Osaka), 14h. (Nagasaki), 15h. (La Paz), 17h. (Ekaterinburg), 18h. (Manila), 19h. (Rocca di Papa), 21h. (Batavia and Malabar), 22h. (Alicante), 23h. (Barcelona).

1923. Sept. 30d. 1h. 20m. 35s. Epicentre 54°-5N. 33°-0W.

A = +.487, B = -.316, C = +.814; D = -.545, E = -.839;
G = +.683, H = -.443, K = -.581.

See Vessels' observations in introductory note to summary.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Edinburgh	16.9	73	4 9	+ 5	8 18	+62	9.4	15.8
Stonyhurst	17.7	79	4 27	+24	7 43	+10	—	11.7
West Bromwich	18.4	83	4 27	+ 5	e 7 46	- 3	—	—
Oxford	19.0	85	4 28	- 1	8 22	+20	10.1	12.0
Kew	19.7	85	5 25	+48	—	—	—	12.4
Bergen	21.1	58	4 42	-12	e 9 25	+39	e 12.4	14.4
Coimbra	21.7	121	4 53	- 8	(8 43)	-16	8.7	9.3
Lisbon	22.5	125	4 6	-65	7 54	-81	—	—
De Bilt	22.6	80	5 12	- 0	9 25	+ 8	11.4	13.7
Uccle	22.7	84	e 5 11	- 2	9 15	- 4	e 10.4	12.4
Toledo	24.2	115	5 19	-11	i 9 40	- 8	e 10.4	11.6
Puy de Dôme	24.3	96	e 5 30	- 1	9 56	+ 6	—	—
Rio Tinto	24.5	122	5 25	- 8	—	—	—	13.4
Hamburg	24.9	74	e 5 41	+ 4	i 10 27	+26	14.4	17.5
Besançon	25.3	90	5 51	+10	10 18	+ 9	—	13.4
Strasbourg	25.6	86	5 37	- 7	10 30	+16	13.4	23.7
San Fernando	25.8	123	i 5 39	- 7	i 9 46	-32	10.9	18.9
Tortosa	26.0	108	5 45	- 3	10 8	-14	11.0	24.2
	26.0	108	5 45	- 3	10 9	-13	12.4	12.5
Barcelona	26.5	105	5 55	+ 2	e 10 36	+ 4	11.5	15.8
Granada	26.5	119	5 47	- 6	i 9 25	-67	i 10.8	13.8
Zurich	26.7	88	e 5 58	+ 3	10 38	+ 3	—	—
Upsala	27.2	58	6 9	+ 9	e 11 19	+34	e 13.4	19.1
Marseilles	27.2	98	e 6 7	+ 7	10 46	+ 1	13.9	—
Northfield	27.4	265	6 21	+19	10 51	+ 3	13.2	16.4
Moncalieri	27.5	92	6 1	- 2	10 39	-11	13.9	14.5
Innsbruck	28.4	86	i 6 22	+10	e 11 45	+39	e 14.4	16.3
Ottawa	28.5	269	6 21	+ 8	11 7	- 1	e 13.4	19.4
Venice	29.9	89	e 6 25	- 2	10 7	-85	13.4	26.1
Fordham	30.1	261	6 6	-23	e 11 9	-27	14.7	18.8
Algiers	30.3	111	6 21	-10	11 19	-20	12.6	15.1
Florence	30.3	91	e 6 32	+ 1	e 11 25	-14	12.6	27.4
Ithaca	30.7	265	e 6 28	-10	11 7	-39	12.6	17.7
Vienna	30.8	82	6 38	+ 2	12 41	+53	e 13.4	17.9
Toronto	31.6	270	e 6 44	+ 1	i 13 3	+62	i 15.5	20.1
	31.6	270	6 42	- 1	13 4	+63	i 15.4	20.7
Rocca di Papa	32.3	93	e 6 39	-12	i 12 3	-10	e 17.5	18.2
Budapest	32.7	80	7 32	+38	—	—	—	e 16.8
Georgetown	33.3	261	1 6 55	- 4	i 12 25	- 4	e 15.6	19.8
	33.3	261	e 6 58	- 1	i 12 27	- 2	e 15.6	21.0

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		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Washington		33.3	261	e 6 58	- 1	12 25	- 4	16.4	20.0
Cheltenham	E.	33.3	260	e 7 8	+ 9	13 17	+48	16.9	20.8
	N.	33.3	260	e 7 2	+ 3	13 18	+49	16.8	20.8
Pulkovo		33.4	55	i 17 5	+ 5	12 32	+ 2	15.9	25.9
Pompeii		34.0	93	e 7 25	+20	13 5	+25	18.4	25.4
Lemberg		34.3	76	e 7 49	+42	e 14 7	+83	e 20.5	22.0
Sarajevo		34.4	87	i 17 13	+ 5	e 14 49	+123	e 18.5	—
Ann Arbor		34.9	270	e 7 19	+ 7	12 55	+ 1	17.6	21.8
Belgrade		35.0	84	e 7 10	- 3	i 13 44	+49	e 17.0	19.6
Chicago		37.5	272	e 7 35	+ 1	13 20	-11	—	19.4
Athens		41.3	90	e 7 57	- 8	e 14 16	- 9	e 22.1	26.5
Porto Rico	E.	44.0	228	—	—	—	—	20.3	21.4
	N.	44.0	228	e 8 19	- 7	14 46	-16	20.0	15.0
Mobile	E.	45.5	262	e 8 50	+13	15 30	+ 9	23.8	—
Ekaterinburg		48.6	48	i 9 9	+11	16 16	+15	19.4	28.9
Denver		48.9	282	e 8 25	-34	—	—	24.4	28.4
Tifis		50.7	70	e 8 37	-34	e 15 43	-44	e 23.4	32.1
Sitka	E.	52.0	317	—	—	17 27	+43	e 29.4	34.6
	N.	52.0	317	—	—	17 27	+43	27.3	31.0
Victoria	E.	52.7	304	e 8 52	-32	17 16	+24	22.1	33.2
	N.	52.7	304	e 9 2	-22	17 14	+22	22.1	31.9
Accra		55.7	140	21 25	?L	—	—	21.4	37.9
Tucson	N.	57.5	281	e 10 30	+34	18 6	+13	28.2	34.2
Balboa Heights	N.	58.6	236	e 9 37	-26	(17 5)	-61	17.1	19.2
Berkeley		59.7	293	10 32	+22	—	—	e 25.9	35.5
Simla	E.	75.6	56	20 55	?S	(20 55)	-38	39.4	43.0
	N.	75.6	56	20 19	?S	(20 19)	-74	38.9	45.6
La Paz		77.0	215	i 12 6	+ 5	i 22 1	+12	i 26.1	40.2
Rio de Janeiro		77.9	190	e 13 40	+94	22 33	+34	33.6	40.4
Bombay		83.4	66	12 41	+ 3	23 6	+ 5	—	54.4
Calcutta	E.	88.1	52	15 27	?PR ₁	—	—	—	—
Pilar	E.	90.2	206	23 19	?S	(23 19)	-57	50.9	51.6
	N.	90.2	206	22 49	?S	(22 49)	-87	50.4	55.2
Honolulu	E.	90.9	310	e 13 48	+27	24 56	+33	—	50.3
	N.	90.9	310	e 13 42	+21	25 3	+40	42.9	49.9
Zi-ka-wel		91.5	21	—	—	e 25 41	+72	—	—
Mendoza		92.6	209	17 37	?PR ₁	—	—	39.9	42.2
Kodaikanal		93.2	68	20 7	?PR ₁	—	—	53.0	61.2
Taihoku		97.5	24	42 11	?L	—	—	(42.2)	—
Hong Kong		98.2	30	27 15	?S	(27 15)	+97	—	—
Cipolletti		98.2	207	24 25	?S	(24 25)	[+11]	51.2	55.6
Manila		107.4	26	e 19 25	?PR ₁	—	—	—	—
Wellington		157.4	294	e 38 1	?	—	—	e 75.9	82.4
Adelaide		159.6	20	—	—	e 87 1	?L	(e 87.0)	110.4
Melbourne		163.2	6	—	—	—	—	e 88.0	96.9

Additional readings and notes: West Bromwich gives also $iS = +8m.1s$.
 Coimbra $S_1 = +7m.27s.$, $SN = +7m.37s.$, $SR_1 = +7m.46s.$, $T_0 = 1h.21m.54s.$
 Paris ($\Delta = 22^\circ.5$) gives $P = 1h.5m.$ De Bilt $eE = +9m.33s.$, $MN = +13.5m.$,
 MZ = +14.2m. Uccle $iP = +5m.21s.$, $iS = +9m.26s.$, $MN = +12.9m.$
 Toledo $PR_1 = +5m.31s.$, $PR_2 = +6m.10s.$, $PR_3 = +6m.28s.$, $MNW = +11.2m.$
 Hamburg $MN = +16.2m.$ Strasbourg $MN = +28.6m.$ San Fernando
 $MN = +11.4m.$ Barcelona $PR_1 = +6m.34s.$ Upsala $MN = +19.3m.$
 Venice $iPN = +6m.44s.$, $+8m.17s.$ Florence $eP = +6m.35s.$ Vienna
 $PR_1 = +8m.43s.$, $MZ = +20.4m.$, and several other i 's. Toronto gives
 many other i 's, also a separate set of readings for both components. Rocca
 di Papa $eP = +6m.42s.$, $i = +6m.53s.$, $iSE = +14m.4s.$, $eLN = +17.4m.$
 Washington $PR_1 = +8m.25s.$ Cheltenham $eE = +10m.29s.$ and
 $+13m.40s.$, $eN = +13m.48s.$, $eE = +14m.13s.$, $eN = +14m.20s.$, $T_0 =$
 $1h.21m.6s.$ Pulkovo $PR_2 = +8m.26s.$, $SR_1 = +14m.13s.$, $MN = +22.6m.$,
 $MZ = +24.8m.$ Sarajevo $PR_1 = +11m.53s.$ Ann Arbor $SR_1 =$
 $+14m.37s.$, $MN = +23.4m.$, $T_0 = 1h.20m.54s.$ Belgrade $iP = +7m.19s.$,
 $PR_1 = +8m.12s.$ Athens $i = +8m.9s.$, $MN = +32.5m.$, $T_0 = 1h.20m.32s.$
 Porto Rico $PR_2 = +10m.13s.$, $eE = +18m.5s.$, $eN = +18m.22s.$, $T_0 =$
 $1h.20m.45s.$ Mobile $LN = +24.2m.$, $T_0 = 1h.21m.0s.$ Ekaterinburg
 $PR_1 = +11m.3s.$, $MN = +27.4m.$, $MZ = +29.0m.$ Tifis $MN = +30.1m.$
 All readings have been diminished by 10min. Sitka $eE = +33m.50s.$,
 $eN = +35m.18s.$, $T_0 = 1h.20m.26s.$ Tucson $ePR_1 = +12m.43s.$, $eSE =$
 $+18m.25s.$, $SR_1 = +23m.34s.$, $T_0 = 1h.20m.49s.$ Balboa Heights $MN =$
 $+18.8m.$ Berkeley $iZ = +11m.8s.$, $eE = +25m.20s.$, $eZ = +25m.32s.$
 Simla $SN = +25m.55s.$ La Paz $MN = +38.7m.$, $T_0 = 1h.20m.45s.$
 Calcutta $PN = +15m.39s.$ Honolulu $eE = +37m.56s.$, $eN = +37m.52s.$
 $T_0 = 1h.21m.1s.$ Wellington gives several other e readings. Adelaide
 $e = +88m.1s.$, $SR_1 = +92m.49s.$, $e = +94m.55s.$, $eSR_1 = +95m.55s.$, $eSR_2 =$
 $+97m.25s.$, $e = +100m.25s.$, $eL = +102.1m.$ Melbourne eL has been
 increased by 1h.

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Sept. 30d. 23h. 10m. 15s. Epicentre 35°·5N. 77°·0E.

A = +·183, B = +·793, C = +·581; D = +·974, E = -·225;
G = +·131, H = +·566, K = -·814.

	Δ	Az.	P.		O-C.		S.		O-C.		L.	M.
			m.	s.	s.	m.	s.	m.	s.			
Simla	4·4	178	e 1	3	- 5	e 2	3	+ 2	—	—	—	—
Dehra Dun	5·2	171	1	2	-18	(2 16)	—	- 6	2·3	2·6	—	—
Calcutta E.	16·3	140	6	57	?S	(6 57)	—	- 5	8·7	—	—	—
Bombay	17·0	194	4	22	+17	—	—	—	—	—	—	—
Ekaterinburg	24·0	338	—	—	—	e 9	47	+ 3	13·2	15·4	—	—
Tifis	25·8	293	—	—	—	e 11	9	+51	e 21·4	22·6	—	—
Pulkovo	38·5	324	—	—	—	e 14	33	+48	—	—	—	—
Nagasaki	43·3	79	11	52	?	—	—	—	—	—	—	—
De Bilt	52·1	313	—	—	—	—	—	—	e 35·8	—	—	—

Additional readings and notes: Simla readings are given as eE and eN respectively. Calcutta PN = +6m.45s. Tifis eE = +11m.33s., e = +15m.51s., MN = +32·6m. All readings given for 0h. on Oct. 1d.

Sept. 30d. Readings also at 0h. (Ekaterinburg), 3h. (Kodaikanal), 4h. (near Mizusawa), 5h. (Sarajevo), 6h. (near Osaka and near Mizusawa), 7h. (near Taihoku), 8h. (Victoria), 9h. (Azores), 10h. (Azores and near Taihoku), 11h. (De Bilt), 12h. (Ekaterinburg), 13h. (Azores, Ekaterinburg and Sarajevo (4)), 14h. (Sarajevo), 16h. (Azores), 17h. (Sarajevo (2)), 18h. (Tucson).

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TABLE.

De- grees.	P sec.	S sec.	S - P sec.	De- grees.	P sec.	S sec.	S - P sec.	De- grees.	P sec.	S sec.	S - P sec.
1	15	28	13	51	553	991	438	101	855	1565	710
2	31	55	24	52	560	1004	444	102	860	1575	715
3	47	83	36	53	566	1016	450	103	865	1584	719
4	62	110	48	54	573	1029	456	104	870	1593	723
5	77	137	60	55	579	1041	462	105	874	1602	728
6	92	164	72	56	586	1054	468	106	879	1612	733
7	106	190	84	57	592	1066	474	107	884	1621	737
8	121	217	96	58	599	1079	480	108	888	1630	742
9	136	243	107	59	605	1091	486	109	893	1639	746
10	150	269	119	60	612	1103	491	110	897	1648	751
11	164	294	130	61	619	1116	497	111	902	1657	755
12	179	319	140	62	625	1128	503	112	907	1666	759
13	193	344	151	63	632	1141	509	113	911	1674	763
14	206	368	162	64	638	1153	515	114	916	1682	766
15	219	392	173	65	645	1165	520	115	920	1690	770
16	232	415	183	66	651	1177	526	116	925	1698	773
17	245	438	193	67	658	1190	532	117	929	1706	777
18	257	460	203	68	664	1202	538	118	934	1714	780
19	269	482	213	69	671	1214	543	119	938	1722	784
20	281	503	222	70	677	1226	549	120	942	1729	787
21	293	524	231	71	683	1238	555	121	947	1737	790
22	305	545	240	72	690	1250	560	122	952	1744	792
23	317	565	248	73	696	1262	566	123	957	1752	795
24	328	584	256	74	702	1274	572	124	961	1759	798
25	338	603	265	75	709	1286	577	125	966	1766	800
26	348	622	274	76	715	1297	582	126	970	1773	803
27	358	641	283	77	721	1309	588	127	974	1780	806
28	368	659	291	78	727	1320	593	128	978	1787	809
29	378	677	299	79	733	1332	599	129	983	1794	811
30	388	694	306	80	739	1343	604	130	988	1801	813
31	398	711	313	81	745	1355	610	131	992	1807	815
32	407	728	321	82	750	1366	616	132	996	1814	818
33	416	744	328	83	756	1377	621	133	1001	1821	820
34	425	760	335	84	762	1388	626	134	1005	1827	822
35	433	775	342	85	768	1399	631	135	1009	1833	824
36	442	790	348	86	773	1410	637	136	1014	1840	826
37	450	804	354	87	779	1421	642	137	1018	1846	828
38	458	818	360	88	785	1432	647	138	1023	1852	829
39	466	832	366	89	790	1443	653	139	1027	1858	831
40	475	847	372	90	796	1454	658	140	1031	1864	833
41	483	861	378	91	801	1464	663	141	1035	1869	834
42	491	875	384	92	807	1475	668	142	1039	1875	836
43	498	888	390	93	812	1485	673	143	1043	1881	838
44	506	902	396	94	818	1496	678	144	1047	1886	839
45	513	915	402	95	823	1506	683	145	1051	1892	841
46	520	928	408	96	829	1516	687	146	1055	1897	842
47	527	941	414	97	834	1526	692	147	1059	1902	843
48	534	954	420	98	840	1536	696	148	1063	1907	844
49	540	966	426	99	845	1546	701	149	1067	1912	845
50	547	979	432	100	851	1556	705	150	1071	1917	846

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