The International Seismological Summary for 1919

(APRIL, MAY, JUNE).

FORMERLY THE BULLETIN OF THE BRITISH ASSOCIATION SEISMOLOGY COMMITTEE.

The practice of retaining an old Epicentre when it gives small residuals has been found increasingly convenient. It is not difficult to estimate the appropriate change where necessary or its effect on the residuals; and meanwhile there is a clear gain in associating earthquakes in the same neighbourhood, even if not from actually the same focus. The economy of calculation is also a consideration, in view of the rapid growth of the work. Many more records become available as we begin to leave the restricted years of the War behind.

Attention may be called to the following cases of "deep focus" (positive) and "high focus" (negative):—

Date.				Epicentre.		Focal Depth.
	d.	h.	m.	s.	°	°	
April	17	20	53	5	14·5N.	91·0W.	+·010
April	30	7	16	55	[19·5S.	173·0W.]	—·015
May	3	0	51	55	40·7N.	145·8E.	+·005
May	6	19	40	45	6·0S.	153·0E.	—·030
May	29	10	59	45	31·5N.	100·5E.	—·020
June	1	6	51	13	25·7N.	124·8E.	+·040

In most of these cases a discussion of the evidence is given; for although the assumptions on which these reductions are based have now been before the seismological public for some two years, there have as yet been no independent opinions expressed as to their validity as far as I am aware. Outside criticism would be cordially welcomed.

It seems impossible to allow a message of any kind, however formal, to go out to seismologists without some reference to the great loss our Science has sustained in the death of Professor Omori.

H. H. TURNER.

University Observatory, Oxford,
1924 February 1.

1919 APRIL, MAY, & JUNE.

April 1d. Records at 0h. (Rio Tinto), 1h. (Athens and Taihoku), 4h. (Helwan (2) and San Fernando), 8h. (Osaka, Kobe, and Taihoku), 9h. (Edinburgh), 10h., 11h. (2) and 12h. (Taihoku), 13h. (Helwan), 14h. (Batavia), 20h. (Taihoku and Tokyo), 21h. and 22h. (La Paz).

1919. April 2d. 0h. 34m. 48s. Epicentre 6·0S. 105·0E.

A = −·257, B = +·961, C = −·104; D = +·966, E = +·259; G = +·027, H = −·101, K = −·994.

It seems probable that there were two shocks; see, for instance, the Manila records and note. The adopted solution is for the shock which reached the distant stations.

Station and Component.		Δ °	Az. °	P. m. s.	O−C. s.	S. m. s.	O−C. s.	L. m.	M. m.
Batavia		1·9	96	i 1 11	+42	—	—	—	—
Manila		26·0	38	e 5 42	− 6	(e 9 22)	−60	6·5	6·8
Perth		27·9	160	5 32	−35	—	—	—	—
Colombo		28·2	297	(6 30)	+20	(10 36)	−27	10·6	12·2
Kodaikanal		31·9	301	6 54	+ 8	(11 6)	−61	11·1	20·1
Calcutta		32·8	332	7 12	+17	11 54	−27	—	—
Taihoku		34·9	28	e 8 2	+50	—	—	—	—
Bombay		40·3	310	7 40	−17	—	—	—	21·9
Zi-ka-wei		40·4	22	e 7 43	−15	e 13 48	−25	—	—
Adelaide		42·4	137	6 51	−83	14 22	−18	23·6	26·2
Simla		45·6	327	e 9 12	+35	15 12	−10	23·7	24·2
Melbourne		48·3	137	9 0	+ 4	16 6	+ 8	23·3	31·7
Osaka		49·8	34	9 5	− 1	16 16	0	24·2	33·4
Riverview		51·0	130	e 9 16	+ 3	e 16 29	− 2	e 24·3	30·4
Sydney		51·0	130	9 18	+ 5	16 42	+11	25·9	31·5
Tokyo		52·9	35	18 34	?	18 53	?	—	—
Mizusawa	E.	55·4	34	9 48	+ 6	17 32	+ 6	—	—
	N.	55·4	34	9 49	+ 7	17 29	+ 3	—	—
Helwan	E.	79·0	304	12 36	+23	—	—	—	46·7
	N.	79·0	304	21 48	?S	(21 48)	−24	—	51·7
Capetown		83·8	237	40 18	?L	—	—	(40·3)	52·3
Lemberg		88·7	321	e 13 0	− 9	23 18	−42	—	23·7
Vienna	E.	93·5	320	i 13 34	− 1	i 24 22	−29	e 55·2?	—
Pompeii		94·3	311	13 27	−13	24 17	−42	25·2	—
Monte Cassino	N.	94·8	312	23 17	?S	(23 17)	−107	—	25·0
Pola		95·0	316	e 13 34	− 9	23 56	−70	e 41·2	—
Rocca di Papa		95·7	312	17 30	?PR_1	25 30	+17	—	—
Hamburg		97·8	324	e 13 42	−17	i 24 11	−83	e 48·2	60·2
Zurich		98·8	317	e 14 12	+ 8	e 24 13	−91	—	—
Strasbourg		99·3	318	—	—	e 24 10	−99	e 54·7	56·2
Moncalieri		99·4	315	13 42	−25	24 17	−93	37·8	—
De Bilt		100·8	322	—	—	i 24 27	−96	e 51·2	64·2
Uccle		101·4	321	e 17 12	?	e 24 24	−105	—	63·2
Paris		102·7	320	—	—	i 24 36	−105	57·2	59·2
Algiers		103·1	307	—	—	—	—	10·2	—
Shide		104·9	321	—	—	i 25 28	−73	—	—
Edinburgh		105·1	326	25 12	?S	(25 12)	−91	—	66·2
Eskdalemuir		105·2	326	24 50	?S	(24 50)	−114	52·2	—
Bidston		105·5	324	27 30	?S	34 30	?SR_1	—	60·9
San Fernando		110·6	307	33 12	?SR_1	—	—	—	80·2
Ottawa		140·5	359	22 34	?PR_1	—	—	e 71·2	—
Chicago		142·5	12	19 47	[+ 3]	—	—	56·2	—
Harvard		143·4	353	e 77 41	?L	—	—	80·7	—
Washington		147·0	1	i 19 50	[− 1]	29 58	−104	—	—
La Paz		156·5	197	20 12	[+ 8]	34 31	?	76·2	79·7

Additional records: Manila gives its S as e of another shock. Calcutta SN = +11m.48s. Zi-ka-wei T_g = 0h.34m.50s. Adelaide PR_1 = +9m.56s., SR_1 = +17m.31s. Melbourne SR_1 = +19m.42s. Osaka MN = +36·7m., T_g = 0h.34m.51s. Riverview PR_1 = +11m.12s., eS = +16m.48s., PS = +17m.2s., SR_1 = +19m.34s., MN = +32·7m., T_g = 0h.35m.0s. Sydney SR_1 = +20m.12s., M = +33·9m. Vienna iPZ = +13m.18s., iSN = +24m.31s. De Bilt iE = +26m.49s., MN = +58·7m. Eskdalemuir iE = +27m.36s., LE = +55·2m., LN = 61·2m. San Fernando MN = +69·2m. Chicago L = +65·7m. and +107·2m.

April 2d. Records also at 4h. (Helwan), 19h. (Helwan, De Bilt, and Capetown), 22h. (San Fernando), 23h. (Berkeley).

April 3d. Records at 0h. (La Paz), 1h. (Denver), 5h. (San Fernando), 7h. and 8h. (Helwan), 10h. and 11h. (La Paz), 12h. (Taihoku), 13h. (La Paz), 17h. (Manila), 18h. (Rio Tinto and La Paz), 19h. (La Paz), 20h. (San Fernando).

April 4d. Records at 1h. (Athens), 11h. (Tokyo), 13h. (Tokyo, Osaka, and Mizusawa), 15h. (Batavia), 19h. (Mizusawa and San Fernando), 20h. (Hokoto and Taihoku), 23h. (La Paz).

April 5d. 4h. 17m. 55s. Epicentre 37°·0N. 26°·0E. (as on 1917 Aug. 27d.).

A = +·718, B = +·350, C = +·602.

	Δ °	P. m. s.	O−C. s.	S. m. s.	O−C. s.	L. m.	M. m.
Athens	2·0	e 0 29	− 2	1 2	+ 7	e 1·1	1·6
Helwan	8·3	1 5	−61	—	—	(5·1)	—
Moncalieri	15·9	—	—	—	—	7·4	—
De Bilt	21·0	—	—	8 43	− 1	11·9	12·7

Athens gives also iP = +38s.

April 5d. Records also at 0h. (Helwan), 1h. (Denver), 3h. (Rocca di Papa), 10h. (La Paz), 12h. (Tortosa), 13h. (Bidston), 15h. (La Paz), 16h. (La Paz and Helwan), 20h. (Helwan and Manila), 23h. (La Paz).

April 6d. Records at 1h. (San Fernando), 2h. (Athens), 5h., 6h., and 8h. (Helwan), 15h. (La Paz), 21h. (Rocca di Papa), 22h. (La Paz), 23h. (San Fernando).

April 7d. Records at 0h. (La Paz), 1h. (La Paz, Tokyo, Mizusawa, and Osaka), 3h. (La Paz and Helwan), 6h. (Helwan), 10h. (Kodaikanal), 15h. (Helwan and San Fernando), 16h. (Batavia).

April 8d. Records at 0h. (Zurich), 3h. (La Paz), 12h. (Zurich), 15h. (Manila), 16h. (Taihoku).

April 9d. Records at 0h. (San Fernando), 2h. (Algiers), 7h. (Helwan), 13h. (Helwan and Tokyo), 15h. (Helwan), 16h. (Osaka), 19h. (Tokyo).

April 10d. Records at 0h. (La Paz), 3h. (Kodaikanal and Batavia), 5h. (San Fernando), 7h. (Riverview), 12h. (La Paz), 15h. (Tokyo), 19h. (Colombo), 21h. (Kingston), 22h. (Melbourne).

April 11d. Records at 2h. and 4h. (San Fernando).

April 12d. Records at 0h. (Manila, Taihoku, and Zi-ka-wei), 1h. (San Fernando), 9h. (Moncalieri), 12h. (Manila), 13h. (Monte Cassino), 18h. (Helwan), 22h. (Rocca di Papa).

April 13d. Records at 0h. (San Fernando), 4h. (Apia), 16h. (Rocca di Papa), 18h. (Rio Tinto).

April 14d. Records at 2h. and 5h. (San Fernando), 12h. (Athens and Mizusawa), 15h. (Manila), 22h. (Lick), 23h. (Lick, Berkeley, and La Paz).

April 15d. 23h. 52m. 43s. Epicentre 37°·2N. 139°·0E. (as on 1919 Feb. 18d.).

A = −·601, B = +·522, C = +·605.

	Δ °	P. m. s.	O−C. s.	S. m. s.	O−C. s.	L. m.	M. m.
Tokyo	1·7	0 28	+ 2	0 46	− 2	—	—
Mizusawa	2·5	0 32	− 7	—	—	—	—
Osaka	3·9	1 10	+ 9	(1 48)	+ 1	1·8	2·0
Zi-ka-wei	15·7	e 3 44	− 4	—	—	—	—

Osaka gives MN = +3·1m.

April 15d. Records also at 1h. and 2h. (San Fernando), 4h. (Paris), 5h. (Paris and Helwan), 9h. (Apia), 17h. (Harvard), 19h. (Manila), 21h. (San Fernando, Manila, Riverview, and Melbourne), 23h. (Toronto, Lick, and Taihoku).

April 16d. 3h. 13m. 53s. Epicentre 39°·0S. 17°·0W.

A = +·743, B = −·227, C = −·629; D = −·292, E = −·956; G = −·602, H = +·184, K = −·777.

		△	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Capetown		28·8	91	11 31	?S	(11 31)	+18	14·9	17·5
Pilar	N.	38·5	270	21 13	?L	—	—	(21·2)	53·9
Andalgala	E.	42·2	273	22 55	?L	—	—	(22·9)	28·1
	N.	42·2	273	—	—	—	—	25·5	29·4
La Paz		49·7	282	9 5	0	16 15	0	24·0	29·4
San Fernando		76·0	10	—	—	—	—	—	44·1
Kingston		79·7	307	—	—	—	—	66·1	—
Helwan	E.	82·2	42	27 37	?SR_1	—	—	—	49·5
	N.	82·2	42	25 1	?	—	—	—	51·1
Rocca di Papa		85·2	23	(12 49)	0	—	—	e 15·4	16·4
Moncalieri		86·9	19	e 16 49	?PR_1	—	—	35·8	—
Paris		89·5	13	—	—	—	—	e 45·1	50·1
De Bilt		93·1	16	—	—	e 24 40	− 6	e 46·1	52·4
Harvard		95·0	325	—	—	—	—	46·0	—
Hamburg		95·5	17	—	—	—	—	e 49·1	54·1
Edinburgh		95·6	9	37 7	?L	—	—	(37·1)	52·6
Ottawa		99·5	324	—	—	—	—	e 46·1	—
Colombo		99·6	90	50 7	?L	—	—	54·1?	57·1
Kodaikanal		99·8	86	—	—	—	—	59·9	62·0
Toronto	E.	100·0	321	49 19	?	—	—	55·9	—
Melbourne		101·4	167	—	—	—	—	e 52·1	57·6
Chicago	E.	103·0	316	—	—	—	—	51·0	—

Additional records: Capetown gives S = +12m.37s. La Paz T_0 = 3h.13m.57s. Mauritius (△ = 66°·0) PN = 3h.12m.12s., PE = 3h.9m.0s., ME = 3h.41m.30s. De Bilt eSR_1N = +30m.44s., MN = +52·6m. Harvard L = +58·8m. and +65·7m. Chicago LE = +59·6m.

April 16d. 16h. 39m. 45s. Epicentre 6°·5N. 128°·0E. (as on 1918 July 15d.).

A = −·612, B = +·783, C = +·113; D = +·788, E = +·616; G = −·070, H = +·089, K = −·994.

		△	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Manila		10·7	320	e 2 39	− 1	—	—	4·4	4·6
Batavia		24·7	239	e 5 41	+ 6	5 53	?	—	8·2
Zi-ka-wei		25·5	346	e 5 34	− 9	e 9 56	−17	—	—
Osaka		29·0	13	5 17	−61	—	—	—	8·5
Colombo		47·8	274	15 15	?S	(15 15)	−36	—	—
Kodaikanal		50·1	279	34 3	?L	—	—	(34·0)	—
Helwan	E.	92·6	301	24 15	?S	(24 15)	−26	—	—
Hamburg		100·8	329	—	—	—	—	e 51·2	—
Rocca di Papa		104·0	317	—	—	—	—	e 35·2	—
De Bilt	E.	104·0	329	—	—	—	—	e 54·2	56·6
	N.	104·0	329	—	—	—	—	e 52·2	55·9
Edinburgh		105·9	333	54 15	?L	—	—	(54·2)	67·2

Additional records: Manila gives MN = +4·9. Helwan PN = +23m.15s.

April 16d. Records also at 1h. (San Fernando), 3h. (La Paz), 4h. (Victoria and Pilar), 7h. (Barcelona), 8h. (Tokyo), 11h. (Lick), 17h. (Colombo), 18h. (Rio Tinto), 19h. (Taihoku), 22h. and 23h. (San Fernando).

1919. April 17d. 11h. 22m. 2s. Epicentre 30°·2S. 179°·0W.

A = −·864, B = −·015, C = −·503; D = −·018, E = +1·000;
G = +·503, H = +·009, K = −·864.

The Epicentre 29°·0S. 178°·0W. (as on 1917 Nov. 16d.) appears to be too near Apia and too far from Australia, as is indicated by Riverview, Melbourne, and Perth consistently. The Epicentre 30°·2S. 177°·7W. (as on 1918 Aug. 5d.) is equally unsuitable.

Station and Component.		Δ °	Az. °	P. m. s.	O−C. s.	S. m. s.	O−C. s.	L. m.	M. m.
Apia		17·7	24	i 4 12	− 1	(7 34)	+ 1	7·6	—
Riverview		25·5	254	i 5 41	− 2	i 10 14	+ 1	e 12·1	12·8
Sydney	E.	25·5	254	5 40	− 3	9 52	−21	11·8	14·4
Melbourne		30·6	245	i 6 34	0	11 52	+ 8	15·9	18·0
Adelaide		35·8	252	7 10	−10	12 46	−21	15·3	21·7
Perth		55·0	250	9 39	0	17 21	0	27·4	—
Honolulu		55·4	25	9 46	+ 4	16 22	−64	27·0	32·9
Manila		73·1	300	e 11 40	+ 3	21 28	+25	32·4	33·3
Batavia		73·2	274	11 42	+ 5	21 8	+ 4	32·6	45·1
Osaka		77·8	323	12 0	− 6	21 57	− 1	31·7	40·1
Mizusawa	E.	78·6	330	12 10	− 1	22 9	+ 2	—	—
	N.	78·6	330	12 11	0	22 5	− 2	—	—
Nagasaki		79·4	320	27 30	?SR_1	—		—	—
Taihoku		79·4	309	—	—	e 21 28	−48	—	—
Zi-ka-wei		83·4	313	e 12 32	− 6	e 22 47	−14	35·0	44·2
Ootomari		84·2	336	17 2	?PR_1	—	—	—	—
Cipolletti		85·6	133	—	—	(22 46)	−40	22·8	23·5
Berkeley		86·2	41	i 12 42	−12	e 23 12	−20	—	—
Pilar	N.	92·8	130	23 34	?S	(23 34)	−69	—	59·8
Victoria		93·0	34	13 34	+ 2	22 29	−136	38·8	53·2
Andalgala		93·5	127	24 22	?S	(24 22)	−29	43·6	56·0
La Paz		98·7	116	14 9	+ 5	i 24 25	−78	41·8	46·4
Colombo		103·1	271	18 58	?PR_1	27 58	+93	64·0	67·0
Mauritius	E.	105·7	234	15 58	+80	26 58	+ 9	50·5	54·0
	N.	105·7	234	14 58	+20	26 58	+ 9	40·0	53·7
Kodaikanal		106·8	273	18 46	?PR_1	—	—	52·1	70·2
Chicago		110·5	51	19 12	?PR_1	25 9	−144	50·6	—
Rio de Janeiro	N.	112·1	136	—	—	—	—	53·8	—
Ann Arbor	E.	113·4	52	—	—	29 22	+85	42·9	71·0
	E.	113·4	52	19 40?	?PR_1	29 28	+91	43·0	71·0
Capetown		113·8	195	26 52	?S	(26 52)	−68	74·4	77·4
Bombay		114·8	279	19 48	?PR_1	—	—	—	65·5
Toronto		116·8	51	18 40	[− 3]	i 30 4	+100	e 68·3	70·2
Georgetown	E.	117·0	59	19 22	?PR_1	30 6	+100	56·0	—
Washington		117·0	59	20 8	?PR_1	25 44	?	29·6	—
Ithaca	E.	118·5	53	e 29 19	?S	35 52	?SR_1	53·3	—
	N.	118·5	53	e 29 23	?S	36 16	?SR_1	50·3	—
Ottawa		119·8	50	19 23	?PR_1	30 10	+82	49·9	—
Harvard		122·3	55	27 17	?S	36 39	?SR_1	58·6	65·8
Dyce		152·9	4	i 20 5	[+ 5]	27 51	?	43·8	53·9
Helwan	E.	153·8	277	20 46	[+45]	—	—	—	106·8
	N.	153·8	277	20 58	[+57]	—	—	—	111·5
Lemberg		153·8	325	e 20 4	[+ 3]	—	—	e 58·1	101·5
Edinburgh		154·2	5	22 58	?PR_1	—	—	—	110·0
Eskdalemuir		154·7	6	20 3	[+ 1]	31 2	?	52·0	53·1
Hamburg		155·7	347	i 19 58	[− 5]	—	—	e 72·0	85·0
Bidston		156·6	6	20 16	[+12]	31 58	?	—	85·0
De Bilt		157·9	353	20 4	[− 2]	e 34 41	?	e 75·0	94·5
Oxford		158·4	356	20 7	[+ 1]	25 18	?PR_1	44·2	—
Vienna		158·5	331	i 20 2	[− 4]	—	—	e 51·1	105·2
Kew		158·7	2	—	—	—	—	—	120·0
Uccle		159·2	354	20 1	[− 6]	e 30 10	?	—	80·0
Shide		159·4	357	19 54	[−13]	—	—	—	102·8
Athens	E.	159·7	298	e 20 2	[− 6]	e 31 5	?	e 46·5	86·8
	N.	159·7	298	e 20 2	[− 6]	e 31 5	?	e 51·2	81·6
Strasbourg		160·9	346	20 4	[− 5]	34 59	?	—	81·7
Paris		161·3	357	e 20 10	[+ 1]	34 37	?	45·0	45·0
Zurich		161·9	343	e 20 6	[− 3]	—	—	—	—
Pola		162·2	329	e 23 8	?PR_1	—	—	46·4	100·5
Besancon		162·6	349	20 47?	[+37]	—	—	87·0	—

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	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Moncalieri	164·3	342	20 11	[0]	34 9	?	48·7	99·4
Pompeii	164·8	318	20 26	[+14]	30 12	?	51·0	93·0
Rocca di Papa	165·1	324	e 20 10	[− 2]	—	—	e 47·5	96·3
Marseilles	166·5	347	e 50 57	?	—	—	—	98·0
Coimbra	167·4	35	20 38	[+25]	30 40	?	46·0	90·4
Barcelona	168·7	356	e 24 58	?PR_1	41 5	?SR_1	e 78·4	63·0
Tortosa	169·4	2	20 14	[0]	31 23	?	51·0	107·2
Rio Tinto	170·2	38	21 58	?	—	—	—	114·0
San Fernando	171·3	42	20 40	[+25]	—	—	94·2	111·0
Granada	172·1	28	20 18	[+ 2]	32 43	?	—	—
Algiers	173·2	346	20 25	[+ 9]	30 14	?	47·0	95·0

Additional records: Riverview gives $iPR_1 = +6m.33s.$, $PS = +10m.25s.$, $SR_1 = +11m.45s.$, $MZ = +16·1m.$, $T_0 = 11h.22m.3s.$ Epicentre 30°·0S., 178°·0W. Melbourne $PR_1 = +7m.40s.$ Adelaide $PR_1 = +8m.40s.$, $SR_1 = +14m.20s.$ Perth $PR_1 = +13m.25s.$, $SR_1 = +22m.28s.$ Manila MN $= +34·2m.$ Batavia $M = +21·6m.$, $T_0 = 11h.22m.17s.$ Zi-ka-wei $MN = +43·8m.$, $T_0 = 11h.22m.17s.$ Berkeley $ePEN = +12m.52s.?$. The P given in the table is PZ. $T_0 = 11h.22m.12s.$ Andalgala $MN = +52·8m.$ Colombo gives no seconds. Chicago $L = +28·7m.$ Capetown $S = +34m.58s.$ (?SR_1). Toronto $i = +41m.22s.$, $e = +44m.16s.$, $eL = +109·2m.$ Georgetown $L = +41·4m.$ Ithaca $eE = +25m.16s.$ (?PR_1), $L = +122·0m.$ Harvard $SE = +37m.44s.$, $eLN = +50·7m.$, $L = +65·7m.$ Eskdalemuir $PZ = +19m.55s.$, $PR_1 = +23m.37s.$, $T_0 = 11h.28m.36s.$ Hamburg $MN = +79·0m.$ Bidston $PR_1 = +23m.58s.$ De Bilt $eN = +23m.45s.$ and $+27m.53s.$, $MN = +76·1m.$ Vienna $iPE = +20m.3s.$ Uccle $PR_1 = +24m.16s.$ Athens $PR_1N = +23m.58s.$, $PR_1E = +24m.1s.$ Strasbourg $PR_1 = +24m.38s.$, $MN = +83·0m.$ Paris $iPE = +20m.19s.$, $e_1 = +23m.44s.$, $e_2 = +31m.43s.$ Pola $MN = +89·4m.$ Moncalieri $MN = +107·0m.$ Coimbra $PR_1E? = +24m.0s.$, $PR_2E = +25m.8s.$, $MN = +111·2m.$ Barcelona $PR? = +31m.56s.$ San Fernando $MN = +113·5m.$

1919. April 17d. 20h. 53m. 5s. Epicentre 14°·5N. 91°·0W.

(as on 1918 Oct. 19d.).

$A = -·017$, $B = -·968$, $C = +·250$; $D = -1·000$, $E = +·018$; $G = -·004$, $H = -·250$, $K = -·968$.

The residuals suggest a very slight depth of focus, say 0·010, but even when this is allowed for it would seem that the epicentre is a little too far from the European stations, and too close to the North American. We retain the old epicentre, but allow for the extra depth of focus.

Station and Component.		Corr. for Focus	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	°	m. s.	s.	m. s.	s.	m.	m.
Balboa Hts.	E.	−0·1	12·5	115	3 6	+ 1	5 46	+17	6·8	8·2
	N.	−0·1	12·5	115	3 7	+ 2	5 29	0	6·4	8·6
Mobile		−0·2	16·4	9	e 4 5	+10	i 7 5	+ 5	7·7	7·8
Lawrence	E.	−0·5	24·8	352	e 5 25	− 6	(i 9 50)	0	i 9·8	10·3
	N.	−0·5	24·8	352	i 5 18	−13	(i 9 51)	+ 1	i 9·8	10·3
Vieques	E.	−0·5	24·8	78	5 39	+ 8	10 39	+49	13·6	19·6
	N.	−0·5	24·8	78	6 12	+41	11 21	+90	13·2	13·7
Tucson	E.	−0·5	25·4	318	5 43	+ 6	i 10 6	+ 5	13·6	16·8
	N.	−0·5	25·4	318	5 24	−13	i 10 1	0	13·5	—
Cheltenham	E.	−0·6	27·3	25	5 53	− 2	10 43	+ 8	16·2	19·3
	N.	−0·6	27·3	25	5 50	− 5	10 39	+ 4	16·6	19·4
Georgetown	E.	−0·6	27·3	24	e 5 47	− 8	10 33	− 2	12·4	15·6
	N.	−0·6	27·3	24	e 5 48	− 7	10 33	− 2	—	19·0
Washington		−0·6	27·3	24	5 46	− 9	(10 35)	0	10·6	15·7
Chicago		−0·6	27·4	6	5 45	−11	9 5	−92	11·4	12·5
Denver		−0·6	28·0	337	—	—	(9 55)	−53	9·9	17·9
Ann Arbor	E.	−0·6	28·5	11	5 55	−12	11 7	+10	—	19·6
	N.	−0·6	28·5	11	5 43	−24	11 1	+ 4	17·4?	19·5
Ithaca		−0·7	30·6	21	5 56	−31	11 14	−18	—	19·7
Toronto		−0·7	30·8	17	6 55	+26	i 12 31	− 5	i 14·6	26·3
Harvard	E.	−0·8	32·8	28	i 6 38	− 9	11 52	−16	—	20·3
	N.	−0·8	32·8	28	i 6 37	−10	11 44	−24	i 16·8	19·4
Ottawa		−0·8	33·5	20	i 6 44	−10	e 12 7	−12	e 15·4	21·9
Northfield		−0·8	33·6	26	e 5 53	−62	(11 55)	−26	18·5	22·9
Lick		−0·8	35·4	315	—	—	(e 11 55)	−54	e 11·9	22·9

Continued on next page.

Station and Component.		Corr. for Focus	Δ	Az.	P.		O−C.	S.		O−C.	L.	M.
		°	°	°	m.	s.	s.	m.	s.	s.	m.	m.
Berkeley	E.	−0·8	36·2	316	e 6	56	−21	e 12	39	−22	e 16·0	23·1
	N.	−0·8	36·2	316	e 6	58	−19	e 12	39	−22	e 16·5	23·1
La Paz		−0·8	38·3	143	i 7	26	− 8	i 13	31	0	i 18·0	22·1
Victoria		−0·9	43·1	329	7	51	−21	14	7	−31	23·2	31·6
	Z.	−0·9	43·1	329	7	58	−14	13	38	−60	22·4	30·6
La Quiaca	E.	−0·9	44·2	146	32	19	?	—		—	39·4	44·2
	N.	−0·9	44·2	146	32	13	?	—		—	—	44·4
Andalgala	E.	−1·0	48·4	150	17	19	?SR_1	—		—	19·9	20·5
Pilar	N.	−1·1	53·0	150	40	43	?	—		—	—	47·2
Sitka	E.	−1·1	54·1	331	e 17	1	?S	(e 17	1)	+ 5	e 28·4	34·2
	N.	−1·1	54·1	331	e 17	7	?S	(e 17	7)	+11	e 33·2	37·4
Honolulu		−1·2	63·7	287	10	49	+20	19	25	+30	30·4	33·0
Coimbra		−1·3	75·2	52	11	46	+ 5	21	26	+13	33·3	44·4
Edinburgh		−1·3	76·8	35	11	55	+ 3	—		—	—	52·2
Eskdalemuir		−1·3	76·8	36	11	53	+ 1	21	44	+12	38·9	48·9
Bidston		−1·3	77·2	39	—		—	21	55	+19	—	50·9
Dyce	N.	−1·3	77·2	33	—		—	22	12	+36	34·0	42·9
San Fernando		−1·3	77·3	55	12	7	+12	—		—	40·9	55·4
Oxford		−1·3	78·5	40	12	5	+ 3	22	2	+11	27·4	44·7
Shide		−1·3	78·7	40	12	5	+ 2	21	59	+ 6	39·1	49·3
Kew		−1·3	79·2	39	20	55	?S	(20	55)	−64	—	50·9
Granada		−1·3	79·3	55	12	21	+14	22	12	+12	—	—
Paris		−1·3	81·4	42	i 12	21	+ 1	e 22	19	− 5	35·9	44·9
Uccle		−1·3	82·2	40	e 12	22	− 2	e 22	25	− 9	e 38·9	50·9
De Bilt	E.	−1·3	82·3	38	12	27	+ 2	22	41	+ 6	e 41·9	52·3
	N.	−1·3	82·3	38	12	27	+ 2	22	41	+ 6	e 35·9	54·3
Barcelona		−1·4	82·8	49	—		—	e 22	40	+ 1	e 39·4	44·4
Besançon		−1·4	84·1	43	12	19	−15	—		—	39·9	—
Algiers		−1·4	84·6	53	e 12	42	+ 5	23	2	+ 3	39·9	56·4
Hamburg		−1·4	84·8	37	i 12	38	0	i 23	6	+ 5	37·9	52·9
Apia		−1·4	84·8	254	—		—	e 22	49	−12	38·3	—
Strasbourg		−1·4	84·9	42	12	39	0	23	1	− 2	e 40·3	47·8
Zurich		−1·4	85·7	43	12	42	− 2	—		—	e 47·0	—
Moncalieri		−1·4	85·8	45	12	47	+ 3	i 23	11	− 1	29·3	54·6
Florence		−1·4	88·6	45	24	35	?	—		—	44·9	51·9
Pola		−1·4	90·0	42	e 12	55	−13	e 23	35	−24	e 37·5	56·2
Vienna		−1·4	90·4	40	e 13	7	− 3	i 24	6	+ 3	43·9	51·9
Athens		−1·5	99·6	46	—		—	—		—	e 52·2	—
Helwan		−1·5	108·9	51	14	55	+ 9	(21	55)	?	—	74·0
Cape Town		−1·6	114·0	120	26	19	?S	29	19	+90	—	72·4
Nagasaki		−1·6	118·7	321	e 83	27	? L	—		—	(e 83·5)	—
Riverview		—	120·9	238	e 16	46	+59	e 30	16	+80	55·6	69·7
Sydney	E.	—	120·9	238	19	7	[+12]	—		—	—	—
Zi-ka-wei		—	124·8	326	20	44	?PR_1	—		—	—	—
Melbourne		—	125·6	234	21	37	?PR_1	26	37	−173	60·6	66·9
Taihoku		—	129·3	320	—		—	e 29	25	−31	—	—
Adelaide		—	131·1	235	—		—	31	47	+99	—	76·3
Simla		—	133·0	14	e 58	43	? L	—		—	(e 58·7)	79·2
Manila		—	137·1	311	e 19	21	[−13]	—		—	—	66·2
Mauritius		—	149·8	105	17	49	− 1	75	7	? L	82·2	84·6
Perth		—	149·9	230	19	52	[− 4]	—		—	—	—
Kodaikanal		—	152·8	25	38	55	?SR_1	—		—	90·4	98·5
Colombo		—	156·8	24	23	55	?PR_1	97	55	?	108·6	109·6
Batavia		—	160·6	293	20	30	[+21]	e 49	57	?SR_1	79·6	98·8

Additional records: Mobile gives iSN = +7m.20s., MN = +12·6m., T_0 = 20h.53m.28s. Washington S = +9m.14s., L = +22·9m., T_0 = 20h.54m.33s. Chicago MN = +12·1m. Denver MN = +10·9m. Toronto iL = +18·6m. and +24·6m., T_0 = 20h.52m.54s. Harvard iN = +17m.24s., T_0 = 20h.53m.13s. Ottawa L = +42·9m. and +61·9m., T_0 = 20h.53m.2s. Northfield S? = +8m.19s. The true S is given as the first L. Berkeley ePV = +6m.55s., MZ = +23·6m., T_0 = 20h.52m.49s. La Paz PR_1 = +8m.57s., T_0 = 20h.52m.50s., Victoria L = +18·2m. (?SR_1), T_0 = 20h.53m.0s. Coimbra MN = +43·1m., T_0 = 20h.53m.9s. San Fernando MN = +50·5m. De Bilt PR_1E = +15m.45s., m = +32m.28s., T_0 = 20h.53m.16s. Barcelona gives S as e and S (?SR_1) at +28m.44s. Hamburg PR_1 = 15m.49s., SR_2 = +32m.55s., T_0 = 20h.53m.13s. Apia e = +28m.13s. (?SR_1). Strasbourg SR_1 = +.28m.43s., SR_2 = +32m.49s., T_0 = 20h.53m.20s. Moncalieri MN = +49·6m., T_0 = 20h.53m.25s. Pola MN = 56·6m. All the records are given one hour late. Vienna ePE = +13m.55s. Helwan MN = +70·0m. Riverview ePR$_1$? = +21m.49s., PR_2? = +27m.27s., PS = +31m.15s., eSR_1 = +37m.0s. and +37m.25s., SR_2 = +40m.50s. and +41m.42s., MN = +79·4m. Melbourne L = +32·3m., M = +34·9m. Adelaide PR_1 = +22m.34s., SR_1 = +34m.37s.? Manila MN = +70·6m.

April 17d. Records also at 0h. (La Paz), 9h. (Batavia and Manila), 13h. (La Paz, Zi-ka-wei, Taihoku, and Toronto), 16h. (Tortosa), 18h. (Mizusawa), 19h. (Rio Tinto), 22h. (Batavia).

April 18d. 6h. 20m. 12s. Epicentre 46°·0N. 25°·0E. (as on 1916 Jan. 26d.).
A = +·630, B = +·294, C = +·719; D = +·423, E = −·906.;
G = +·651, H = +·304, K = −·695.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Lemberg		3·9	351	e 1 0	−1	—	—	—	8·2
Vienna	E.	6·3	294	e 2 0	+24	—	—	7·1	9·5
Pola		7·9	266	e − 12	−132	—	—	e 6·5	8·3
Strasbourg	Z.	12·0	289	2 58	− 1	—	—	—	—
Moncalieri		12·1	269	—	—	—	—	9·3	—
Hamburg		12·3	314	3 4	+ 1	—	—	e 10·3	10·9
Uccle		14·5	297	e 3 30	− 3	—	—	e 10·8	—
De Bilt	E.	14·6	303	—	—	e 7 32	+70	e 9·5	14·7
Paris		15·4	288	—	—	—	—	e 11·5	11·8
Helwan		16·8	161	3 48	−14	—	—	—	—
Edinburgh		20·2	310	9 48	?L	—	—	(9·8)	—

Additional records: Vienna gives ePZ = +1m.49s. Pola MN = +8·0m.
De Bilt eSN = +7m.35s., MN = +12·3m.

1919. April 18d. 21h. 0m. 57s. Epicentre **19°·6N. 106°·5W.**
A = −·268, B = −·903, C = +·336; D = −·959, E = +·284;
G = −·095, H = −·322, K = −·942.

Station and Component.		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Tuscon	E.	13·2	344	—	—	e 6 26	+37	7·6	9·4
	N.	13·2	344	3 40	+24	—	—	8·0	10·4
Denver		20·1	4	—	—	7 3	−82	10·0	12·0
Lawrence	E.N.	21·7	24	e 5 7	+ 6	9 17	+18	12·3	14·3
Lick		22·1	327	—	—	—	—	e 11·0	—
Berkeley	N.	22·8	326	5 9	− 6	—	—	e 12·0	14·3
Chicago		27·3	32	6 3	+ 2	10 43	− 3	13·8	15·0
Ann Arbor	E.	29·8	35	—	—	11 9	−22	16·6	17·6
	E.	29·8	35	—	—	11 27	− 4	16·5	17·0
	N.	29·8	35	—	—	11 21	−10	16·4	17·0
Victoria		31·8	340	9 29	?	12 26	+21	18·3	22·6
Cheltenham	N.	31·9	47	7 42	+56	12 16	+ 9	18·3	19·6
Georgetown	E.	31·9	46	e 6 33	−13	12 3	− 4	18·2	19·6
Washington		31·9	46	6 37	− 9	12 1	− 6	15·5	49·0
Toronto		33·0	37	—	—	14 51	?SR_1	19·8	20·6
Ithaca		34·0	41	e 7 49	+44	e 12 24	−16	18·8	—
Ottawa		36·2	38	7 19	− 5	13 3	−10	e 19·4	—
Northfield		37·3	40	—	—	e 13 28	0	53·0	—
Harvard	E.	37·5	43	7 30	− 4	13 31	0	21·8	22·2
	N.	37·5	43	—	—	13 24	− 7	19·1	—
Sitka	E.	43·0	339	—	—	—	—	e 25·0	27·0
Honolulu		48·1	281	20 51	?	—	—	—	26·2
La Paz		52·2	130	9 21	0	e 16 37	− 9	24·0	28·0
Cipolletti		68·8	147	32 57	?L	—	—	37·0	39·6
Apia		72·4	248	—	—	—	—	e 32·8	—
Eskdalemuir		81·2	34	—	—	i 22 46	+ 9	41·0	—
Bidston		82·0	37	—	—	24 3	+77	—	46·0
Coimbra		83·4	50	e 12 39	+ 1	23 9	+ 8	42·0	—
Oxford		83·7	38	23 5	?S	(23 5)	− 1	—	53·0
Shide		84·1	39	13 26?	+43	23 19	+10	42·4	51·8
Rio Tinto		85·5	51	—	—	22 3	−82	—	59·0
San Fernando		86·4	52	48 3	?L	—	—	(48·0)	55·0
De Bilt		87·1	35	—	—	23 47	+ 5	42·0	48·8
Paris		87·1	39	—	—	e 23 47	+ 5	40·0	46·0
Uccle		87·2	37	—	—	e 23 45	+ 2	e 36·0	—
Hamburg		88·9	31	—	—	e 25 3	+61	40·0	52·0
Barcelona		90·2	45	—	—	e 25 29	+73	e 44·5	56·0
Strasbourg		90·3	39	—	—	e 24 3	−14	e 39·0	—
Moncalieri		92·1	40	e 24 10	?S	(e 24 10)	−26	46·5	—
Florence		94·9	40	(16 3)	+140	—	—	16·0	37·0
Pola		95·8	38	—	—	e 40 3	?	e 55·0	56·3
Rocca di Papa		96·9	41	—	—	e 23 39	−106	—	26·2
Sydney	E.	110·7	241	50 45	?L	—	—	(50·8)	54·2
Riverview		110·8	241	—	—	e 33 38	?SR_1	e 50·8	63·1
Helwan	N.	116·1	40	29 3	?S	(29 3)	+44	—	—
Colombo		152·8	346	94 3	?L	—	—	(94·0)	—

For Notes see next page.

NOTES TO APRIL 18d. 21h. 0m. 57s.

Additional records: Denver MN = +13·0m. These records are given 1hr. late. Berkeley ePV = +5m.11s., eLV = +11·9m.?, eLE = +12·1m., ME = +21·4m., T_0 = 21h.0m.21s.?. Cheltenham PE = +7m.57s., LE = +19·4m. Georgetown eL = +15·0m., LN = +18·0m., MN = +19·1m. Toronto L = +26·2m. Ithaca ePN = +7m.56s., eN = +15m.21s. Ottawa PR_1 = +8m.33s., L = +21·0m., T_0 = 21h.1m.2s. Harvard iN = +8m.56s., iE = +8m.58s., LN = +20·6m., T_0 = 21h.1m.0s. De Bilt eSR_1 = +29m.37s., MN = +44·1m. Paris MN = +41·0m. Moncalieri S = +31m.7s. Riverview PS? = +34m.52s., MN = +67·0m. Helwan PE = +31m.3s.

April 18d. Records also at 1h. (Helwan), 4h. (La Paz), 5h. (Eskdalemuir), 20h. (La Paz), 23h. (La Paz).

April 19d. 2h. 57m. 2s. Epicentre 17°·0N. 97°·0W. (as on 1917 Mar. 5d.).

A = −·117, B = −·949, C = +·292; D = −·992, E = +·122; G = −·036, H = −·290, K = −·956.

This old epicentre appears to be a trifle too far to the east.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Tucson	E.	19·8	323	11 35	?L	—	—	(11·6)	—
Chicago		26·1	19	5 49	0	10 32	+ 8	16·5	—
Washington		28·0	34	5 40	−28	11 8	+ 9	—	—
Toronto		30·5	27	—	—	—	—	15·7	—
Ottawa		33·5	29	—	—	i 12 36	+ 4	22·5	—
Harvard	E.	33·7	35	—	—	19 57	? L	e 22·7	—
Victoria		38·0	331	—	—	—	—	21·7	24·2
La Paz		43·9	141	8 21	− 4	—	—	22·4	28·6
Paris		83·4	41	—	—	—	—	49·0	—
De Bilt	E.	83·9	39	—	—	23 13	+ 5	45·0	—
Helwan	E.	111·7	47	73 58	?L	—	—	(74·0)	—

Additional records: Tucson gives PN = +11m.21s. Georgetown gives from 3h.21m.13s. to 3h.25m.0s. Toronto L = +41·3m. Harvard eN = +23·0m., LE = +24·8m., and +25·7m., LN = +26·6m., T_0 = 3h.5m.50s. De Bilt eSR_1N = +28m.44s., eSR_1E = +28m.53s., eLN = +46·0m. De Bilt says the same epicentre as on 18d., but this does not seem to be the case. Helwan PN = +75m.58s.

April 19d. Records also at 4h. and 21h. (La Paz).

April 20d. Records at 2h. (Rio Tinto), 6h. (Rocca di Papa, Monte Cassino, and Pompeii), 8h. (La Paz).

1919. April 21d. 11h. 25m. 54s. Epicentre 8°·0N. 40°·5W.

A = +·753, B = −·643, C = +·139; D = −·649, E = −·760; G = +·106, H = −·090, K = −·990.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Vieques	E.	26·3	294	5 41	−10	9 36	−52	11·7	16·8
	N.	26·3	294	5 49	− 2	10 18	−10	—	17·5
La Paz		36·8	229	i 7 36	+ 8	i 13 17	− 4	17·6	21·8
Accra		40·1	90	11 6	?	—	—	16·1	31·6
San Fernando		42·3	43	8 6	− 7	14 36	− 3	20·3	31·1
Rio Tinto		42·7	40	7 6	−70	—	—	—	25·1
Coimbra		43·1	37	8 15	− 4	i 14 32	−17	19·8	20·4
Harvard	E.	43·6	326	8 32	+ 9	15 0	+ 4	e 19·5	—
	N.	43·6	326	8 31	+ 8	14 57	+ 1	e 19·3	—
Georgetown		45·1	319	8 40	+ 6	15 18	+ 2	21·1	—
Washington		45·1	319	8 44	+10	15 20	+ 4	21·9	—
Pilar		45·5	209	19 24	?SR_1	—	—	25·2	31·4
Ithaca	E.	46·8	322	8 37	− 9	15 27	−11	21·4	—
	N.	46·8	322	8 39	− 7	15 26	−12	21·5	—
Algiers		48·9	48	8 53	− 6	15 51	−14	22·1	31·9
Tortosa		49·1	40	8 57	− 4	15 54	−13	21·3	28·9
Toronto		49·2	321	—	—	—	—	e 33·6	35·2

Continued on next page.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Barcelona		50·3	41	e 9 2	− 7	16 12	−11	19·6	28·8
Ann Arbor		51·2	320	—	—	—	—	34·1	—
Marseilles		53·3	40	—	—	i 17 5	+ 5	23·1	31·6
Shide		53·6	29	e 9 32	+ 2	i 17 4	0	23·1	—
Chicago		53·6	318	9 42	+12	17 14	+10	25·6	—
Oxford		54·3	29	9 41	+ 6	17 8	− 5	23·6	26·6
Paris		54·5	35	e 9 38	+ 2	e 17 8	− 7	23·1	30·1
Kew		54·5	29	—	—	—	—	—	31·1
Moncalieri		55·6	40	e 9 40	− 3	i 17 25	− 4	23·6	30·2
Besancon		55·7	38	9 49	+ 5	17 31	+ 1	25·1	—
Eskdalemuir		55·7	26	9 25	−19	17 31	+ 1	26·1	26·3
Edinburgh		56·2	24	16 56	?S	(16 56)	−40	—	28·1
Uccle		56·6	32	9 47	− 3	17 45	+ 4	e 26·1	28·1
Strasbourg		57·3	37	9 57	+ 3	17 46	− 4	25·6	31·2
Zurich		57·3	39	e 9 53	− 1	e 17 54	+ 4	—	—
Dyce		57·5	25	e 10 16	+20	18 8	+15	24·0	—
De Bilt		57·6	32	10 4	+ 8	17 55	+ 1	e 26·1	29·0
Rocca di Papa		57·7	46	9 59	+ 2	e 17 56	+ 1	e 31·7	35·7
Pompeii		58·6	47	10 6	+ 3	18 14	+ 8	27·1	36·1
Pola		59·5	41	e 10 12	+ 3	e 18 12	− 5	e 27·6	37·2
Hamburg		61·1	31	e 10 22	+ 2	i 18 45	+ 8	e 25·1	30·4
Vienna		62·4	40	i 10 27	− 1	e 19 6	+13	29·6	34·6
Athens		64·9	53	e 10 44	0	—	—	31·6	35·7
		64·9	53	i 10 54	+10	i 19 27	+ 3	e 34·2	40·9
Lemberg		67·7	40	e 11 24	+22	e 20 6	+ 8	e 33·0	38·1
Capetown		69·8	131	20 42	?S	(20 42)	+18	(32·2)	40·7
Helwan	E.	70·3	61	12 0	+41	—	—	—	45·2
	N.	70·3	61	14 54	?PR_1	—	—	—	38·2
Victoria		79·4	319	—	—	—	—	37·1	47·5
Mauritius	E.	100·6	110	25 6	?S	(25 6)	−55	47·4	49·9
	N.	100·6	110	11 48	?	—	—	—	48·9
Simla		108·8	52	e 51 12	?L	—	—	(e 51·2)	60·5
Bombay		109·1	68	—	—	—	—	—	60·3
Honolulu		112·1	298	—	—	—	—	74·9	79·1
Kodaikanal		115·6	75	55 12	?L	—	—	62·9	99·1
Colombo		118·7	78	45 6	?	64 12	?L	66·8	72·1
Zi-ka-wei		137·2	23	—	—	—	—	e 64·1	81·2
Taihoku		142·6	29	—	—	—	—	e 63·2	—
Perth		147·5	139	38 4	?	—	—	—	—
Batavia		147·6	87	e 20 2	[+10]	—	—	74·3	—
Melbourne		149·8	188	71 12	?L	77 12	?L	84·1	88·1
Manila		150·9	40	21 6	[+69]	—	—	—	—
Riverview		152·0	200	e 50 0	?	e 65 18	?	e 77·6	81·8

Additional records: La Paz gives $PR_1 = +9$m. 1s., $T_0 = 11$h.26m.19s. San Fernando MN = +27·1m., $T_0 = 11$h.25m.48s. Coimbra PE = +8m.11s., $PR_1N = +9$m.51s., LN = +18·3m., MN = +20·5m., $T_0 = 11$h.26m.3s. There is also a set of observations with the Milne machine. Harvard iE = +9m.28s., $T_0 = 11$h.26m.17s. Ithaca e = +11m.41s. Toronto L = +17·8m. Barcelona i = +13m.1s., +17m.49s., and +19m.24s. Ann Arbor gives its record 1h. early. Shide iP = +9m.40s., eS = +16m.34s. Paris iP = +9m.42s., iS = +17m.17s., MN = +27·1m., $T_0 = 11$h.26m.8s. Moncalieri MN = +32·6m., $T_0 = 11$h.26m.54s. Strasbourg L = +26·1m., $T_0 = 11$h.26m.6s. Epicentre 8°·5N. 40°·0W. Dyce SN = +18m.10s. De Bilt MN = +38·7m., $T_0 = 11$h.26m.11s. Pola MN = +34·6m. Hamburg MN = +34·1m., $T_0 = 11$h.25m.55s. Vienna ePN = +10m.36s., MZ = +94·1m. Athens $PR_1 = +13$m.46s., $PR_2 = +14$m.56s., $T_0 = 11$h.25m.56s. Lemberg eP = +5m.54s. Honolulu gives L one hour too late. Zi-ka-wei MN = +82·2m. Riverview MN = +91·9m.

April 21d. Records also at 2h. and 6h. (La Paz), 7h. (Bombay), 8h. (Paris, Osaka, and Batavia), 9h. (Bombay, Riverview, and Manila), 10h. (Calcutta and Helwan), 13h. (Manila), 14h. (La Paz), 15h. (Chicago, La Paz, Washington, Harvard, and Ottawa), 16h. (De Bilt), 23h. (Berkeley).

April 22d. 2h. 43m. 38s. Epicentre 1°·0N. 147°·0E.

$A = -·839$, $B = +·545$, $C = +·017$; $D = +·545$, $E = +·839$; $G = -·015$, $H = +·010$, $K = -1·000$.

The Australian stations indicate an epicentre considerably nearer them with a deep focus. The La Paz record, however, indicates normal depth. Were there perhaps two shocks ?

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	29·1	300	e 6 25	+ 6	10 42	−37	13·0	13·9
Taihoku	34·4	319	12 53	?S	(12 53)	+ 7	—	—
Riverview	35·0	174	e 6 39	−34	e 11 56	−59	e 15·0	21·4
Osaka	35·2	345	7 15	0	—	—	—	15·5
Zi-ka-wei	38·7	325	e 7 42	− 2	e 13 42	− 6	—	—
Melbourne	38·8	183	13 16	?S	(13 16)	−33	20·9	26·2
Batavia	40·7	262	e 8 2	+ 1	—	—	—	11·2
Perth	44·2	219	12 58	?S	(12 58)	−127	22·8	—
Honolulu	57·3	68	17 52	?S	(17 52)	+ 2	26·5	32·9
Victoria	89·1	42	—	—	—	—	41·1	49·9
Mauritius	89·5	250	43 40	?L	—	—	(43·7)	—
Helwan	111·5	304	—	—	29 22	+100	—	—
Hamburg	114·8	334	—	—	—	—	e 64·4	—
Chicago	114·9	42	19 49	?PR_1	29 31	+82	60·4	—
De Bilt	118·0	335	e 20 23	?PR_1	—	—	e 60·4	63·0
Edinburgh	118·2	341	30 22	?S	(30 22)	+106	—	—
Eskdalemuir	118·7	341	e 20 25	?PR_1	i 30 11	+91	59·4	—
Toronto	119·1	37	—	—	—	—	69·8	—
Strasbourg	119·2	330	—	—	—	—	e 61·4	—
Uccle	119·2	334	—	—	—	—	e 61·4	—
Ottawa	120·2	33	—	—	(e 27 22)	−89	e 54·4	—
Bidston	120·2	340	27 34	?S	31 22	?	—	66·7
Kew	120·7	338	—	—	—	—	—	67·4
Paris	121·5	334	—	—	—	—	e 61·4	75·4
La Paz	142·1	119	19 36	[− 7]	—	—	72·5	—

Additional records : Riverview gives $iPR_1 = +8$m.5s., $PS = +12$m.31s., $MN = +23·2$m., $MZ = +24·6$m., $T_o = 2$h.43m.41s. Melbourne $S = +18$m.16s. (?SR_1). Chicago L? $= +42·4$m., $L = +47·4$m. De Bilt $MN = +62·5$m. Toronto $L = +41·1$m. and $+72·9$m. Ottawa gives eS as the L of a supposed earlier shock.

April 22d. Records also at 4h. (Manila), 10h. (Tokyo, Osaka, and Kobe), 13h. (Bidston), 17h. (De Bilt and Rocca di Papa), 19h. (Vienna), 21h. (Helwan) 23h. (De Bilt, Rocca di Papa, and Eskdalemuir).

April 23d. 7h. 5m. 10s. Epicentre 19°·0S. 177°·0W. (as on 1918 Oct. 13d.).

$A = -·944$, $B = -·049$, $C = -·326$; $D = -·052$, $E = +·999$; $G = +·325$, $H = +·017$, $K = -·946$.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Apia	7·3	45	1 54	+ 3	—	—	3·6	—
Riverview	31·9	236	e 6 55	+ 9	e 12 6	− 1	e 15·4	16·8
Melbourne	38·5	232	—	—	13 44	− 1	20·8	22·1
Adelaide	42·2	238	9 5	+53	13 35	−63	19·1?	25·0
Honolulu	44·4	26	16 2	?S	(16 2)	+55	18·9	19·6
Perth	60·7	243	—	—	19 6	+34	—	—
Manila	69·7	294	—	—	e 18 50	−92	—	—
Victoria	82·7	23	42 25	?L	—	—	53·3	60·5
La Paz	101·6	112	e 17 42	?	—	—	48·9	71·9
Chicago	102·3	50	e 17 50	?PR_1	—	—	47·8	—
Colombo	104·7	272	55 50	?L	63 50	?	(55·8)	73·8
Kodaikanal	107·9	275	63 26	?L	—	—	(63·4)	—
Toronto	108·4	49	—	—	—	—	60·3	—
Ottawa	111·0	48	—	—	e 29 50	+133	e 47·8	—
Mauritius	113·5	235	49 2	?	—	—	56·0	64·3
Edinburgh	143·0	6	55 50	?L	—	—	(55·8)	—
Eskdalemuir	143·3	6	—	—	—	—	74·8	—
Hamburg	145·0	352	e 19 44	[− 4]	—	—	e 71·8	—
Bidston	145·3	6	55 2	?	63 50	?L	(63·8)	99·8
De Bilt	146·9	358	19 50	[− 1]	—	—	e 69·8	79·3
Strasbourg	150·2	352	20 10	[+14]	—	—	e 82·8	—
Paris	150·3	1	—	—	—	—	e 73·8	—
Helwan E.	152·1	298	35 10	?	—	—	—	—
Rocca di Papa	155·9	342	e 21 15	[+72]	—	—	—	27·9
San Fernando	160·8	23	37 50	?	—	—	(50·8)	62·8

For Notes see next page.

NOTES TO APRIL 23d. 7h. 5m. 10s.

Additional records: Apia gives L = +2·7m. Riverview eP = +9m.33s., PS = +12m.25s., SR_1 = 14m.12s. and +14m.42s., MN = +17·7m., MZ = +17·3m., T_e = 7h.5m.32s. Melbourne PR_1 = +9m.20s., SR_1 = +16m.50s. Adelaide SR_1 = +16m.40s. ? It is added that these observations may be ± ½min. in error owing to the time signal having failed. Manila gives its record one hour late. Chicago L = +56·8m., +78·8m., and 87·8m. Ottawa e = +38m.50s., L = +56·8m., LE = +80·8m. Mauritius PN = +46m.38s., MN = +56·4m. De Bilt MN = +70·8m. Helwan PN = +37m.10s. San Fernando MN = +114·8m. It is assumed that the figures for the hour in the records for P and M have been interchanged.

April 23d. Records also at 15h. (Taihoku), 16h. (Batavia and Helwan), 23h. (San Fernando).

April 24d. 17h. 10m. 32s. Epicentre 6°·0S. 105°·0E. (as on 1919 April 2d.).

A = −·257, B = +·961, C = −·104; D = +·966, H = +·259; G = +·027, H = −·101, K = −·994.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Batavia		1·9	96	i 0 38	+ 9	i 1 3	+10	—	—
Manila		26·0	38	e 5 50	+ 2	—	—	—	—
Perth		27·9	160	—	—	10 54	− 3	—	—
Colombo		28·2	297	11 28	?S	(11 28)	+25	20·5	21·5
Kodaikanal		31·9	301	18 28	?L	—	—	(18·5)	—
Zi-ka-wei		40·4	22	—	—	e 14 3	−10	—	—
Mauritius	N.	47·8	248	16 46	?S	(16 46)	+55	22·9	24·7
Melbourne		48·3	137	—	—	(14 58)	−60	15·0	—
Riverview		51·0	130	e 16 1	?S	(e 16 1)	−30	e 27·2	28·6
Helwan		79·0	304	25 28	?SR_1	—	—	(39·5)	—
Hamburg		97·8	324	—	—	—	—	e 55·5	69·5
De Bilt	E.	100·8	322	—	—	—	—	e 59·5	68·2
	N.	100·8	322	—	—	—	—	e 57·5	58·3
Paris		102·7	320	—	—	—	—	63·5	—
Edinburgh		105·1	326	56 28	?L	—	—	(56·5)	—
San Fernando		110·6	307	61 28	?L	—	—	(61·5)	—
La Paz		156·5	197	—	—	—	—	86·0	87·0

Additional records: Batavia gives T_e = 17h.10m.39s. Epicentre 8°·1S. 106°·3E. Colombo gives its records in minutes only. S = +16m.28s. Riverview MN = +30·8m. Mauritius PE = +15m.10s. Helwan gives its two records as PE and PN respectively.

April 24d. Records also at 1h. (Melbourne), 7h. (Taihoku), 17h. (Batavia and Melbourne), 19h. (Batavia (2)), 20h. (Osaka, Kobe, Nagasaki, and Zi-ka-wei), 21h. (Batavia and De Bilt).

April 25d. Records at 0h. (San Fernando), 1h. (Pola), 2h. (Vienna and Rocca di Papa), 12h. (Zi-ka-wei, Kobe, Osaka, and Nagasaki), 16h. (Batavia (2)), 23h. (Tokyo, Mizusawa, and Osaka).

April 26d. Records at 0h. (Kingston and San Fernando), 2h. (San Fernando), 3h. (Batavia (2)), 4h. (Batavia), 16h. (Tokyo), 17h. (Mizusawa), 18h. (Batavia), 19h. (Mizusawa).

1919. April 27d. 0h. 21m. 55s. Epicentre 13°·0N. 123°·0E.

(as on 1919 Mar. 21d.).

A = −·531, B = +·817, C = +·225; D = +·839, E = +·545; G = −·123, H = +·189, K = −·974.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	2·6	309	i 0 49	+ 8	—	—	—	—
Taihoku	12·1	354	3 9	+ 9	4 56	−25	7·0	10·3
Zi-ka-wei	18·2	356	e 4 30	+11	7 50	+ 6	—	13·6
Nagasaki	20·7	17	e 2 2	?	—	—	—	—
Kobe	24·3	25	5 35	+ 4	(10 6)	+16	10·1	10·6
Osaka	24·4	26	5 33	+ 1	—	—	10·2	11·4
Batavia	25·1	221	e 5 13	−26	9 13	−52	—	11·6
Tokyo	27·2	31	6 32	+32	—	—	—	—

Continued on next page.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Calcutta	34·3	291	6 29	−38	—	—	24·4	27·4
Kodaikanal	44·7	271	14 17	?S	(14 17)	−54	26·2	28·5
Simla	45·8	302	15 5	?S	(15 5)	−20	—	29·8
Bombay	48·5	282	8 49	− 8	—	—	—	32·0
Riverview	54·0	150	e 9 31	− 2	e 16 53	−16	e 20·9	30·1
Melbourne	54·8	160	—	—	22 5	?SR_1	28·8	31·2
Mauritius	72·1	242	24 47	?SR_1	—	—	—	33·0
Honolulu	75·1	70	—	—	—	—	24·1	54·6
Helwan	85·0	300	14 11	?	—	—	—	59·0
Lemberg	85·7	320	—	—	e 23 5	−22	e 50·3	54·5
Vienna	91·0	321	e 13 5	−16	e 24 5	−19	48·0	—
Hamburg	92·6	327	—	—	e 23 5	−96	e 46·0	51·1
Victoria	95·3	37	—	—	—	—	51·9	56·8
Rocca di Papa	95·9	316	13 5	−43	—	—	48·9	64·1
De Bilt E.	95·9	328	—	—	e 24 10	−65	e 47·1	53·5
N.	95·9	328	—	—	—	—	e 45·1	53·2
Strasbourg	96·1	321	—	—	—	—	e 46·1	57·9
Dyce	96·6	333	—	—	—	—	50·1	—
Uccle	96·9	326	—	—	—	—	e 48·1	53·1
Moncalieri	97·8	320	e 17 1	?PR_1	32 4	?SR_1	50·8	63·8
Edinburgh	97·8	333	24 5	?S	(24 5)	−89	—	56·1
Eskdalemuir	98·2	332	23 49	?S	32 11	?SR_1	44·1	54·2
Paris	99·0	325	—	—	i 24 27	−79	50·1	54·1
Kew	99·0	328	—	—	—	—	—	62·1
Bidston	99·3	330	—	—	39 5	?L	(39·1)	53·5
Oxford	99·5	329	—	—	—	—	49·1	63·1
Shide	100·0	328	—	—	24 26	−90	49·4	62·2
Barcelona	103·0	319	—	—	e 24 2	−142	e 53·6	63·1
Cape Town	109·2	237	63 5	?L	—	—	(63·1)	72·1
Coimbra	110·3	320	24 51	?S	44 55	?	61·0	65·1
Rio Tinto	110·7	318	57 5	?L	—	—	(57·1)	68·1
San Fernando	111·3	316	34 17	?SR_1	—	—	—	67·1
Chicago	118·4	24	20 12	?PR_1	36 35	?SR_1	56·2	—
Ottawa	119·2	12	—	—	30 12	+89	e 64·1	—
Toronto	119·8	17	—	—	e 63 23	?L	e 72·0	79·7
Harvard E.	123·1	10	—	—	53 52	?L	66·7	—
N.	123·1	10	—	—	53 38	?L	68·6	—
Washington	124·8	17	20 58	?PR_1	—	—	e 73·1	—
La Paz	168·7	109	20 16	[+ 2]	—	—	92·1	110·3

Additional records: Zi-ka-wei gives MN = +12·8m., T_o = 0h.22m.16s., Kobe MN = +11·2m. Osaka MN = +14·1m. Calcutta PE = +6m.41s. (O−C = −26s.). The Simla record is given on 28d., but this is assumed to be due to a misprint. Riverview MN = +30·4m., T_o = 0h.22m.12s. Melbourne PR_1 = +17m.41s. Mauritius PE = +25m.59s. Helwan PN = +20m.11s. (?PR_1), MN = +59·3m. Vienna gives its L one hour too early. Hamburg MN = +48·1m., MZ = +57·1m. Strasbourg MN = +52·9m. Moncalieri MN = +65·7m. Eskdalemuir MN = +63·8m. San Fernando MN = +75·6m. Chicago L = +64·1m. and +76·1m., P and S doubtful. Ottawa L = +70·1m. and +83·1m. Harvard eE = +60m.3s. and +61m.36s., LN = +72·4m., T_o? = 0h.55m.45s. Washington L = +79·1m.

April 27d. 2h. 33m. 35s. Epicentre 25°·0N. 141°·5E.

A = −·709, B = +·564, C = +·423; D = +·622, E = +·783; G = −·331, H = +·263, K = −·906.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Tokyo	10·7	352	4 0	?S	(4 0)	−48	—	—
Osaka	11·0	333	2 47	− 3	—	—	8·6	12·4
Kobe	11·1	332	2 46	0	—	—	8·6	11·8
Zi-ka-wei	18·7	294	e 4 27	+ 2	e 7 59	+ 4	—	—
Manila	21·9	246	—	—	e 8 55	− 8	—	—
Batavia	45·9	232	—	—	e 15 17	−10	—	15·5

Additional records: Osaka gives MN = +13·1m. Kobe MN = +13·0m.

April 27d. Records also at 0h. (Florence), 1h. (Manila and Batavia), 12h. (Edinburgh and Manila), 20h. (Taihoku and Riverview).

April 28d. 6h. 45m. 45s. Epicentre 14°·5N. 91°·0W. (as on 1919 Apr. 17d.).

A = −·017, B = −·968, C = +·250; D = −1·000, E = +·018; G = −·004, H = −·250, K = −·968.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Balboa Heights	N.	12·5	115	2 42	−24	4 8	−84	5·4	7·9
Vieques	E.	24·8	78	9 47	?S	(9 47)	−12	13·1	16·0
Cheltenham	N.	27·3	25	6 9	+ 8	—	—	15·2	18·0
Washington		27·3	24	6 7	+ 6	10 45	− 1	13·0	—
Georgetown		27·3	24	e 6 0	− 1	10 40	− 6	e 15·4	—
Chicago		27·4	6	6 10	+ 8	10 49	+ 1	13·6	—
Ann Arbor	E.	28·5	12	8 57?	+164	14 39	+211	16·6	17·0
	N.	28·5	12	—	—	13 27	+139	16·6	20·2
	E.	28·5	12	—	—	13 15	+127	16·5	17·2
	N.	28·5	12	—	—	13 39	+151	17·0	20·2
Ithaca		30·7	23	—	—	e 12 10	+24	16·2	—
Toronto		30·8	17	—	—	14 15	?L	i 18·4	18·8
Northfield		31·0	25	—	—	—	—	e 14·2	—
Harvard	E.	32·8	28	—	—	e 11 39	−42	e 18·0	—
	N.	32·8	28	e 12 10	?S	(e 12 10)	−11	e 18·2	—
Ottawa		33·5	20	e 8 7	?PR$_1$	e 12 23	− 9	e 16·2	—
Berkeley		36·2	316	—	—	—	—	e 17·8	—
La Paz		38·3	143	7 38	− 2	13 14	−28	17·4	19·6
Victoria		43·1	329	—	—	—	—	24·7	31·7
Honolulu		63·7	287	—	—	—	—	31·2	36·8
Edinburgh		76·8	35	30 15	?L	—	—	(30·2)	—
Bidston		77·2	38	9 15	?	—	—	—	49·2
Paris		81·4	42	—	—	—	—	e 41·2	42·2
De Bilt	E.	82·5	38	—	—	—	—	e 39·2	48·8
	N.	82·5	38	—	—	—	—	e 42·2	45·9
Hamburg		84·8	37	—	—	—	—	e 40·2	50·2
Strasbourg		84·9	42	—	—	—	—	e 43·2	—
Helwan		108·9	51	60 15	?L	—	—	(60·2)	—

Additional records: Balboa Heights gives PE = +2m.37s., T_o = 6h.46m.30s. Cheltenham PE = +6m.14s. Washington L = +17·8m., T_o = 6h.46m.2s. For Ann Arbor the Bosch-Omori records are given first and the Wiechert afterwards. Ithaca eEN = +13m.8s., LN = +16·8m. Northfield LE = +18·2m. Harvard iN = +12m.30s., SN? = +12m.36s., iN = +13m.31s., LN = +20·4m., and +20·8m., T_o = 6h.44m.22s. Ottawa L = +26·2m. and +44·2m. La Paz T_o = 6h.46m.51s. Helwan PN = +57m.15s.

April 28d. Records also at 3h. (Mizusawa), 5h. (Manila (2)), 11h. (Harvard), 15h. (Manila (2)), 17h. (Manila), 19h. (Manila and La Paz), 21h. (La Paz and Algiers), 22h. (Manila).

April 29d. Records at 0h. (San Fernando), 1h. (Strasbourg, De Bilt, and Paris), 2h., 4h., and 6h. (Manila), 7h. (Accra), 8h. (Manila (2)), 10h. (Manila, La Paz, and Helwan), 11h. (Manila), 13h. (Manila (2)), 15h. (Manila), 16h. (Athens).

1919. April 30d. 7h. 16m. 55s. Epicentre 21°·2S. 172°·5W.

A = −·924, B = −·122, C = −·362; D = −·130, E = +·991; G = +·359, H = +·047, K = −·932.

The epicentre 19°·5S. 173°·0W. given by Apia was first tried, but found to be too near Japan and China, and too far from Australia. The above departure from it was therefore adopted for use. But some 30 consistent observations of [P] have a mean value +7s., or 10s. greater than the normal [−3s.], indicating a focal *height* of approximately 0·015. It we exclude Apia and make a new solution from the epicentric stations on this supposition, we find three good groups of stations giving equations for δ Δ as below:—

No. Stns.	Locality.	Azimuth.	Equation.	δ Δ	C_1	O−C_1	C_2	O−C_2
4	Australia, etc.	248	−·93x − ·37y = −0·2	−0·6	+0·4	+0·1	−0·3
10	Japan, etc.	313	−·73x + ·68y = −2·0	−1·9	−0·1	−1·6	−0·4
5	America, etc.	33	+·54x + ·84y = −0·2	−0·6	+0·4	−1·1	+0·9

—the solution of which is x = +1°·2, y = −1°·4 represented in the column C_1. This indicates an epicentre at 19°·8S. 173°·8W., which is distinctly a return towards that given by Apia. The actual Apia epicentre, 19°·5S. 173°·0W. would be represented by x = +0°·5, y = −1°·7, and would give the values C_2

Continued on next page.

and the residuals O − C_S. Of these the large positive one is mainly due to the Honolulu P, which has been hitherto retained, but must be late on almost any supposition. If we omit it, the Apia epicentre will fit quite well, with the assumption of high focus, but not without. The solution is, however, printed with epicentre given above to show the necessity of the assumption of high focus (or some equivalent).

		Δ	Az.	P.	O − C.	S.	O − C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Apia		7·4	6	i 1 17	−35	(i 2 17)	−64	i 2·3	2·6
Riverview		34·4	240	e 7 9	+ 1	e 12 48	+ 2	e 16·0	22·4
		34·4	240	i 7 20	+12	i 13 1	+15	—	—
Melbourne		40·2	235	7 59	+ 2	14 11	+ 1	19·9	24·1
Adelaide		44·8	241	9 3	+31	15 33	+21	21·2	27·7
Honolulu		44·8	19	9 5	+33	15 29	+17	18·8	24·6
Tokyo		72·7	321	11 32	− 2	(20 52)	− 6	20·9	56·0
Misusawa	E.	74·3	324	11 40	− 4	30 0	?SR_1	—	—
	N.	74·3	324	11 41	− 3	29 45	?SR_1	—	—
Manila		74·5	292	e 11 47	+ 1	21 22	+ 2	36·5	52·7
Osaka		74·6	319	11 48	+ 2	21 14	− 7	30·2	40·8
Kobe		74·8	320	11 48	0	21 28	+ 4	30·8	42·1
Lick	N.	75·4	39	e 12 1	+10	e 22 4	+34	e 33·6	45·9
Berkeley	E.	75·5	38	e 11 51	− 1	e 21 23	− 9	e 32·8	48·3
	N.	75·5	38	e 11 50	− 2	e 21 28	− 4	e 31·9	48·9
Nagasaki		77·1	315	12 8	+ 6	21 48	− 2	32·1	41·0
Ootomari		78·9	330	12 20	+ 8	(22 7)	− 4	22·1	23·6
Taihoku		79·0	303	12 21	+ 8	(22 2)	−10	22·0	23·1
Batavia		79·1	269	12 19	+ 5	22 39	+26	34·8	56·3
Tucson	N.	79·5	50	12 27	+11	—	—	e 37·3	56·8
Hokoto		79·9	301	e 11 55	−23	(22 9)	−13	22·2	—
Zi-ka-wei		82·2	309	12 30	− 1	22 46	− 2	37·7	47·1
Victoria		82·3	30	12 19	−13	19 42	−187	32·0	46·3
	Z.	82·3	30	12 5	−27	19 5	−224	36·3	43·6
Sitka	E.	84·2	20	e 12 45	+ 2	e 24 16	+66	e 47·3	62·8
	N.	84·2	20	12 42	− 1	e 23 54	+44	e 47·8	62·9
Cipolletti		87·3	131	12 29	−32	(23 23)	−21	23·4	46·0
Denver		87·6	46	22 5	?S	28 35	?SR_1	40·1	51·1
Andalgala	E.	93·5	122	16 35	?PR_1	(27 41)	?SR_1	27·7	57·4
	N.	93·5	122	16 41	?PR_1	(27 35)	?SR_1	27·6	58·9
Lawrence	E.	93·9	49	13 22	−15	17 21?	?PR_1	24·2	58·9
	N.	93·9	49	13 24	−13	—	—	43·2	45·5
Balboa Heights	E.	96·0	84	13 50	+ 1	24 54	−22	45·4	61·1
	N.	96·0	84	13 45	− 4	25 5	−11	40·1	61·6
Mobile		96·0	60	e 18 55	?PR_1	e 26 47	+91	i 53·1	—
La Quiaca		96·5	116	—	—	—	—	64·8	98·7
La Paz		96·8	110	14 5	+12	i 24 41	−43	42·1	47·0
Chicago		100·3	49	13 57	−15	24 33	−86	42·1	56·1
Ann Arbor	E.	103·2	49	13 17?	−69	—	—	43·5	70·1
	N.	103·2	49	—	—	25 53	−33	43·1	65·1
	E.	103·2	49	14 5?	−21	—	—	42·9	70·1
	N.	103·2	49	—	—	25 59	−27	42·1	69·1
Calcutta	N.	106·0	289	14 53	+14	26 41	−11	33·5?	—
Toronto		106·6	48	e 15 5	+23	e 23 23	?	59·6	62·1
Georgetown	E.	107·2	53	e 14 25	−20	25 25	−98	e 44·7	61·0
	N.	107·2	53	e 14 25	−20	25 28	−95	—	63·4
Washington		107·2	53	14 34	−11	25 25	−98	53·1	—
Cheltenham	E.	107·3	54	18 56	?PR_1	—	—	54·9	67·8
	N.	107·3	54	18 59	?PR_1	27 5	+ 1	60·1	65·6
Ithaca		108·4	50	14 29	−21	25 26	−108	44·4	68·0
Colombo		108·8	269	14 5	−47	19 5	?PR_1	24·1	74·1
Ottawa		109·5	47	e 14 35	−20	e 27 17	− 7	e 44·1	—
Northfield		111·5	49	—	—	e 18 58	?PR_1	55·1	—
Vieques	E.	111·9	78	19 36	?PR_1	29 18	+93	55·5	74·4
	N.	111·9	78	18 36	?PR_1	—	—	57·9	59·5
Kodaikanal		112·2	272	19 59	?PR_1	(26 5)	−103	26·1	70·0
Harvard	E.	112·3	50	e 14 36	−32	26 1	−107	48·2	61·8
	N.	112·3	50	15 25	+17	25 55	−113	e 45·8	60·5
Rio de Janeiro	E.	113·8	129	19 59	?PR_1	30 29	+149	56·3	65·9
	N.	113·8	129	—	—	29 59	+119	56·4	64·5
Mauritius	E.	115·7	232	14 35	−49	20 47	?PR_1	30·1	66·1
	N.	115·7	232	16 5	+41	20 41	? PR_1	27·8	66·1
Simla		117·7	293	20 29	?PR_1	30 17	+105	45·2	66·8
Bombay		119·1	280	15 52	+14	30 28	+105	—	64·4
Cape Town		123·9	190	21 11	?PR_1	34 5	?SR_1	66·2	73·2
Dyce		143·3	9	19 58	[+12]	33 14	?	42·8	79·6
Edinburgh		144·5	10	19 45	[− 2]	—	—	—	107·8

Continued on next page.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Bidston		146·8	11	19 17	[−34]	33 23	?	—	73·1
Hamburg	Z.	147·6	357	e 19 49	[− 3]	—	—	e 73·1	128·4
West Bromwich		147·8	11	19 55	[+ 2]	—	—	—	—
Lemberg		148·5	339	i 20 6	[+12]	—	—	e 62·1	110·8
Oxford		148·7	11	19 56	[+ 2]	—	—	43·1?	61·1?
De Bilt		149·1	2	20 2	[+ 8]	—	—	e 77·1	129·9
Kew		149·2	10	20 5	[+11]	—	—	—	116·1
Shide		149·7	11	19 56	[+ 1]	—	—	81·3	85·6
Uccle		150·3	4	19 57	[+ 1]	—	—	e 43·1	104·8
Paris		152·1	7	i 20 13	[+14]	e 43 5	?SR_1	73·1	88·1
Vienna	N.	152·1	347	20 5	[+ 6]	—	—	e 52·4	104·7
	Z.	152·1	347	i 19 57	[− 2]	—	—	e 58·1	106·6
Strasbourg		152·7	358	20 3	[+ 3]	34 11	?	e 63·0	118·4
Zurich		153·8	358	e 20 6	[+ 5]	—	—	—	—
Besançon		154·0	2	20 12	[+11]	29 0?	?	78·1	—
Milan		155·7	357	20 40	[+37]	21 6	?	80·1	86·8
Pola		155·8	349	20 17	[+14]	e 31 7	?	e 107·1	112·1
Moncalieri		156·2	0	20 9	[+ 6]	37 46	?	49·4	110·3
Coimbra		156·7	32	20 15	[+11]	32 57	?	61·4	102·6
Helwan		156·9	297	19 53	[−12]	—	—	—	—
Florence		157·2	353	20 46	[+41]	42 5	?SR_1	45·1	84·1
Marseilles		157·9	4	i 20 21	[+15]	e 26 1	?PR_1	e 81·1	116·7
Athens	E.,	158·2	324	20 8	[+ 2]	30 59	?	e 44·9	67·8
	N.	158·2	324	—	—	—	—	e 44·0	114·5
Rocca di Papa		159·0	349	e 20 12	[+ 5]	e 34 49	?	e 50·5	117·8
Monte Cassino		159·1	346	20 21	[+14]	—	—	—	113·1?
Barcelona		159·3	11	20 12	[+ 5]	33 44	?	45·3	52·5
Rio Tinto		159·5	33	20 5	[− 2]	—	—	—	117·1
Tortosa		159·5	15	20 17	[+10]	—	—	54·8	63·4
Pompeii		159·6	344	20 22	[+14]	34 5	?	61·1	117·1
San Fernando		160·7	35	20 29	[+20]	—	—	84·1	92·1
Granada		161·4	29	20 26	[+17]	—	—	—	—
Algiers		164·0	13	20 15	[+ 4]	—	—	46·1	120·6

Additional records: Riverview gives i = +7m.29s., PR_1 = +9m.4s., PR_2 = +9m.38s., PS = +13m.22s., SR_1 = +15m.31s., SR_2 = +16m.47s., MN and E = +17·4m., MZ = +20·8m., T_0 = 7h.16m.54s. Epicentre 17°·0S. 176°·0W. Melbourne PR_1 = +9m.29s., SR_1 = +16m.59s. Adelaide PR_1 = +11m.52s., SR_1 = +17m.31s., SR_2 = +18m.53s. or +19m.13s. Tokyo S = +12m.53s. Manila iE = +13m.23s. and +14m.30s., iN = +14m.31s., and many more i's, MN = +42·4m., T_0 = 7h.17m.5s. Osaka MN = +41·9m., T_0 = 7h.17m.16s. Kobe MN = +48·2m. Lick ME = +46·6m., T_0 = 7h.16m.51s. Berkeley MV = +47·7m., T_0 = 7h.17m.12s. Ootomari gives S as P and records S = +17m.38s. Taihoku gives S = 16m.55s. (?PR_1). Zi-ka-wei PS = +23m.36s., SR_1N = +31m.27s., SR_1E = +31m.58s., LN = +38·0m., MN = +45·4m., T_0 = 7h.17m.5s. Denver LN = +42·1m. Lawrence LN = +25·1m. Mobile i = +25m.0s. La Paz PR_1E = +17m.56s., PR_1N = +18m.3s. and +20m.12s., MN = +47·0m. T_0 = 7h.18m.20s. Ann Arbor records Bosch and Wiechert records entered in this order above. Calcutta SE = +25m.41s. Toronto e = +13m.53s., +18m.23s., and +20m.5s., iL = +27·7m. and +31·1m., and several other L's. Georgetown PR_1 = +18m.58s., T_0 = 7h.18m.16s. Washington L = +44·5m. and +70·1m. Cheltenham SR_1N = +34m.31s. Ithaca PR_1 = +18m.24s., SN = +26m.21s. Colombo gives no seconds throughout. L = +29·1m. Ottawa ePR_1 = +19m.23s., L = +63·1m., T_0 = 7h.16m.30s. Northfield L = +60·1m. Vieques SR_1N = +35m.50s., SR_1E = +35m.33s. Harvard PR_1N = +19m.23s., PR_1E = +19m.34s., PR_2E = +20m.23s., PR_2N = +20m.50s., iN = +27m.19s., iE = +29m.10s., SR_1N = +31m.5s., SR_1E = +30m.5s., SR_2N = +36m.5s., T_0 = 7h.18m.10s. Rio di Janeiro LN = +40·9m., LE = +41·5m., MN = +41·2m. Dyce PE = +20m.6s. Bidston P = +19m.17s. Hamburg iPZ = +19m.58s. (±1s.). De Bilt MN = +116·6m. Shide P = +20m.5s. Uccle iP = +20m.9s., MZ = +120·8m., MN = +121·3m. Vienna ME = +117·1m. Strasbourg i? = +45m.39s., MN = +112·6m. Pola MN = +114·1m. Moncalieri MN = +103·6m. Coimbra PR_1 = +27m.17s., LN = +65·8m., MN = +119·9m. Helwan PN = +21m.59s. Athens i = +21m.27s., iN = +21m.34s., iE = +21m.51s., and a large number of M's. Rocca di Papa iP = +20m.18s., MN = +110·5m. Barcelona PR_1 = +25m.18s., MN = +112·2m. San Fernando MN = +87·1m.

April 30d. Records also at 3h. (Ascension), 6h. (Port au Prince), 7h. (Chicago), 8h. (Perth), 9h. (La Quiaca), 10h. (Osaka and Kobe), 11h. (Batavia and Mauritius), 12h. (Manila), 16h. (Paris), 17h. (Toronto), 19h. (La Paz Riverview, and Apia), 20h. and 23h. (Apia).

May 1d. 1h. 20m. 45s. Epicentre 26°·0N. 143°·0E.
A = −·718, B = +·541, C = +·438; D = +·602, E = +·799;
G = −·350, H = +·264, K = −·899.

		△	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Tokyo		10·1	345	—	—	—	—	e 6·4	—
Osaka		10·9	325	2 57	+14	—	—	—	13·2
Zi-ka-wei		19·6	290	e 4 40	+ 4	e 8 13	− 2	—	—
Manila		23·5	245	e 5 22	− 1	(9 23)	−12	9·4	—
Apia		59·3	127	—	—	—	—	47·8	—
De Bilt		93·7	336	—	—	—	—	e 49·2	—
Eskdalemuir		93·7	341	—	—	—	—	40·2	—
Helwan		93·9	306	15 15	+98	—	—	—	—
San Fernando		111·1	334	25 15	?S	(25 15)	−143	—	—

Additional records: Osaka gives MN = +14·4m. De Bilt gives its records one hour early, eLN = +44·2m. Eskdalemuir gives its record one hour wrong. Helwan PN = +18m.15s. (?PR$_1$).

1919. May 1d. 5h. 5m. 33s. Epicentre 10°·0S. 36°·0E.

A = +·797, B = +·579, C = −·174; D = +·588, E = −·809;
G = −·140, H = −·102, K = −·985.

		△	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Mauritius	E.	23·4	118	18 39	?	—	—	—	22·0
Capetown		28·8	211	8 39	?	11 27	+14	—	17·0
Accra		39·2	292	18 27	?L	—	—	(18·4)	27·4
Kodaikanal		45·9	66	15 27	?S	(15 27)	0	23·6	27·8
Bombay		46·4	51	8 47	+ 4	—	—	—	28·7
Colombo		46·8	70	15 27	?S	(15 27)	−11	24·6	28·4
Rocca di Papa		56·0	340	9 43	− 3	e 17 17	−17	e 30·3	41·2
Algiers		56·1	330	e 8 54	−53	e 17 42	+ 7	30·0	35·3
Florence		58·3	341	—	—	—	—	27·4	35·4
Pola		58·4	344	e 8 49	−72	e 18 17	+13	e 31·5	39·6
Granada		60·0	325	i 10 14	+ 2	18 19	− 4	—	—
Barcelona		60·2	333	e 9 46	−27	—	—	e 15·8	37·9
Moncalieri		60·6	339	e 9 16	−60	—	—	23·2	37·8
Calcutta		60·7	57	17 9	?S	(17 9)	−83	—	—
Vienna	N.	60·8	349	e 10 19	+ 1	e 18 50	+17	e 33·6	40·4
San Fernando		61·1	323	—	—	—	—	34·4	37·4
Rio Tinto		62·2	324	11 27	+61	—	—	—	39·4
Besançon		63·2	338	10 52	+19	—	—	34·4	—
Strasbourg		63·7	340	10 34	− 2	19 7	− 2	33·1	—
Coimbra	E.	64·9	325	e 10 40	− 4	19 21	− 3	33·7	40·9
	N.	64·9	325	e 10 36	− 8	—	—	32·6	40·4
Paris		65·8	338	e 10 51	+ 1	e 19 46	+11	32·4	42·4
Uccle		66·8	341	10 59	+ 2	e 19 45	− 3	e 36·4	42·4
Hamburg		67·4	346	e 10 59	− 1	e 19 54	− 1	e 32·4	49·2
De Bilt		67·5	343	11 1	0	19 58	+ 2	e 34·4	43·4
Shide		68·8	338	11 6	− 4	20 9	− 3	32·9	45·1
Kew		69·0	339	—	—	—	—	—	45·4
Oxford		69·7	339	10 49	−26	20 21	− 1	36·6	43·4
Batavia		70·1	92	e 11 46	−28	—	—	36·8	21·2
Bidston		71·6	339	8 27	?	19 9	−96	—	39·0
Eskdalemuir		73·1	340	11 34	− 3	21 15	+12	47·4	—
Edinburgh		73·5	340	20 57	?S	(20 57)	−11	—	40·4
Manila		87·7	75	e 13 57	+54	—	—	—	—
Taihoku		90·3	66	38 21	?L	—	—	(38·4)	—
Adelaide		94·4	128	—	—	—	—	—	55·4
Cipolletti		94·5	230	—	—	—	—	59·2	60·6
Andalgala	E.	96·0	240	—	—	—	—	56·2	62·6
Melbourne		98·5	132	—	—	—	—	53·2	55·4
La Paz		100·5	251	e 14 17	+ 4	25 4	−57	49·0	57·4
Mizusawa		108·0	52	33 30	?SR$_1$	—	—	—	—
Ottawa		112·3	315	—	—	—	—	e 53·4	—
Ithaca	E.	113·4	311	—	—	e 54 42	?	e 60·9	—
Georgetown	E.	114·3	309	—	—	—	—	60·6	—
Washington		114·3	309	—	—	54 7	?L	63·0	—
Toronto		115·2	313	—	—	—	—	e 63·4	70·4
Chicago		121·5	312	—	—	54 7	?	63·4	—
Victoria		137·8	339	—	—	—	—	80·3	84·8
Apia		143·6	130	—	—	(30 27)	?	30·4	—
Berkeley		146·0	328	—	—	—	—	e 71·0	—
Honolulu		162·4	48	—	—	(40 27)	?SR$_1$	40·4	105·6

For Notes see next page.

NOTES TO MAY 1d. 5h. 5m. 33s.

Additional records: Mauritius PN = +18m.27s., MN = +21·0m. Colombo S = +22m.51s. Algiers gives its P and S as e simply, also e = +26m.48s., S = +28m.12s. Pola MN = +42·1m. Moncalieri MN = +43·1m. Vienna ePZ = +10m.18s. Hamburg MN = +49·4m., T_0 = 5h.5m.37s. De Bilt MN = +43·0m., T_0 = 5h.5m. 37s. Eskdalemuir L = +36·4m., T_0 = 5h.5m.23s. Andalgala MN = +61·2m. La Paz MN = +58·4m. Ottawa L = +64·4m. and +76·4m. Chicago L = +67·4m.

May 1d. Records also at 0h. (Melbourne), 1h. (Perth), 2h. (Vieques), 3h. (Apia, La Paz, Rocca di Papa, and Tokyo), 4h. (La Paz, Kodaikanal, and Simla), 5h. (Mizusawa), 7h. (Harvard and Dehra Dun), 8h. (La Paz and Apia), 12h. (Taihoku and Batavia), 13h. (Manila), 14h. (Kobe and Osaka), 15h. (Melbourne, Manila, Perth, Apia, and Adelaide), 16h. (Victoria, Apia, and De Bilt), 17h. (Marseilles), 19h. (Granada and Apia), 20h. (Tokyo, Mizusawa, and Osaka), 21h. (Apia, Honolulu, Manila, Perth, Taihoku, Adelaide, and Melbourne), 22h. (Helwan, Mauritius, De Bilt, and Victoria), 23h. (Apia).

1919. May 2d. 2h. 7m. 10s. Epicentre 21°·2S. 172°·5W.

(as on 1919 April 30d.).

A = −·924, B = −·122, C = −·362; D = −·130, E = +·991; G = +·359, H = +·047, K = −·932.

T_0 has been inferred from observations of [P] at the Antipodal Stations. An epicentre at 20°·4S, 171°·4W. would suit the observations rather better, but the material is scanty.

		Δ °	Az. °	P. m. s.	O−C. s.	S. m. s.	O−C. s.	L. m.	W. m.
Apia		7·4	6	1 20	−32	—	—	2·3	4·0
Melbourne		40·2	235	17 50	?	21 8	?	22·8	35·0
Honolulu		44·8	19	8 2	−30	14 50	−22	18·1	26·8
Adelaide		44·8	241	8 25	− 7	14 47	−25	24·2	29·1
Perth		63·9	245	10 47	+10	—	—	—	—
Manila		74·5	292	e 11 43	− 3	—	—	—	—
Osaka		74·6	319	11 34	−12	21 20	− 1	30·4	40·2
Berkeley		75·5	38	—	—	21 20	−12	—	—
Batavia		79·1	269	e 11 31	−43	22 14	+ 1	e 44·7	23·7
Victoria		82·3	30	22 27	?S	(22 27)	−22	34·4	43·3
Cipolletti		87·3	131	21 56	?S	(21 56)	−108	43·9	50·9
Andalgala	E.	93·5	122	—	—	—	—	49·6	52·6
La Paz		96·8	110	—	—	24 37	−47	44·4	49·3
Chicago		100·3	49	14 4	− 8	24 30	−89	50·8	—
Ann Arbor	E.	103·2	49	23 50?	?S	(23 50?)	−156	41·8	55·8
	E.	103·2	49	25 50?	?S	(25 50?)	−36	42·8	55·8
Calcutta	E.	106·0	289	14 50	+11	—	—	—	—
Toronto		106·6	48	—	—	i 26 44	−13	47·5	61·5
Washington		107·2	53	—	—	e 50 20	?L	55·3	—
Georgetown		107·2	53	e 29 9	?S	(e 29 9)	+126	e 55·0	—
Ithaca		108·4	50	—	—	—	—	e 54·3	—
Colombo		108·8	269	57 50	?L	—	—	(57·8)	76·8
Ottawa		109·5	47	—	—	e 26 50	−34	52·0	—
Northfield		111·5	49	—	—	—	—	e 59·8	—
Vieques		111·9	78	—	—	—	—	57·3	—
Kodaikanal		112·2	272	60 38	?L	—	—	67·1	70·2
Harvard	N.	112·3	50	e 15 9	0	27 19	−29	e 49·2	60·8
Mauritius		115.7	232	18 20	?PR_1	(28 8)	− 8	57·5	63·0
Simla		117·7	293	e 49 2	?L	—	— (e 49·0)		—
Capetown		123·9	190	40 38	?	68 2	?L	(68·0)	87·0
Edinburgh		144·5	10	99 50	?L	—	—	(99·8)	140·3
Eskdalemuir		145·0	10	e 20 0	[+12]	i 41 34	?SR_1	73·3	83·0
Bidston		146·8	11	41 56	?SR_1	—	—	—	75·0
Hamburg		147·6	357	e 19 48	[− 4]	—	—	e 73·8	91·6
De Bilt	E.	149·1	2	19 56	[+ 2]	e 42 21	?SR_1	e 72·8	88·4
	N.	149·1	2	19 53	[− 1]	e 24 23	?PR_1	e 75·8	87·5
Kew		149·2	10	—	—	—	—	—	89·8
Shide		149·7	11	—	—	—	—	—	86·1
Uccle		150·3	4	e 19 54	[− 2]	—	—	—	86·8

Continued on next page.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Paris		152·1	7	—	—	e 42 50	?SR_1	78·8	86·8
Vienna		152·1	347	e 20 4	[+ 5]	e 34 50	?	—	87·9
Strasbourg	Z.	152·7	358	20 4	[+ 4]	—	—	—	—
Pola		155·8	349	—	—	e 43 50?	?SR_1	e 83·8?	104·8
Moncalieri		156·2	0	e 34 16	?S	47 7	?SR_1	71·8	91·4
Coimbra		156·7	32	e 20 32	[+28]	—	—	42·9	94·6
Helwan	E.	156·9	297	21 44	[+99]	—	—	—	114·3
	N.	156·9	297	24 44	?PR_1	—	—	—	116·5
Florence		157·2	353	33 44	?S	(33 44)	?	—	54·8
Marseilles		157·9	4	—	—	—	—	e 86·1	—
Barcelona		159·3	11	—	—	—	—	e 81·2	88·8
Rio Tinto		159·5	33	25 50	?PR_1	—	—	—	114·8
San Fernando		160·7	35	84 50	?L	—	—	(84·8)	112·8
Granada		161·4	29	i 20 50	[+41]	33 14	?	—	—
Algiers		164·0	13	—	—	—	—	e 83·8	90·8

Additional records: Osaka gives MN = +40·4m. Andagala MN = +53·6m. La Paz PR_1 = +18m.17s. Ann Arbor gives Bosch-Omori and Wiechert readings. Toronto eL = +55·5m. Georgetown eLZ = +54·7m. Ottawa e = +24m.50s. and many other L's. Harvard iN = +29m.14s., LN = 51·7m. Mauritius S is given as PN. Hamburg MN = +89·3m., MZ = +90·9m. Vienna iPZ = +20m.1s. Pola MN = +91·3m. Moncalieri MN = +90·2m. Coimbra MN = +87·9m. San Fernando MN = +90·3m. Granada SR_1 = +44m.30s.

May 2d. Records also at 0h. (Batavia and Apia), 4h. (Colombo and Apia), 5h. (Chicago, Vienna, and Zi-ka-wei), 6h. (Ottawa, Apia, and Strasbourg), 7h. (Helwan, Taihoku, and Victoria), 9h. (Apia), 18h. (La Paz), 19h. (Ascension), 21h. (Helwan and Chicago), 22h. and 23h. (Lick).

1919. May 3d. 0h. 51m. 55s. Epicentre 40°·7N. 145°·8E.

A = −·627, B = +·426, C = +·652; D = +·562, E = +·827; G = −·539, H = +·367, K = −·758.

The records of this earthquake give a very good determination on the assumption of a very slight depth of focus. As the evidence is plentiful it seems justifiable to go to rather greater refinements than usual, and in the following we have assumed for the depth of focus 0·005, which appears by no means too small to bring the observations in different azimuths into line.

Station and Component.		Corr. for Focus	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	°	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	E.	0·0	3·9	247	1 1	0	—	—	—	—
Ootomari		0·0	6·4	341	1 34	− 4	—	—	2·0	3·3
Tokyo		0·0	6·9	226	1 45	0	3 10	+ 3	—	—
Osaka		−0·1	10·2	237	2 33	+ 2	—	—	5·5	6·1
Kobe	N.	−0·1	10·3	238	2 35	+ 2	—	—	4·9	6·5
Nagasaki		−0·1	15·0	243	3 37	− 1	—	—	6·8	10·9
Zi-ka-wei		−0·2	21·8	252	e 4 59	− 1	e 8 53	− 4	—	14·5
Taihoku		−0·3	25·6	240	5 44	+ 3	(10 22)	+13	10·4	10·7
Manila		−0·4	33·9	227	e 6 45	−16	12 5	−27	15·5	15·7
Honolulu		−0·5	50·9	94	9 11	+ 2	(16 17)	− 7	16·3	31·1
Calcutta	E.	−0·5	51·2	269	9 5	− 6	16 35	+ 8	29·1	—
	N.	−0·5	51·2	269	9 5	− 6	16 29	+ 2	29·1	34·3
Sitka	E.	−0·5	51·2	43	9 13	+ 2	e 16 35	+ 8	e 29·1	33·8
	N.	−0·5	51·2	43	—	—	e 16 40	+13	e 32·5	34·8
Dehra Dun		−0·5	54·8	281	9 35	0	—	—	—	—
Batavia		−0·6	59·0	227	10 5	+ 4	18 12	+ 8	e 28·4	44·7
Victoria		−0·6	61·3	49	10 0	−17	18 56	+24	32·8	38·1
Bombay		−0·6	65·1	275	10 59	+17	—	—	—	42·4
Apia		−0·6	67·2	133	—	—	e 19 53	+ 8	28·4	32·5
Colombo		−0·6	67·4	260	11 5	+ 8	22 5	?	44·1	48·1
Berkeley	E.	−0·6	67·6	58	e 11 5	+ 7	e 20 7	+17	—	32·5
	N.	−0·6	67·6	58	e 11 3	+ 5	e 19 59	+ 9	e 30·8	35·6
	Z.	−0·6	67·6	58	e 11 7	+ 9	—	—	—	35·8
Lick		−0·6	68·4	58	—	—	e 20 43	+43	—	35·6
Sydney	E.	−0·6	74·7	175	20 5	?8′	(20 5)	−70	31·8	34·4
Adelaide		−0·7	75·9	188	10 5	−105	21 10	−18	—	51·3

Continued on next page.

Station and Component.		Corr. for Focus	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	°	m. s.	s.	m. s.	s.	m.	m.
Lemberg		−0·7	76·1	325	i 12 0	+ 9	i 21 41	+11	e 40·9	50·6
Denver	N.	−0·7	77·1	49	—	—	—	—	39·1	—
Perth		−0·7	77·7	205	12 16	+15	—	—	—	—
Hamburg		−0·7	78·4	335	i 12 9	+ 4	i 22 6	+ 9	e 38·1	45·1
Tucson		−0·7	78·4	57	—	—	22 20	+23	—	—
Dyce	E.	−0·7	78·5	344	12 20	+14	22 14	+16	47·5	55·1
	N.	−0·7	78·5	344	12 18	+12	22 16	+18	34·1	47·5
Melbourne		−0·7	78·5	181	—	—	22 5	+ 7	37·7	42·8
Edinburgh		−0·7	79·9	343	12 5	− 9	—	—	—	48·2
Eskdalemuir		−0·7	80·4	343	12 19	+ 2	22 8	+ 8	39·1	51·6
Vienna		−0·7	80·5	329	i 12 20	+ 2	i 22 31	+10	41·4	51·6
De Bilt		−0·7	81·1	337	12 26	+ 5	22 35	+ 7	38·1	44·8
Bidston		−0·7	82·1	342	12 28	+ 1	i 22 43	+ 4	—	—
Uccle		−0·7	82·5	337	12 31	+ 2	e 22 45	+ 1	40·1	45·2
West Bromwich		−0·7	82·7	341	12 31	+ 1	e 22 42	− 4	—	—
Kew		−0·7	83·2	340	—	—	—	—	—	53·1
Oxford		−0·7	83·2	340	12 35	+ 2	i 22 57	+ 5	—	—
Strasbourg		−0·7	83·4	333	12 37	+ 3	22 51	− 3	39·0	47·2
Zurich		−0·7	84·1	331	12 39	+ 1	23 3	+ 2	—	—
Pola		−0·7	84·2	329	e 12 39	0	e 23 1	− 2	e 39·1	53·5
Shide		−0·7	84·2	340	12 39	0	i 23 1	− 2	39·4	50·4
Chicago		−0·7	84·4	37	i 12 40	0	23 5	− 1	39·8	—
Paris		−0·7	84·8	338	i 12 45	+ 2	i 23 8	− 1	40·1	41·1
Besançon		−0·7	85·1	335	12 46	+ 2	23 8	− 4	42·1	—
Athens	E.	−0·7	85·3	319	e 12 45	− 1	23 13	− 2	e 41·2	56·5
	N.	−0·7	85·3	319	—	—	—	—	e 40·9	55·4
Milan		−0·7	85·5	331	11 20	−87	13 20	?	—	23·5
Ann Arbor	E.	−0·7	85·7	34	12 47	− 1	23 29	+10	40·4	46·2
	E.	−0·7	85·7	34	12 47	− 1	23 17	− 2	40·1	46·1
	N.	−0·7	85·7	34	12 47	− 1	23 11	− 8	40·1	50·1
Florence		−0·7	86·1	330	13 5	+15	23 5	−18	30·1	46·1
Ottawa		−0·7	86·2	28	i 12 51	0	i 23 25	0	38·6	—
Toronto		−0·7	86·3	30	e 13 23	+32	e 23 59	+33	38·1	56·9
Moncalieri		−0·7	86·5	331	i 12 48	− 4	i 23 21	− 7	29·9	56·5
Helwan	E.	−0·7	87·0	309	12 47	− 8	—	—	—	68·3
	N.	−0·7	87·0	309	12 59	+ 4	—	—	—	62·5
Rocca di Papa		−0·7	87·3	327	12 52	− 5	23 21	−16	e 43·0	49·8
Pompeii		−0·7	87·4	325	e 12 27	−30	23 27	−11	33·1	50·6
Northfield		−0·7	88·4	26	13 2	− 1	23 35	−14	e 45·1	—
Ithaca	E.	−0·7	88·5	30	12 58	− 6	23 14	−36	39·9	—
	N.	−0·7	88·5	30	13 1	− 3	22 54	−56	33·5	—
Marseilles		−0·7	88·8	332	i 13 8	+ 2	23 26	−27	42·1	—
Harvard		−0·7	90·4	26	13 6	− 8	24 5	− 6	48·3	62·1
Georgetown	E.	−0·7	91·3	31	e 13 18	− 1	24 21	+ 1	e 45·3	51·2
	N.	−0·7	91·3	31	e 13 18	− 1	24 18	− 2	e 45·3	—
	Z.	−0·7	91·3	31	i 13 9	−10	24 22	+ 2	e 44·1	—
Washington		−0·7	91·3	31	13 15	− 4	24 18	− 2	42·1	—
Barcelona		−0·7	91·5	333	13 14	− 6	23 49	−33	39·9	50·6
Cheltenham	E.	−0·7	91·5	31	13 30	+10	24 24	+ 2	50·1	62·1
	N.	−0·7	91·5	31	13 19	− 1	24 19	− 3	46·9	62·7
Tortosa		−0·7	92·6	335	13 23	− 3	23 57	−37	44·4	54·5
Algiers		−0·7	95·3	330	e 13 29	−12	24 19	−43	46·1	53·1
Coimbra	E.	−0·7	95·8	340	13 0	−44	24 20	−47	43·2	57·1
	N.	−0·7	95·8	340	—	—	—	—	45·4	56·6
Rio Tinto		−0·7	97·5	339	15 5	+72	—	—	—	68·1
San Fernando	N.	−0·7	98·7	338	13 53	− 7	24 5	−91	53·1	58·6
Mauritius		−0·7	101·4	255	16 17	+123	—	—	—	58·2
Vieques	E.	−0·8	114·3	32	19 44	?PR_1	—	—	51·8	62·2
	N.	−0·8	114·3	32	19 53	?PR_1	29 32	+93	62·6	69·0
Cape Town		—	138·2	262	19 23	[−13]	23 41	?PR_1	83·4	87·4
La Paz	E.	—	142·0	60	e 19 40	[− 3]	33 44	+149	68·7	80·1
	N.	—	142·0	60	i 19 39	[− 4]	33 27	+132	68·6	71·6
Andalgala	E.	—	150·6	74	23 35	?PR_1	—	—	78·9	103·2
	N.	—	150·6	74	23 23	?PR_1	—	—	80·6	90·9
Cipolletti		—	154·0	97	19 5	[−56]	—	—	—	85·6

Additional records: Mizusawa PN = +1m.3s. Zi-ka-wei MN = 14·6m., T_e = 0h.52m.2s. Manila MN = +15·8m., T_e = 0h.51m.57s. Dehra Dun gives its record 10m. too early. Batavia SR_1 = +22m.0s., T_e = 0h.51m.56s. Colombo only records minutes. Lick MN = +37·4m. Adelaide PR_1 = +14m.40s., SR_1 = +30m.40s. Lemberg PR_1 = +14m.53s. Denver LE = +43·1m. Hamburg PR_1 = +15m.19s., SR_1 = +27m.16s., MN = +45·0m., MZ = +50·8m., T_e = 0h.52m.5s. Melbourne SR_1 = +27m.17s. Eskdalemuir PR_1 = +15m.43s., SR_1 = +27m.35s., T_e = 0h.52m.1s. De Bilt PR_1 = 15m.32s., MN = +45·1m., T_e = 0h.52m.10s., epicentre 38°·2N. 137°·7E.

Notes continued on next page.

Bidston $PR_1 = +15m.40s.$ Uccle $iPR_1 = +15m.45s.$, $SR_1 = +28m.5s.$, $MN = +45\cdot7m.$, $MZ = +54\cdot1m.$, $T_o = 0h.52m.10s.$ West Bromwich $iS = +22m.53s.$, $SR_1 = +28m.7s.$ Oxford $PR_1 = +15m.52s.$, $SR_1 = +28m.20s.$ Strasbourg $MN = +47\cdot0m.$, $T_o = 0h.52m.16s.$ Pola $MN = +58\cdot6m.$ Shide $PR_1 = +16m.0s.$, $eS = +22m.49s.$ Chicago $PR_1 = +15m.59s.$, $L = +55\cdot1m.$ and $+71\cdot0m.$, $T_o = 0h.52m.8s.$ Paris $PR_1 = +16m.3s.$, $SR_1 = +28m.48s.$, $T_o = 0h.52m.15s.$ Epicentre 40°·0N. 138°·0E. Athens $PR_1 = +16m.13s.$, $SR_1E = +28m.55s.$, $m = +33m.54s.$, $T_o = 0h.52m.10s.$ Ottawa, a large number of L's and $T_o = 0h.52m.10s.$ Toronto $i = +30m.5s.$, $iL = +48\cdot9m.$ and $+54\cdot6m.$, $T_o = 0h.52m.36s.$ Moncalieri $MN = +56\cdot0m.$, $T_o = 0h.52m.8s.$ Northfield $L = +62\cdot1m.$, $T_o = 0h.52m.22s.$ Ithaca $PR_1 = +16m.17s.$, $T_o = 0h.52m.55s.$ Harvard $iN = +16m.42s.$ and $+23m.37s.$, $eLN = +42\cdot8m.$, $LN = +46\cdot1m.$, $T_o? = 0h.51m.33s.$ Georgetown $iZ = +16m.51s.$, $PR_1N = +17m.2s.$, $T_o = 0h.52m.9s.$ Washington $PR_1 = +16m.57s.$, $PR_2 = +18m.45s.$, $T_o = 0h.52m.3s.$ Barcelona $PR_1 = +16m.53s.$, $PR_2 = +20m.8s.$, $SR_1 = +30m.14s.$, and $+34m.12s.$, $MN = +51\cdot7m.$, $T_o = 0h.52m.22s.$ Algiers $PR_1 = +17m.28s.$, $MN = +56\cdot1m.$, $T_o = 0h.51m.31s.$ Coimbra $PR_1 = +17m.28s.$, $iS = +31m.36s.$, $T_o = 0h.51m.29s.$ San Fernando $PE = +18m.35s.$ ($?PR_1$). Mauritius $PN = +19m.29s.$ ($?PR_1$). La Paz $PR_1 = +23m.25s.$ Andalgala $ME = +45\cdot9m.$ and $MN = +52\cdot9m.$

May 3d. Records also at 4h. (Mizusawa and Apia), 5h. (San Fernando), 6h. (Mizusawa), 10h. (Apia), 11h. (Apia and De Bilt), 12h. (Helwan), 14h. (Apia), 21h. and 23h. (Apia).

May 4d. 18h. 30m. 38s. Epicentre 34°·6N. 140°·7E. (as on 1918 Nov. 10d.).

$A = -\cdot637$, $B = +\cdot521$, $C = +\cdot568$.

	Δ	P.	O−C.	S.	O−C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Tokyo	1·3	0 17	− 3	0 41	+ 5	—	—
Osaka	4·3	1 3	− 4	—	—	2·2	2·3
Mizusawa N.	4·5	1 12	+ 2	2 7	+ 3	—	—
Taihoku	19·2	3 35	−56	—	—	—	—
Helwan	87·4	43 22	?L	—	—	(43·4)	—

Mizusawa $PN = +2m.4s.$ Taihoku gives its record as on 3d.

May 4d. 22h. 0m. 12s. Epicentre 21°·1N. 121°·7E. (as on 1918 April 26d.).

$A = -\cdot490$, $B = +\cdot794$, $C = +\cdot360$.

	Δ	P.	O−C.	S.	O−C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Taihoku	3·9	1 49	?S	(1 49)	+ 2	e 2·4	—
Manila	6·5	1 37	− 2	(2 54)	− 3	2·9	3·2
Zi-ka-wei	10·1	—	—	—	—	e 5·6	—
De Bilt	88·4	—	—	—	—	e 50·8	51·1
Edinburgh	90·1	48 48	?L	—	—	(48·8)	121·8

Additional records: Manila gives $MN = +3\cdot4m.$ De Bilt $MN = +53\cdot4m.$

May 4d. 22h. 42m. 38s. Epicentre 21°·2S. 172°·5W. (as on 1919 May 2d.).

$A = -\cdot924$, $B = -\cdot122$, $C = -\cdot362$; $D = -\cdot130$, $E = +\cdot991$; $G = +\cdot359$, $H = +\cdot047$, $K = -\cdot932$.

T_o has been inferred chiefly from the antipodal stations; but the observations at Apia, Melbourne, Honolulu, and Chicago suggest an increase of T_o to about 43m.0s.; in which case the antipodal stations indicate a deeper focus than on May 2. But the material is poor. The records at Rocca di Papa probably refer to another shock. Manila may be one minute in error.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Apia	7·4	6	2 26	+34	—	—	2·8	—
Sydney E.	34·4	240	22 22	?L	—	—	27·0	29·4
Melbourne	40·2	235	18 22	?	—	—	23·3	24·6
Honolulu	44·8	19	—	—	(15 22)	+10	15·4	28·9
Perth	63·9	245	—	—	—	—	30·7	—
Manila	74·5	292	e 10 50	−56	—	—	—	—
Victoria	82·3	30	—	—	—	—	32·3	45·6
La Paz	96·8	110	—	—	—	—	55·8	58·2

Continued on next page.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Chicago		100·3	49	15 30	+78	25 27	−32	42·4	—
Toronto		106·6	48	—	—	—	—	58·8	61·9
Ithaca		108·4	50	—	—	—	—	61·7	—
Harvard		112·3	50	—	—	—	—	59·4	—
Eskdalemuir		145·0	10	—	—	e 41 28	?SR$_1$	72·4	—
Hamburg		147·6	357	i 19 44	[− 8]	—	—	e 84·4	—
De Bilt	E.	149·1	2	—	—	e 42 16	?SR$_1$	79·4	86·6
	N.	149·1	2	—	—	—	—	76·4	87·3
Strasbourg		152·7	358	20 0	[0]	—	—	—	—
Helwan		156·9	297	38 22	?	—	—	—	—
Rocca di Papa		159·0	349	e 20 22	[+15]	(e 20 34)	[+27]	—	20·9
		159·0	349	e 20 4	[− 3]	—	—	89·4	20·9
San Fernando		160·7	35	22 22	?PR$_1$	—	—	—	—

Additional records: Chicago gives L = +50·4m., T$_o$ = 22h.6m.49s. Toronto eL = +60·4m. Harvard L = +61·9m. Eskdalemuir eN = +54m.57s.

May 4d. Records also at 1h., 2h., and 8h. (Apia), 10h. (Helwan), 11h. (Apia), 12h. (Rocca di Papa), 15h. (Apia), 16h. (Mizusawa), 17h. (Apia).

May 5d. 20h. 27m. 45s. Epicentre 55°·0N. 35°·0W. (as on 1917 Mar. 3d.).
A = +·470, B = −·329, C = +·819; D = −·574, E = −·819;
G = +·671, H = −·470, K = −·574.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Eskdalemuir	18·0	76	—	—	7 15	−25	—	—
Shide	20·6	88	—	—	—	—	—	13·8
Kew	20·9	84	—	—	—	—	—	12·2
Coimbra	23·0	119	—	—	—	—	e 11·7	—
De Bilt	23·7	80	5 31	+ 6	9 37	− 1	11·2	14·8
Hamburg	25·8	75	e 5 44	− 2	—	—	e 15·0	15·2
San Fernando	27·0	122	15 15	?L	—	—	(15·2)	—

Additional records: De Bilt gives MN = +15·0, T$_o$ = 20h.28m.8s. Hamburg MN = +16·2m., T$_o$ = 20h.33m.29s. San Fernando PN = +14m.45s.

May 5d. Records also at 0h. (Helwan and Paris), 2h. (Cape Town), 4h. (Rio Tinto), 5h. (Georgetown), 6h. (De Bilt and Eskdalemuir (2)), 13h. (Apia and Hamburg), 14h. (Vienna and Strasbourg), 15h. (Colombo and Helwan), 16h. (Hamburg, Paris, and De Bilt (2)), 17h. (Rocca di Papa and Vienna), 18h. (La Paz), 19h. (Zi-ka-wei, Helwan, Eskdalemuir, Moncalieri, and De Bilt), 23h. (Helwan and De Bilt).

May 6d. 4h. 8m. 50s. Epicentre 21°·2S. 172°·5W. (as on 1919 May 4d.).
A = −·924, B = −·122, C = −·362; D = −·130, E = +·991;
G = +·359, H = +·047, K = −·932.
The identity of the epicentre is very doubtful.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Apia		7·4	6	3 0	+68	i 3 10	−11	—	4·6
Melbourne		40·2	235	—	—	14 10	0	24·0	24·7
Honolulu		44·8	19	15 10	?S	(15 10)	− 2	19·0	28·2
Adelaide		44·8	241	18 4	?SR$_1$	22 54	?L	27·3	29·7
Perth		63·9	245	19 10	?S	(19 10)	− 2	—	—
Manila		74·5	292	e 12 20	+34	—	—	—	—
Victoria		82·3	30	—	—	—	—	40·6	45·5
Cipolletti		87·3	131	46 16	?L	—	—	(46·3)	53·6
La Paz		96·8	110	e 33 21	?SR$_1$	—	—	48·0	58·7
Chicago		100·3	49	—	—	25 43	−16	46·7	52·2
Toronto		106·6	48	—	—	—	—	56·5	62·1
Colombo		108·8	269	71 10	?L	—	—	(71·2)	—
Edinburgh		144·5	10	42 10	?SR$_1$	—	—	—	80·4
Eskdalemuir		145·0	10	—	—	41 10	?SR$_1$	—	—
Hamburg		147·6	357	e 20 29	[+37]	—	—	e 79·2	94·2
De Bilt	E.	149·1	2	—	—	e 43 7	?SR$_1$	e 84·2	84·7
	N.	149·1	2	e 20 54	[+60]	—	—	e 80·2	86·8
Kew		149·2	10	—	—	—	—	—	90·2
Paris		152·1	7	—	—	—	—	e 85·2	—
Vienna		152·1	347	i 20 41	[+42]	23 47	?PR$_1$	31·2	—
Strasbourg		152·7	358	—	—	—	—	94·2	—
Helwan	E.	156·9	297	30 10	?S	(30 10)	?	—	—

Additional records: Melbourne gives PR$_1$ = +9m.22s., SR$_1$ = +20m.40s. Chicago L = +52·2m. Toronto eL = +58·5m. Helwan PN = +43m.10s. (?SR$_1$).

1919. May 6d. 19h. 40m. 45s. Epicentre 6°·0S. 153°·0E.

(as on 1918 Aug. 8d.). Focus 0·030 *above* normal.

A = −·886, B = +·451, C = −·104; D = +·454, E = +·891; G = +·093, H = −·047, K = −·995.

There seem to be several mistakes of whole minutes. The solution adopted is the outcome of a good deal of work on the material, which pointed persistently to the high focus. It will be seen that the antipodal observations support this view.

		Corr. for Focus	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	°	m. s.	s.	m. s.	s.	m.	m.
Sydney		+1·8	27·9	183	—	—	—	—	—	17·8
Adelaide		+2·1	31·8	203	6 59	− 5	11 59	−40	16·9	18·9
Melbourne		+2·2	32·7	192	7 15	+ 3	13 51	+57	—	20·2
Apia		+2·2	35·5	104	7 35	− 1	(13 21)	−13	16·0	20·2
Manila		+2·4	37·9	303	e 7 42	−15	14 3	− 8	17·5	20·7
Perth		+2·7	43·3	228	6 33	−127	15 15	−13	—	—
Taihoku		+2·7	43·5	319	8 46	+ 5	13 42	−109	18·5	20·0
Tokyo		+2·7	43·5	347	8 31	−10	16 24	+53	19·5	23·5
Hokoto		+2·7	44·0	316	e 7 25	−80	—	—	—	—
Kobe		+2·7	44·0	339	8 47	+ 2	—	—	18·8	22·2
Osaka		+2·7	44·0	339	8 36	− 9	15 23	−14	19·7	19·9
Nagasaki		+2·8	44·5	332	8 31	−18	—	—	19·2	23·7
Batavia		+2·8	45·9	268	(4) 48	(−10)	(12) 36	(−26)	18·9	21·3
Mizusawa		+2·9	46·4	349	8 40	−22	19 36	?SR_1	—	—
Ootomari		+3·3	53·4	354	8 41	−69	15 31	−131	20·5	22·8
Honolulu		+3·4	55·3	59	9 15	−48	i 15 45	−142	24·8	33·2
Calcutta	E.	+3·8	69·3	299	11 33	− 4	21 27	+24	30·7	36·5
	N.	+3·8	69·3	299	11 21	−16	20 45	−18	30·7	—
Colombo		+3·9	74·1	279	12 15	+ 8	23 15	+75	37·2	50·2
Dehra Dun		+4·0	80·2	304	11 15	−88	—	—	—	—
Simla		+4·0	81·1	303	12 27	−22	22 45	−35	34·6	49·5
Bombay		+4·1	82·8	290	13 23	+25	—	—	—	—
Sitka	E.	+4·1	85·2	31	e 24 11	?S	(24 11)	+ 5	39·8	42·5
	N.	+4·1	85·2	31	e 25 40	?S	(25 40)	+94	39·2	42·7
Berkeley	E.	+4·2	89·4	52	e 13 19	−17	e 25 1	+ 9	—	52·8
	N.	+4·2	89·4	52	e 13 55	+19	e 25 6	+14	e 36·6	43·5
	Z.	+4·2	89·4	52	e 13 23	−13	e 24 56	+ 4	—	52·8
Lick		+4·2	89·9	52	—	—	e 26 7	+70	—	54·2
Victoria		+4·2	90·3	41	16 6	+145	24 28	−33	38·2	56·9
Tucson		+4·3	98·3	58	—	—	—	—	40·7	42·6
Denver		+4·4	103·0	50	47 15	?	—	—	59·2	60·2
Chicago		—	115·7	45	18 35	[− 5]	30 5	?	50·2	—
Ann Arbor	E.	—	118·3	45	20 33	?PR_1	30 27	?	50·9	64·2
	N.	—	118·3	45	20 21?	?PR_1	—	—	51·2	65·2
	E.	—	118·3	45	20 39	?PR_1	—	—	51·0	64·2
	N.	—	118·3	45	20 45	?PR_1	—	—	51·2	—
Lemberg		—	118·9	324	20 45	?PR_1	—	—	e 52·4	68·2
Helwan	E.	—	120·4	301	53 21	?L	—	—	(53·3)	143·6
	N.	—	120·4	301	55 21	?L	—	—	(55·3)	134·8
Toronto		—	120·8	42	e 20 39	?PR_1	31 15	?	39·3	82·1
		—	120·8	42	21 27	?PR_1	e 32 3	?	43·4	—
Cipolletti		—	121·2	142	21 51	?PR_1	—	—	63·8	77·4
Cape Town		—	121·4	223	17 51	[−65]	31 33	?	65·3	72·3
Ottawa		—	122·4	39	e 20 21	?PR_1	31 6	?	50·2	—
Ithaca		—	123·2	42	e 21 4	?PR_1	—	—	51·6	—

The allowance for high focus has ceased to be applicable—except by guess. The remainder of the observations are chiefly interesting at present for the value of [P].

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Hamburg		123·7	333	e 19 18	[+16]	—	—	e 53·2	68·1
Vienna		124·0	326	19 23	[+20]	31 17	?	e 50·2	55·2
Athens		124·1	312	e 19 41	[+58]	30 26	?	e 52·4	64·3
Georgetown	E.	124·2	46	e 19 55	[+51]	e 31 41	?	e 52·8	70·2
	N.	124·2	46	e 20 4	[+60]	e 31 48	?	e 53·2	62·9
Washington		124·2	46	e 20 15	?PR_1	31 45	?	52·7	—
Cheltenham	E.	124·4	46	22 0	?PR_1	—	—	55·2	70·6
	N.	124·4	46	23 6	?PR_1	—	—	53·2	68·2
Northfield		124·8	39	e 20 35	?PR_1	31 20	?	54·2	—
Dyce	E.	125·1	344	22 5	?PR_1	—	—	53·1	65·0
	N.	125·1	344	22 5	?PR_1	31 17	?	39·2	63·1

Continued on next page.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Edinburgh		126·6	344	20 15	[+65]	—	—	—	67·2
Harvard		126·7	40	e 20 12	[+62]	31 28	?	e 53·1	62·1
De Bilt	E.	126·9	336	e 15 54	−20	e 28 36	−63	e 54·2	59·1
	N.	126·9	336	e 19 50	[+39]	e 32 30	?	—	75·5
Eskdalemuir	E.	127·2	343	14 56	−79	e 21 47	?PR$_1$	30·2	—
Pola		127·4	324	e 20 15	[+63]	e 32 15	?	e 53·7	67·4
Uccle		128·1	335	e 19 15	[+ 1]	—	—	e 54·2	79·5
Strasbourg		128·3	330	19 33	[+18]	—	—	e 22·3	67·6
Zurich		128·7	329	e 19 27	[+12]	—	—	e 44·2	—
Bidston		128·7	342	21 15	?PR$_1$	33 45	?	—	72·2
Pompeii		129·3	319	19 47	[+30]	31 41	?	43·2	65·2
Andalgala		129·3	133	27 3	?	—	—	67·5	78·4
		129·3	133	45 3	?	—	—	67·8	79·0
Kew		129·4	339	22 15	?PR$_1$	—	—	—	71·2
Oxford		129·5	339	20 1	[+44]	—	—	—	82·3
Florence		129·5	322	22 24	?PR$_1$	39 59	?SR$_1$	59·2	64·2
Milan		129·6	327	18 21	[−56]	—	—	63·2	85·5
Rocca di Papa		129·8	322	19 28	[+10]	28 5	?	e 56·0	67·4
Besançon		130·0	331	19 56	[+38]	—	—	54·2	—
Shide		130·4	339	20 0	[+41]	23 15	?PR$_1$	43·4	73·1
Paris		130·5	335	19 56	[+37]	—	—	56·2	61·2
Moncalieri		130·7	328	20 14	[+54]	35 59	?	45·3	82·3
La Quiaca		132·8	129	60 21	?L	—	—	(60·3)	66·3
Marseilles		133·1	329	i 23 32	?PR$_1$	e 29 9	−73	57·2	78·7
La Paz		133·5	119	20 1	[+35]	33 27	?	56·7	69·2
Barcelona		136·1	328	e 20 2	[+30]	36 18	?	54·2	70·5
Tortosa		137·4	329	19 50	[+15]	—	—	47·4	71·0
Algiers		138·7	323	20 4	[+27]	29 35	−81	61·2	72·2
Vieques	E.	140·6	68	21 13	[+93]	23 59	?PR$_1$	59·5	79·3
	N.	140·6	68	21 20	[+100]	—	—	60·0	79·6
Coimbra		141·9	337	20 12	[+29]	31 26	+12	57·0	76·4
		141·9	337	e 22 49	?PR$_1$	42 15	?SR$_2$	59·2	76·7
Granada		142·3	329	e 19 55	[+11]	e 33 3	+106	—	—
Rio Tinto		143·2	333	19 15	[−30]	—	—	—	91·2
San Fernando		144·1	332	20 9	[+22]	—	—	74·2	94·2
Rio de Janeiro		147·1	151	e 21 3	[+72]	—	—	43·8	—
		147·1	151	e 20 51	[+60]	—	—	43·6	—
Azores		148·3	357	21 27	[+94]	—	—	—	—

Additional records: Adelaide PR$_1$ = +8m.2ls., SR$_1$ = +13m.11s. Melbourne PR$_2$ = +9m.27s., SR$_1$ = +16m.21s., SR$_2$ = +17m.27s. Manila MN = +20·3m., T$_0$ = 19h.40m.25s. Perth PR$_1$ = +10m.43s., SR$_1$ = +18m.27s. Kobe MN = +21·9m. Osaka MN = +22·1m., T$_0$ = 19h.40m.48s. Batavia: In forming the P and S residuals the records have been increased by 4m. Mizusawa PN = +8m.44s. Honolulu i = +18m.45s. Kodaikanal (Δ = 76°·7, Az. = 282°) gives P = 19h.30m.12s., L = 19h.55m.6s., M = 20h.28m.30s. Mauritius (Δ = 92°·6, Az. = 249°) gives PEN = 19h.35m.54s., LE = 20h.6m.36s., LN = 20h.5m.36s., ME = 20h.35m.6s., MN = +20h.22m.12s. Lick MN = +44·1m. Denver MN = +51·2m. Chicago L = +69·2m. Ann Arbor gives Bosch-Omori and Weichert readings. Helwan gives its records 1h. early. Toronto E = +19m.15s., iP = +24m.9s., and +26m.39s., and other L's. Ottawa gives a large number of L's, T$_0$ = 19h.48m.19s. Hamburg PR$_1$ = +23m.39s., PR$_2$ = +26m.48s., SR$_1$ = +39m.17s., SR$_2$ = +43m.1s., MN = +74·1m., MZ = +78·3m. Vienna PR$_1$ = +23m.54s., PR$_2$ = +26m.45s., PR$_3$ = +28m.25s. Athens PR$_1$ = +26m.49s., PS = +31m.25s., SR$_1$ = +34m.43s., LN = +53·4m., MN = +63·2m., T$_0$ = 19h.47m.39s. Washington L = +58·9m. and +68·2m. Northfield L = +60·7m., +75·2m., and +82·2m. Dyce iN = +25m.37s. Harvard eE = +21m.28s., eN = +21m.48s., eE = +36m.1s., iN = +39m.22s., iE = +39m.42s., L = +56·2m., and +60·3m. De Bilt e = +39m.15s. Eskdalemuir eN = +18m.37s. and +21m.39s. Rola MN = +67·7m. Uccle MN = +75·6m., MZ = +79·4m. Strasbourg MN = +80·3m. Pompeii L = +58·2m. Paris eE = +20m.24s., i = +22m.8s. Moncalieri MN = +81·2m. La Quiaca MN = +115·6m. La Paz PR$_1$N = +24m.7s. and +28m.3s., MN = +72·2m., L = +57·9m. and +64·0m. Barcelona PR$_1$ = +23m.38s., PR$_2$ = +29m.34s., SR$_1$ = +42m.17s. Algiers PR$_1$ = +22m.59s., MN = +83·2m. Coimbra gives a set of Milne observations given in the second of its two lines in the table, also PR$_1$ = +23m.58s., PSN = +31m.6s., SR$_1$ = +36m.28s., SR$_2$ = +42m.32s., LN = +60·0m., MN = +74·3m., T$_0$ = 19h.47m.38s. San Fernando MN = +89·2m.

May 6d. Records also at 0h. (San Fernando), 1h. (De Bilt), 3h. (Algiers), 6h. (Kodaikanal), 7h. (Harvard), 8h. (Helwan, Apia (2), and Balboa Heights), 10h. (Helwan), 12h. (La Paz), 14h. (Helwan), 18h. (Berkeley), 19h. (Colombo).

May 7d. 5h. 13m. 38s. Epicentre 6°·0S. 153°·0E.

(as on 1919 May 6d. 19h., but there is no evidence of high focus).

$A = -\cdot886$, $B = +\cdot451$, $C = -\cdot104$; $D = +\cdot454$, $E = +\cdot891$; $G = +\cdot093$, $H = -\cdot047$, $K = -\cdot995$.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Sydney		27·9	183	5 10	−57	10 46	−11	15·6	17·0
Adelaide		31·8	203	6 51	+ 6	11 58	− 7	16·0	18·5
Apia		35·5	104	7 22?	+ 4	—	—	—	—
Manila		37·9	303	e 7 22	−15	—	—	—	—
Perth		43·3	228	8 29	+ 9	—	—	22·8	—
Tokyo		43·5	347	8 31	+ 9	—	—	—	—
Osaka		44·0	339	8 30	+ 4	16 50	+108	24·7	31·1
Batavia		45·9	268	e 8 44	+ 5	—	—	e 25·7	16·1
Mizusawa	E.	46·4	349	8 21	−22	14 49	−44	—	—
	N.	46·4	349	8 27	−16	15 16	−17	—	—
Zi-ka-wei		47·9	325	e 8 50	− 3	—	—	—	—
Honolulu		55·3	59	11 28	+107	(i 18 28)	+63	29·8	34·7
Calcutta	E.	69·3	299	10 52	−21	19 46	−32	—	—
Kodaikanal		76·7	282	30 46	?	—	—	49·2	53·6
Berkeley		89·4	52	—	—	—	—	e 35·9	—
Victoria		90·3	41	24 5	?S	(24 5)	−12	39·3	49·2
Mauritius		92·6	249	24 40	?S	(24 40)	− 1	50·0	53·0
Chicago		115·7	45	19 8	?PR_1	29 22	+66	48·7	—
Ann Arbor	E.	118·3	45	22 22?	?PR_1	31 58	?	56·4	68·4
Toronto		120·8	42	45 58	?SR_1	e 59 16	?L	e 69·4	77·4
Cipolletti		121·2	142	—	—	—	—	68·2	69·8
Capetown		121·4	223	57 58	?L	—	—	(58·0)	74·0
Ottawa		122·4	39	e 20 34	?PR_1	e 30 46	+99	e 50·4	—
Hamburg		123·7	333	e 20 22	?PR_1	—	—	57·4	72·4
Vienna		124·0	326	19 6	[+ 3]	—	—	e 58·4	72·4
De Bilt		126·9	336	21 23	?PR_1	—	—	e 57·4	60·5
Eskdalemuir		127·2	343	21 4	?PR_1	—	—	59·4	82·7
Uccle		128·1	335	—	—	—	—	—	61·4
Strasbourg		128·3	330	20 22	?PR_1	—	—	—	—
Bidston		128·7	342	22 40	?PR_1	33 46	?	—	73·1
Andalgala	E.	129·3	133	—	—	—	—	76·2	83·7
Kew		129·4	339	—	—	—	—	—	87·4
Rocca di Papa		129·8	322	22 22	?PR_1	37 52	?SR_1	—	—
Paris		130·5	335	e 32 49	?S	—	—	67·4	92·4
Moncalieri		130·7	328	21 34	?PR_1	31 7	+62	39·4	81·1
La Paz		133·5	119	e 19 28	[+ 2]	33 27	?	70·4	75·5
Coimbra		141·9	337	e 23 4	?PR_1	34 56	?	62·4	—
Granada		142·3	329	19 22	[−22]	—	—	—	—
San Fernando		144·1	332	71 22	?L	—	—	(71·4)	112·4

Additional records: Adelaide gives $PR_1 = +7$m.58s., $SR_1 = +14$m.41s. Perth $SR_1 = +18$m.19s. Osaka MN = +30·5m., $T_0 = 5$h.11m.50s. Apia gives its record as 6d. Honolulu gives S as i, also i = +24m.34s. Calcutta PN = +11m.22s. (O−C. = +9s.). Victoria S = +29m.30s. Mauritius PN = +24m.22s. Chicago L = +54·4m., L = +61·4m., and L = +76·4m. Toronto E = +54m.52s., S? = +56m.52s., e = +62m.58s. Ottawa eSR_1? = +37m.22s., $T_0 = 5$h.21m.58s. Hamburg MN = +75·4m. De Bilt MN = +75·8m. Eskdalemuir MN = +78·5m. Paris MN = +89·4m. Moncalieri MN = +81·3m. La Paz $PR_1 = +23$m.10s. Coimbra L = +83·7m. San Fernando MN = +94·4m.

May 7d. Records also at 0h. (Colombo), 2h. (Ithaca), 3h. (Mizusawa), 4h. (Batavia), 5h. (Toronto), 6h. (Batavia, Manila, and Adelaide), 8h. (La Paz), 9h. (De Bilt and Manila), 10h. (Toronto, Victoria, De Bilt, Helwan, and Batavia), 11h. (Harvard and Edinburgh), 12h. (Manila), 19h. (Osaka, Mizusawa, and Tokyo), 20h. (Cheltenham and De Bilt), 21h. (Colombo), 22h. (San Fernando).

May 8d. 10h. 7m. 30s. Epicentre 21°·2S. 172°·5W. (as on 1919 May 6d. 4h.).

A = −·924, B = −·122, C = −·362; D = −·130, E = +·991; G = +·359, H = +·047, K = −·932.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Apia	7·4	6	1 56	+ 4	—	—	—	4·3
Sydney	34·4	240	8 0	?PR_1	—	—	15·2	20·4
Melbourne	40·2	235	14 0	?S	(14 0)	−10	(19·5)	27·5
Honolulu	44·8	19	14 24	?S	(14 24)	−48	e 22·5	27·5
Adelaide	44·8	241	—	—	22 54	?L	(22·9)	29·1
Perth	63·9	245	—	—	—	—	33·2	—
Manila	74·5	292	e 12 27	+41	—	—	—	—
Victoria	82·3	30	—	—	—	—	40·1	45·0
Cipolletti	87·3	131	44 54	?L	—	—	(44·9)	54·0
La Paz	96·8	110	—	—	—	—	48·7	56·8
Chicago	100·3	49	12 0	?	24 50	−69	51·5	—
Toronto	106·6	48	—	—	—	—	55·5	61·2
Colombo	108·8	269	73 30	?L	—	—	(73·5)	—
Ottawa	109·5	47	—	—	—	—	e 57·5	—
Edinburgh	144·5	10	41 30	?SR_1	—	—	—	81·0
Eskdalemuir	145·0	10	—	—	40 30	?SR_1	—	—
Bidston	146·8	11	77 54	?L	83 48	?	(77·9)	98·5
Hamburg	147·6	357	e 20 6	[+14]	—	—	e 79·5	91·5
De Bilt E.	149·1	2	e 20 11	[+17]	e 42 47	?SR_1	e 81·5	89·4
Paris	152·1	7	e 20 30	[+31]	—	—	e 80·5	87·5
Vienna	152·1	347	20 21	[+22]	—	—	—	—
Strasbourg	152·7	358	5 28	?	—	—	—	—
Helwan	156·9	297	25 30	?PR_1	—	—	—	—
Rocca di Papa	159·0	349	20 30	[+23]	—	—	—	37·5
San Fernando	160·7	35	87 30	?L	—	—	(87·5)	123·0

Additional records: Apia 1 = +2m.30s. Sydney gives P = 10h.5m.30s., assumed to be 10m. in error. Melbourne gives S as P and records S = +19m.30s. Honolulu gives S as P and records iS = +18m.12s. Adelaide gives L as S and records SR_1 = +25m.14s., L = +27·3m. Chicago L = +70·5m. Toronto E? = +43m.0s., eL = +57·3m. Hamburg MN = +89·5m. De Bilt eE = +44m.11s., eLN = +79·5m., MN = +81·5m. San Fernando MN = +117·5m.

May 8d. Records also at 5h. (De Bilt, Simla, Honolulu, Taihoku, and Manila), 6h. (Taihoku, Calcutta, and De Bilt), 7h. (Zi-ka-wei), 8h. (Andalgala), 9h. (Apia), 18h. (Honolulu, Calcutta, Sydney, and Melbourne), 19h. (Manila, Honolulu, Melbourne, Sydney (2), Perth, Helwan, Ascension, and De Bilt), 21h. (Ottawa, Toronto, Chicago, Victoria, and Berkeley).

May 9d. Records at 1h. (Melbourne, La Paz, Manila, and Apia), 2h. (De Bilt), 7h. (Zi-ka-wei and Taihoku), 16h. (Helwan), 17h. (Coimbra), 18h. and 19h. (Helwan), 21h. (Paris and Athens), 22h. and 23h. (La Paz).

May 10d. 5h. 15m. 0s. Epicentre close to Nagasaki, which gives P = 5h.15m.0s., L = 5h.15m.8s.

	Δ	P.	O−C.	L.	M.
	°	m. s.	s.	m.	m.
Osaka	4·8	1 43	+29	2·9	5·0
Zi-ka-wei	7·2	—	—	e 3·8	—

Osaka gives MN = +4·6m.

May 10d. Records also at 0h. (San Fernando), 2h. (Helwan), 6h. (Azores), 10h. (Tokyo), 13h. (Manila and Bidston), 15h. (Mizusawa), 18h. (De Bilt, La Paz, Eskdalemuir, and Helwan), 19h. (Helwan), 21h. (San Fernando).

May 11d. Records at 4h. (San Fernando), 5h. (Rocca di Papa and Kodaikanal), 7h. (De Bilt and Algiers), 9h. (Manila), 10h. (Apia and Chicago), 11h. (Helwan), 13h. (Manila and Tokyo), 14h. (Taihoku), 19h. (Ascension).

May 12d. Records at 0h. (San Fernando), 3h. (Mizusawa), 4h. (Apia), 6h. (Helwan), 11h. (Apia and Bidston), 14h. and 15h. (Apia), 19h. (Ascension), 20h. (Melbourne), 21h. (Lick and Berkeley).

May 13d. Records at 6h. (Batavia), 14h. (Manila), 23h. (San Fernando).

May 14d. Records at 3h. (Apia), 4h. (Victoria, Toronto, and Chicago), 5h. (De Bilt and Helwan), 12h. (Osaka and Helwan), 15h. (Mizusawa), 19h. (Ascension), 21h. (Batavia).

May 15d. Records at 0h. (San Fernando), 5h. (Rocca di Papa), 6h. (Manila), 12h. (Helwan), 19h. (Tortosa and Barcelona), 20h. (Lick), 22h. (Cipolletti), 23h. (Apia).

May 16d. 1h. 0m. 0s. Epicentre 21°·0N. 127°·0E. (as on 1915 July 2d.).

$A = -\cdot562$, $B = +\cdot746$, $C = +\cdot358$; $D = +\cdot799$, $E = +\cdot602$; $G = -\cdot216$, $H = +\cdot286$, $K = -\cdot934$.

Manila and the residuals generally suggest an addition of +10s. to T_0 and a deep focus, but the evidence is inadequate to justify introducing any correction.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Taihoku	6·4	310	1 50	+12	—	—	3·7	3·9
Manila	8·6	223	e 2 13	+ 3	3 51	− 2	4·3	6·0
Zi-ka-wei	11·4	335	—	—	e 4 55	− 9	—	—
Osaka	15·6	27	3 49	+ 2	—	—	—	16·9
Colombo	47·7	260	15 0	?S	(15 0)	−50	—	—
Honolulu	69·2	74	e 24 54	?SR_1	—	—	e 38·0	42·5
Helwan	84·4	300	23 0	?S	(23 0)	−12	—	—
Hamburg	88·0	328	—	—	e 23 0	−52	43·0	47·0
De Bilt	91·1	328	—	—	e 24 15	−10	e 42·0	49·8
Uccle	92·4	327	—	—	—	—	e 45·0	—
Edinburgh	92·4	335	30 0	?SR_1	—	—	—	51·5
Rocca di Papa	92·8	316	13 6	−25	(e 18 42)	?PR_1	e 18·7	39·6
Bidston	94·1	333	29 36	?	38 42	?L	(38·7)	51·4
Oxford	94·4	330	—	—	—	—	—	52·6
Paris	94·5	327	—	—	—	—	e 48·0	—
Shide	95·1	330	—	—	—	—	—	52·6
Coimbra	106·1	325	—	—	—	—	e 51·5	—

Additional records: Osaka gives MN = +14·7m. Helwan PN = +30m.0s. (?SR_1). De Bilt eSR_1N = +30m.19s., eSR_1E = +30m.33s., e = +37m.14s.

May 16d. 11h. 44m. 20s. Epicentre 45°·0N. 135°·0E. (as was adopted for the revised determination of the earthquake on 1918 Jan. 30d. in the appendix to that year).

$A = -\cdot500$, $B = +\cdot500$, $C = +\cdot707$; $D = +\cdot707$, $E = +\cdot707$; $G = -\cdot500$, $H = +\cdot500$, $K = -\cdot707$.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	E.	7·4	220	1 49	− 3	3 13	− 8	—	—
	N.	7·4	220	1 58	+ 6	3 14	− 7	—	—
Tokyo		10·0	157	3 25	+55	3 40	−49	—	—
Osaka		10·3	178	—	—	4 40	+ 3	5·8	6·6
Kobe		10·3	179	—	—	4 47	+10	6·1	6·5
Zi-ka-wei		17·4	222	—	—	e 7 3	−24	—	—

Additional records: Tokyo P may be a minute wrong. Osaka gives MN = +6·4m. Kobe MN = +6·6m.

May 16d. 21h. 1m. 35s. Epicentre 24°·0N. 123°·0E.

$A = -\cdot498$, $B = +\cdot766$, $C = +\cdot407$.

	Δ	P.	O−C.	S.	O−C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Taihoku	1·7	0 23	− 3	—	—	0·5	0·6
Hokoto	3·2	—	—	1 22	− 6	1·9	2·3
Zi-ka-wei	7·3	—	—	e 2 48	−30	—	—
Manila	9·6	e 4 25	?S	(e 4 25)	+ 7	—	—
De Bilt	86·7	—	—	—	—	e 48·4	49·7

De Bilt gives also MN = +49·6m.

May 16d. Records also at 0h. (San Fernando and Strasbourg), 3h. (Colombo), 10h. (Edinburgh), 14h. (Apia), 18h. (Pompeii), 22h. (Helwan and Lick).

May 17d. Records at 0h. (Batavia), 6h. (Ithaca), 10h. (Tokyo and Bidston), 13h. (Rocca di Papa), 23h. (Cipolletti).

May 18d. 10h. 23m. 56s. Epicentre 56°·0N. 136°·0W.

$A = -·402$, $B = -·389$, $C = +·829$; $D = -·695$, $E = +·719$; $G = -·596$, $H = -·576$, $K = -·559$.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Sitka	E.	1·1	19	0 18	+ 1	—	—	—	0·9
	N.	1·1	19	0 30	?S	(0 30)	− 1	—	1·0
Victoria		10·8	129	4 51	?S	(4 51)	+ 1	5·4	6·3
	Z.	10·8	129	4 48	?S	(4 48)	− 2	5·5	6·5
Berkeley		20·3	148	—	—	—	—	e 10·6	—
Chicago		33·9	93	13 4	?S	(13 4)	+25	(16·4)	—
Honolulu		38·3	214	—	—	—	—	16·6	17·1
Ithaca		39·7	84	e 19 44	?L	—	—	(e 19·7)	—
Northfield		40·7	79	—	—	—	—	e 19·6	—
Edinburgh		61·8	28	31 4	?L	—	—	(31·1)	—
Eskdalemuir		62·2	28	—	—	—	—	29·1	—
De Bilt		67·3	25	—	—	e 19 52	− 2	37·1	38·8

Chicago gives S as P and L as S, also L? = +20·1m. De Bilt gives MN = +43·6m.

May 18d. 10h. 38m. 0s. Epicentre 24°·0N. 87°·0W.

$A = +·048$, $B = -·912$, $C = +·407$; $D = -·999$, $E = -·052$; $G = +·021$, $H = -·406$, $K = -·914$.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Cheltenham	E.	17·0	28	—	—	7 16	− 2	—	7·6
	N.	17·0	28	—	—	7 12	− 6	—	8·0
Georgetown		17·1	27	e 3 5	−61	7 15	− 5	e 9·2	—
Washington		17·1	27	e 4 10	+ 4	7 7	−13	9·2	—
Ann Arbor	N.	18·5	8	4 24	+ 1	6 48	−63	10·4	—
Harvard	E.	22·6	32	e 4 55	−17	—	—	8·4	—
	N.	22·6	32	e 5 19	+ 7	—	—	7·6	—

Additional records: Ann Arbor gives PE = +4m.12s. Harvard LE? = +7·7m.

May 18d. Records also at 0h. (San Fernando), 3h. (La Paz), 7h. (Manila), 8h. (Harvard), 9h. (Washington, Chicago, and Sitka), 12h. (Toronto), 13h. (Helwan), 14h. (Azores), 21h. (Apia (2), San Fernando, and Rocca di Papa), 22h. (De Bilt and Chicago), 23h. (Apia, Eskdalemuir, and Helwan).

May 19d. 3h. 55m. 54s. Epicentre 19°·0N. 144°·0E. (as on 1918 June 21d.).

$A = -·765$, $B = +·556$, $C = +·326$; $D = +·588$, $E = +·809$; $G = -·263$, $H = +·191$, $K = -·946$.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Tokyo	17·1	348	4 16	+10	7 14	− 6	—	—
Osaka	17·4	336	4 8	− 2	—	—	7·9	8·9
Taihoku	21·6	290	9 4	?S	(9 4)	+ 7	—	—
Manila	22·5	262	e 5 12	+ 1	—	—	—	—
Zi-ka-wei	23·7	305	e 5 34	+ 9	—	—	—	—
Honolulu	54·1	78	e 23 18	?	—	—	29·1	32·2
Victoria	77·6	43	—	—	—	—	36·9	45·8
Helwan	98·9	306	66 6	?L	—	—	(66·1)	—
De Bilt	100·4	335	—	—	e 26 42	+42	e 48·1	56·4
Eskdalemuir	100·6	342	—	—	—	—	48·1	—
Bidston	102·2	340	40 18	?	51 6	?L	(51·1)	58·8
Chicago	102·7	37	—	—	—	—	e 49·6	—
Toronto	105·8	30	—	—	—	—	65·7	—
La Paz	149·3	90	19 28 [−27]	—	—	—	—	—

Additional records: Osaka gives MN = +9·9m. Helwan PN = +65m.6s. De Bilt MN = +61·7m. Eskdalemuir gives its record as on 18d. Chicago L = +51·6m. and +59·1m.

May 19d. Records also at 8h. (La Paz), 10h. (Tokyo), 12h. (La Paz and Taihoku (2)), 18h. (Helwan), 23h. (Victoria).

May 20d. 4h. 20m. 12s. Epicentre 40°·5N. 122°·0W.

$A = -\cdot403$, $B = -\cdot645$, $C = +\cdot649$; $D = -\cdot848$, $E = +\cdot530$; $G = -\cdot344$, $H = -\cdot551$, $K = -\cdot760$.

(See Note at end.)

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Berkeley	E.	2·6	186	—	—	—	—	e 2·5	5·0
	N.	2·6	186	—	—	—	—	e 2·7	6·0
Lick		3·1	174	− e 1 12	−121	—	—	—	—
Victoria		8·0	354	1 23	−38	—	—	2·4	3·4
	Z.	8·0	354	—	—	—	—	2·3	3·4
Sitka	E.	18·7	337	6 48	?S	(6 48)	−67	e 7·8	—
Chicago		25·8	76	6 11	+25	11 0	+42	14·3	—
Ann Arbor	E.	28·5	74	—	—	—	—	17·1	17·8
Toronto		31·4	70	9 0	?PR_1	—	—	18·5	21·9
Ottawa		33·5	65	6 59	− 2	12 45	+13	17·3	—
Ithaca		33·7	71	—	—	e 19 5	?L	20·0	—
Georgetown		34·2	79	e 7 3	− 4	e 12 31	−12	e 20·8	—
Washington		34·2	79	6 58	− 9	—	—	e 20·4	—
Cheltenham		34·4	79	16 33	?L	—	—	20·8	—
Honolulu		36·0	250	13 24	?S	(13 24)	+14	—	—
Northfield		36·1	66	—	—	—	—	e 15·8	—
Harvard	E.	37·6	70	i 16 37	?SR_1	20 8	?	e 22·3	25·2
	N.	37·6	70	i 16 47	?SR_1	e 21 3	?	e 22·3	24·8
Edinburgh		70·6	31	24 48	?SR_1	—	—	—	42·8
Eskdalemuir		71·0	31	—	—	i 20 30	− 8	33·8	—
Bidston		72·4	33	21 0	?S	(21 0)	+ 5	—	40·4
Kew		75·0	33	—	—	—	—	—	43·8
Shide		75·2	35	—	—	—	—	—	46·0
De Bilt		76·7	30	—	—	e 21 44	− 1	e 35·8	39·0
Hamburg		77·3	27	—	—	—	—	e 36·8	45·8
Uccle		77·4	30	—	—	—	—	—	39·8
Paris		78·2	35	—	—	e 21 59	− 3	38·8	47·8
Coimbra		79·3	45	—	—	—	—	e 39·9	—
Strasbourg		80·5	32	—	—	—	—	42·4	—
San Fernando		83·1	47	47 48	?L	—	—	(47·8)	—
Rocca di Papa		88·1	31	21 48	?S	(21 48)	−125	e 50·2	55·8

Additional records: Chicago gives L = +15·8m., T_e = 4h.20m.19s. Toronto eL = +21·5m. Ottawa gives many other L's, also T_e = 4h.19m.54s. Georgetown eN = +11m.48s. Harvard eN = +21m.24s., T_e = 4h.31m.11s. Eskdalemuir eN = +25m.2s., L = +39·8m. De Bilt eN = +30m.31s., eE = +30m.35s., MN = +44·0m. Strasbourg L = +45·4m.

May 20d. 4h. The above solution is about the best that can be given on the hypothesis of a single shock, but has many obvious defects. The Lick record for P is earlier than T_e: the determination of T_e suits Chicago and Georgetown, but not Ottawa, and there are no other records of both S and P: The epicentre should apparently be nearer Washington and Chicago, azimuth 78°, and also nearer Honolulu, azimuth 250°: and the same may be said of azimuths 180° and 350°. This last defect could be remedied by the hypothesis of a deep focus, but we have no evidence from antipodal stations.

But further it seems probable that there was a second shock about 4h.31m.11s., as suggested by Harvard (in the Notes). If the De Bilt observation (given in the Notes) eN = +30m.31s. may be taken as S, we have

	P.	S−P.	Δ	T_e
	m. s.	m. s.	°	m. s.
Harvard	+16 37	3 31	18·8	+12 10
De Bilt	+21 44	8 47	66·2	+10 51

The accordance is none too good, but may perhaps be accepted as evidence of a second shock about 11min. later than the first, say at 19°·0N. 70°·0W., as on 1917 July 13d. 5h. This would work out for the stations which possibly record this later shock, as follows:—

Continued on next page.

May 20d. 4h. 31m. 5s. At 19°·0N. 70°·0W. (as on 1917 July 13d. 5h.).
A = +·323, B = −·889, C = +·326.

	Δ	P.	O−C.	S.	O−C.	M.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Cheltenham	20·6	5 40	+52	—	—	9·9	—
Harvard	23·4	i 5 44	+23	9 15	−18	e 11·4	14·3
Bidston	61·2	10 7	−13	—	—	—	—
Eskdalemuir	61·3	9 37	−44	—	—	22·9	—
Edinburgh	61·4	13 55	?PR_1	—	—	—	21·9
Paris	64·4	e 11 6	+25	—	—	27·9	36·9
De Bilt	66·1	e 10 51	− 1	19 38	0	e 24·9	28·2

May 20d. Records also at 0h. (Tokyo, San Fernando, Ootomari, and Helwan), 4h. (La Paz), 6h. (Helwan), 10h. (Helwan), 12h. (Bidston), 17h. (Simla), 19h. (San Fernando).

May 21d. Records at 0h. (Mizusawa), 1h. (San Fernando), 4h. (Manila), 5h. (Athens), 11h. (Taihoku), 17h. (La Paz), 18h. and 19h. (Helwan), 22h. (Lick), 23h. (Batavia and Manila).

May 22d. 11h. 52m. 36s. Epicentre 52°·0N. 178°·0W. (as on 1918 Dec. 9d.).
A = −·615, B = −·021, C = +·788; D = −·035, E = +·999;
G = −·788, H = −·028, K = −·616.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Honolulu	34·4	146	e 12 6	?S	(e 12 6)	−40	e 15·8	17·3
Victoria	34·4	76	—	—	(12 18)	−28	12·3	14·8
Osaka	37·2	261	7 22	−10	—	—	—	20·3
Berkeley	40·8	90	—	—	—	—	e 15·9	—
Zi-ka-wei	48·2	271	e 8 45	−10	—	—	—	—
Chicago	58·5	62	10 11	+ 9	18 10	+ 5	28·1	—
Ann Arbor	50·2	59	—	—	—	—	37·4	—
Manila	60·8	259	e 10 24	+ 6	—	—	—	—
Toronto	61·5	55	—	—	(18 42)	0	e 36·5	42·8
Ottawa	62·0	51	10 26	+ 1	18 43	− 5	e 29·4	—
Northfield	64·4	50	—	—	e 37 24	?L	40·9	—
Washington	66·1	58	10 50	− 2	19 28	−10	e 32·2	—
Georgetown	66·1	58	e 10 44	− 8	19 25	−13	e 37·5	—
Harvard	66·5	50	10 34	−21	19 43	− 1	e 33·7	—
Edinburgh	72·0	3	20 24	?S	(20 24)	−26	—	—
Eskdalemuir	72·5	3	e 11 2	−31	e 21 5	+ 9	39·4	—
Hamburg	74·2	355	12 24	+41	—	—	e 37·4	45·4
Bidston	74·5	2	3 42	?	—	—	—	39·9
De Bilt E.	75·8	357	—	—	—	—	e 38·4	45·0
N.	75·8	357	11 55	+ 1	21 44	+ 9	e 37·4	52·6
Kew	76·5	2	—	—	—	—	—	60·4
Uccle	77·1	358	e 12 0	− 2	e 21 54	+ 4	—	53·4
Vienna	79·0	350	12 13	0	22 54	+42	e 44·4	47·4
Paris	79·2	0	—	—	e 22 23	+ 9	43·4	47·4
Moncalieri	82·9	357	e 13 32	+57	22 58	+ 2	37·0	55·2
Rocca di Papa	85·8	352	e 12 30	−22	—	—	e 52·2	58·7
Tortosa	87·2	1	12 44	−16	23 17	−26	37·8	59·3
Coimbra	87·4	8	—	—	e 30 24	?	49·4	—
Kodaikanal	90·7	290	53 42	?L	—	—	(53·7)	—
Algiers	91·2	359	—	—	e 23 54	−32	—	—
San Fernando	91·3	6	55 54	?L	—	—	(55·9)	72·4
Colombo	91·9	285	55 24	?L	—	—	(55·4)	—
Helwan	94·2	335	26 24	?S	(26 24)	+86	—	—
La Paz	115·1	89	—	—	—	—	74·3	—

Additional records: Osaka gives MN = +23·2m. Chicago LE = +51·9m., T_o = 11h.52m.52s. Toronto S is given as L, also L = +32·0m. Ottawa gives four other L's and T_o = 11h.52m.48s. Washington L = +37·9m. Georgetown PN = +10m.42s. Harvard LE = +37·5m. and +40·6m. Eskdalemuir eE = +16m.34s., eN = +16m.38s., iN = +21m.7s. De Bilt eSR_1N = +27m.4s., T_o = 11h.52m.40s. Paris MN = +55·4m. Helwan PN = +19m.24s.

May 22d. Records also at 0h. (San Fernando), 3h. (Athens), 6h. (Mizusawa and Batavia), 16h. (Melbourne), 19h. (Ascension), 21h. (Helwan), 22h. (San Fernando), 23h. (Helwan, La Paz (2), De Bilt, and Pilar).

May 23d. 3h. 7m. 35s. Epicentre 8°·2S. 79°·3W.

A = +·184, B = −·973, C = −·143; D = −·983, E = −·186; G = −·026, H = +·140, K = −·990.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
La Paz		13·7	128	i 3 22	0	6 1	0	7·0	8·9
Andalgala	N.	22·9	149	13 37	?L	—	—	17·5	18·2
Pilar	E.	27·5	151	—	—	(10 25)	−25	10·4	18·0
Vieques	E.	29·7	27	10 35	?S	(10 35)	−54	—	—
Cipolletti		32·3	164	10 55	?S	(10 55)	−78	14·0	22·1
Toronto		51·9	0	—	—	—	—	26·0	32·6
Ottawa		53·7	5	i 8 28	−63	i 17 7	+ 2	e 24·4	—
Coimbra		81·1	48	e 12 8	−18	22 32	− 4	e 38·4	—
Honolulu		82·7	294	e 32 13	?	—	—	e 39·4	44·5
Bidston		88·6	38	24 1	?S	(24 1)	+ 2	(31·9)	40·7
Eskdalemuir		89·0	35	—	—	23 25	−38	—	—
Barcelona		89·1	49	—	—	—	—	e 49·5	—
Edinburgh		89·2	35	16 25	?PR_1	—	—	—	—
Oxford		89·2	39	i 19 5	?	i 23 26	−39	—	—
De Bilt	E.	93·1	40	—	—	e 23 55	−51	e 45·4	53·4
	N.	93·1	40	—	—	e 24 28	−18	e 44·4	53·7
Moncalieri		93·7	46	e 17 11	?PR_1	25 51	+58	42·1	—
Hamburg		96·3	37	—	—	—	—	e 47·4	55·4
Rocca di Papa		97·0	50	—	—	—	—	—	49·6
Helwan		112·0	61	26 25	?S	(26 25)	−81	—	—
Colombo		159·3	92	89 25	?L	—	—	(89·4)	99·4

Additional records: La Quiaca Δ = 19°·1 Az. = 138° gives L = 11·0m., M = +50·2m. What is the error in the time? Ottawa L = +37·4m. Helwan PN = +30m.25s.

May 23d. 6h. 10m. 38s. Epicentre 30°·0N. 71°·0E. (as on 1918 Nov. 29d.).

A = +·282, B = +·819, C = +·500; D = +·946, E = −·326; G = +·163, H = +·473, K = −·866.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Simla		5·5	76	1 22	− 3	2 22	− 9	—	4·2
Dehra Dun		6·0	85	2 42	?S	(2 42)	− 2	—	—
Bombay		11·2	171	1 36	−71	6 11	?L	(6·2)	—
Calcutta	E.	17·3	112	4 34	+25	8 34	+69	10·2	—
	N.	17·3	112	4 28	+19	8 4	+39	9·7	—
Kodaikanal		20·7	161	—	—	—	—	10·7	15·0
Colombo		24·5	158	11 22	?	13 28	?	13·8	16·1
Lemberg		40·2	313	e 9 34	?PR_1	—	—	22·0	29·7
Zi-ka-wei		43·0	75	e 8 30	+12	—	—	—	26·2
Taihoku		44·8	83	20 22	?L	—	—	(20·4)	—
Vienna		45·0	311	i 8 34	+ 1	15 24	+ 9	e 27·9	35·9
Pompeii		46·5	299	8 49	+ 5	—	—	—	—
Pola		46·7	307	—	—	e 15 28	− 9	29·1	33·6
Rocca di Papa		47·8	301	e 9 19	+26	e 15 41	−10	e 27·3	34·5
Manila		48·3	98	e 9 50	+54	—	—	—	—
Hamburg		49·4	319	e 9 8	+ 5	—	—	e 24·4	31·5
Strasbourg		50·8	310	e 10 2	+50	—	—	e 29·4	—
Moncalieri		51·1	306	11 49	?PR_1	16 31	− 1	26·8	32·4
De Bilt	E.	52·2	315	—	—	e 16 52	+ 6	e 27·4	35·5
	N.	52·2	315	—	—	e 16 48	+ 2	e 26·4	31·2
Uccle		52·8	314	—	—	e 17 22	+28	—	37·4
Osaka		53·7	68	e 9 5	−26	—	—	—	34·5
Paris		54·2	311	—	—	e 23 11	?SR_1	32·4	36·4
Barcelona		55·6	303	—	—	e 17 1	−28	e 33·2	44·4
Oxford		56·3	317	9 36	−12	17 46	+ 8	31·0	40·1
Shide		56·4	315	17 43	?S	(17 43)	+ 4	32·8	39·2
Edinburgh		56·9	320	13 52	?PR_1	—	—	—	39·4
Tortosa		56·9	303	9 52	+ 1	17 47	+ 2	35·6	—
Eskdalemuir		57·0	319	e 10 12	+20	e 19 40	+114	28·4	—
Bidston		57·1	317	16 22	?S	22 28	?SR_1	—	33·4
San Fernando		63·2	299	37 22	?L	—	—	(37·4)	44·4
Coimbra		63·7	304	—	—	—	—	e 32·0	—
Melbourne		96·8	132	—	—	—	—	e 59·4	64·9
Victoria		100·6	10	55 45	?L	—	—	(55·8)	67·1
Toronto		101·5	340	—	—	—	—	58·0	61·4
Chicago		105·6	345	—	—	—	—	e 48·9	—
La Paz		140·4	281	—	—	—	—	68·5	72·8

Additional records: Zi-ka-wei gives MN = +25·2m. Pola MN = +31·3m. Rocca di Papa L = +30·4m. Hamburg MN = +31·0m., MZ = +33·1m. Moncalieri MN = +34·7m. Osaka MN = +32·3m. Paris MN = +32·4m. Eskdalemuir LN = +33·4m. Coimbra L = +42·4m.

May 23d. 18h. 8m. 40s. Epicentre 30°·0N. 71°·0E. (as at 6h.).

A = +·282, B = +·819, C = +·500.

		Δ	Az.	P.	O−C.	S.	O−C.	L.
		°	°	m. s.	s.	m. s.	s.	m.
Simla		5·5	76	e 1 20	− 5	—	—	—
Bombay		11·2	171	2 53	+ 6	—	—	—
Calcutta	E.	17·3	112	7 44	?S	(7 44)	+19	(8·7)
Helwan		34·2	280	20 20	?L	—	—	(20·3)
Hamburg		49·4	319	—	—	—	—	e 27·3
De Bilt		52·2	315	—	—	—	—	e 28·3

Calcutta gives SN = +9m.20s. (?L).

May 23d. Records also at 0h. (Moncalieri, Eskdalemuir, and Edinburgh), 2h. (Rocca di Papa), 6h. (Taihoku (2)), 8h. (Vienna), 10h. (Taihoku), 12h. (Manila, Mizusawa, and Tokyo), 13h. and 15h. (La Paz), 19h. (Manila), 20h. (La Paz), 23h. (San Fernando).

May 24d. Records at 3h. (La Paz), 4h. (Algiers), 5h. (Manila), 9h. (Helwan, La Paz, and Taihoku), 10h. (Apia), 14h. (San Fernando), 19h. (Mizusawa and Ascension), 23h. (Mizusawa).

May 25d. Records at 11h. and 14h. (Manila), 18h. (Ascension), 21h. (La Paz and San Fernando), 22h. (La Paz and Manila).

May 26d. Records at 3h. (Batavia), 6h. (Rocca di Papa), 13h. (La Paz), 14h. (Bidston and Manila), 16h. (Manila), 17h. (Helwan), 19h. (Pompeii).

May 27d. 10h. 34m. 20s. Epicentre 37°·2N. 35°·4E.

A = +·649, B = +·461, C = +·605; D = +·579, E = −·815;
G = +·493, H = +·350, K = −·796.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Helwan		8·1	206	3 40	+97	—	—	—	—
Athens	E.	9·3	278	e 2 19	− 1	—	—	5·2	5·8
	N.	9·3	278	—	—	4 19	+ 9	4·8	5·6
Lemberg		15·0	331	e 3 40	+ 1	e 6 46	+24	9·1	10·8
Budapest		15·8	316	e 3 34	−15	—	—	—	—
Pompeii		16·5	288	3 54	− 5	10 14	?L	(10·2)	—
Vienna		17·7	314	i 4 15	+ 2	i 7 40	+ 7	—	14·0
Pola		17·8	302	e 4 14	− 1	e 7 34	− 2	e 9·6	11·8
Rocca di Papa		18·0	292	i 4 16	− 1	e 7 49	+ 9	e 10·3	—
Moncalieri		22·1	299	i 5 20	+14	i 9 1	− 6	13·2	15·6
Zurich		22·1	306	e 5 2	− 4	—	—	—	—
Strasbourg		23·0	308	5 20	+ 3	9 30	+ 5	12·2	—
Hamburg		24·0	321	e 5 34	+ 6	—	—	e 13·7	16·7
De Bilt	E.	25·8	315	e 5 38	− 8	e 9 59	−19	13·3	19·1
	N.	25·8	315	—	—	—	—	14·3	17·4
Tortosa		27·1	289	6 12	+13	10 22	−21	11·9	18·4
Kew		28·8	311	—	—	—	—	—	19·7
Shide		29·2	309	—	—	—	—	—	21·2
Oxford		29·5	311	6 20	− 3	—	—	13·6	17·9
Eskdalemuir		31·9	317	—	—	—	—	15·7	—
Edinburgh		31·8	318	11 40	?S	(11 40)	−25	—	21·2
San Fernando		33·0	282	21 40	?L	—	—	(21·7)	22·7

Additional records: Pola gives MN = +10·5m. Moncalieri MN = +15·4m., T_o = 10h.35m.4s. Zurich e = +1m.46s. Tortosa gives its record apparently in Central European time—1h. east of Greenwich.

May 27d. 17h, 27m. 3s. Epicentre 54°·0N. 161°·0E.

$A = -\cdot556$, $B = +\cdot191$, $C = +\cdot809$; $D = +\cdot326$, $E = +\cdot946$; $G = -\cdot765$, $H = +\cdot263$, $K = -\cdot588$.

The epicentre 54°·5N. 164°·0E., used on 1917 Jan. 30, would suit the European Stations, but not Mizusawa or Zi-ka-wei.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	E.	20·1	230	4 42	0	8 24	− 1	—	—
Zi-ka-wei		36·2	248	—	—	(e 12 48)	−25	e 12·8	—
Honolulu		44·9	120	e 13 21	?S	e 18 45	?SR_1	e 22·4	27·0
Manila		50·3	234	e 9 35	+26	—	—	—	—
Chicago		67·7	50	—	—	e 20 21	+23	38·3	—
Edinburgh		69·4	351	19 57	?S	(19 57)	−22	—	36·4
Toronto		69·6	42	—	—	—	—	36·6	41·4
Hamburg		69·8	342	i 11 16	0	—	—	e 35·0	43·0
Eskdalemuir		69·9	351	11 17	+ 1	20 25	0	35·0	—
De Bilt		72·0	346	11 31	+ 1	20 52	+ 2	e 35·0	42·8
Kew		73·4	350	—	—	—	—	—	52·0
Uccle		73·4	347	—	—	—	—	e 40·0	—
Vienna		73·5	338	—	—	—	—	e 46·0	—
Strasbourg		75·0	344	11 57	+ 8	—	—	—	—
Kodaikanal		78·0	272	48 33	?L	—	—	(48·6)	—
Moncalieri		78·4	342	—	—	e 31 20	?	41·6	—
Colombo		79·2	269	50 57	?L	—	—	(51·0)	54·0
Rocca di Papa		80·5	339	e 12 22	0	24 23	+114	e 42·8	53·8
		80·5	339	e 12 19	− 3	—	—	—	12·8
Pompeii		81·0	335	12 21	− 4	—	—	—	—
Tortosa		83·7	347	12 36	− 4	23 1	− 5	44·7	52·1
Helwan	N.	85·6	319	22 57	?S	(22 57)	−29	—	—
Rio Tinto		87·6	350	52 57	?L	—	—	(53·0)	68·0
San Fernando	N.	88·9	350	50 57	?L	—	—	(51·0)	62·0

Additional records: Toronto gives $L = +24\cdot4$m. (?SR_1). De Bilt $MN = +48\cdot9$m., $T_o = 17$h.27m.12s. Helwan gives $PE = +24$m.57s. San Fernando $PE = +53$m.57s.

May 27d. Records also at 0h. (San Fernando and Helwan), 1h. (Helwan), 18h. (Mizusawa), 20h. (Helwan), 22h. (San Fernando).

May 28d. 3h. 3m. 55s. Epicentre 53°·5N. 163°·5E.

$A = -\cdot570$, $B = +\cdot169$, $C = +\cdot804$; $D = +\cdot284$, $E = +\cdot959$; $G = -\cdot771$, $H = +\cdot228$, $K = -\cdot595$.

This is a puzzling case. It is difficult to reconcile the fairly definite indications of the European stations with the absence of any records from China and Japan.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Honolulu	43·4	123	e 18 5	?SR_1	—	—	21·1	26·1
Chicago	66·9	51	—	—	—	—	36·1	—
Hamburg	70·7	346	e 11 20	− 1	—	—	e 41·1	49·1
De Bilt	72·8	348	11 35	0	20 55	− 5	e 36·1	42·7
Strasbourg	75·9	345	11 58	+ 4	—	—	—	—
Paris	76·4	350	—	—	—	—	e 46·1	51·1
Moncalieri	79·3	345	—	—	—	—	e 43·6	—
Colombo	80·6	271	52 5	?L	—	—	(52·1)	—
Rocca di Papa	81·5	340	e 12 18	−10	—	—	—	12·4
Tortosa	84·5	349	12 38	− 7	23 5	− 9	47·1	57·8
Helwan	87·2	320	58 5	?L	—	—	(58·1)	—

De Bilt gives also $MN = +48\cdot8$m., $T_o = 3$h.4m.9s.

May 28d. 5h. 39m. 22s. Epicentre 37°·0N. 20°·5E. (as on 1918 July 5d.).

$A = +\cdot748$, $B = +\cdot280$, $C = +\cdot602$; $D = +\cdot350$, $E = -\cdot937$; $G = +\cdot564$, $H = +\cdot211$, $K = -\cdot799$.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	2·8	69	e 0 44	0	1 17	0	1·4	1·6
Pompeii	5·9	311	1 32	+ 1	3 22	+41	(3·4)	—
Rocca di Papa	7·6	311	1 35	−20	—	—	—	4·4
Helwan	11·6	125	12 38	?	—	—	—	—
Moncalieri	12·4	314	—	—	—	—	e 6·2	—
De Bilt	18·5	330	—	—	—	—	9·4	11·2

De Bilt also gives $MN = +10\cdot5$m.

May 28d. Records also at 4h. (Helwan), 10h. (Colombo), 14h. (Manila), 18h. (Batavia), 19h. (Athens), 21h. (Ootomari), 22h. (San Fernando), 23h. (Lick).

May 29d. 10h. 59m. 45s. Epicentre 31°·5N. 100°·5E.

A −·155, B = +·838, C = +·522 : D = +·983, E = +·182 ; G = −·095, H = +·514, K = −·853.

A focal height 0·020 above the normal level has been assumed for this earthquake.

		Corr. for Focus	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	°	m. s.	s.	m. s.	s.	m.	m.
Calcutta	E.	+0·4	14·0	233	3 33	+ 1	6 33	+15	8·2	10·4
	N.	+0·4	14·0	233	3 39	+ 7	6 27	+ 9	8·2	10·4
Zi-ka-wei		+0·7	17·9	85	e 4 16	− 8	e 7 38	−15	—	10·9
Taihoku		+0·8	19·6	104	4 40	− 6	—	—	10·5	—
Simla		+0·8	19·9	275	e 9 3	?S	(e 9 3)	+25	—	13·2
Manila		+1·1	25·2	127	e 5 40	−11	10 57	+29	12·9	15·0
Bombay		+1·3	27·9	250	11 5	?S	(11 5)	−15	—	16·0
Kobe		+1·4	29·1	74	6 49	+16	—	—	—	17·8
Osaka		+1·4	29·3	74	6 47	+12	—	—	—	16·9
Kodaikanal		+1·4	30·1	230	12 9	?S	(12 9)	+ 9	19·2	24·8
Colombo		+1·4	31·2	224	10 15	?	—	—	—	23·2
Tokyo		+1·5	32·7	75	18 3	?L	—	—	(18·0)	—
Batavia		+1·7	38·2	171	e 7 22	−32	—	—	e 20·2	—
Lemberg		+2·4	58·1	312	30 33	?L	32 27	?	(30·6)	34·6
Helwan	E.	+2·4	58·4	289	19 9	?S	(19 9)	+36	—	39·8
	N.	+2·4	58·4	289	25 15	?L	—	—	(25·2)	39·9
Vienna		+2·5	63·4	314	11 1	+11	16 10	?PR_1	30·2	36·8
Hamburg		+2·5	65·4	320	—	—	e 24 15	?SR_1	e 34·2	37·0
Rocca di Papa		+2·6	68·1	309	e 20 13	?S	(e 20 13)	−21	e 38·8	42·2
Strasbourg		+2·6	68·6	315	—	—	e 28 15	?SR_1	—	—
De Bilt	E.	+2·6	68·7	320	—	—	e 20 42	0	e 34·2	38·9
	N.	+2·6	68·7	320	—	—	e 20 43	+ 1	—	39·1
Uccle		+2·6	70·0	319	—	—	—	—	e 36·2	39·2
Moncalieri		+2·6	70·1	312	e 21 0	?S	(e 21 0)	+ 2	36·7	43·4
Edinburgh		+2·6	71·3	325	21 15	?S	(21 15)	+ 2	—	42·8
Paris		+2·6	71·6	318	—	—	—	—	36·2	—
Eskdalemuir		+2·6	71·6	325	—	—	—	—	30·2	—
Kew		+2·6	71·9	321	—	—	—	—	—	48·2
Oxford		+2·6	72·4	321	14 25	?PR_1	i 21 23	− 3	—	—
Bidston		+2·6	72·5	322	29 21	?SR_1	—	—	—	40·2
Shide		+2·6	72·8	320	21 28	?S	(21 28)	− 2	—	46·6
Barcelona		+2·6	75·3	311	—	—	e 39 15	?SR_1	e 40·6	43·2
Coimbra		+2·7	82·8	315	—	—	e 29 15	?SR_1	e 43·7	—
		+2·7	82·8	315	—	—	e 36 45	?	44·2	47·8
Rio Tinto		+2·7	83·0	311	41 15	?L	—	—	(41·2)	54·2
San Fernando		+2·7	83·5	310	43 15	?L	—	—	(43·2)	52·2
Ottawa		+2·9	103·1	358	—	—	—	—	e 55·2	—
Chicago		+2·9	106·4	7	—	—	—	—	59·2	—

Additional records: Zi-ka-wei gives MN = +10·2m., T_o = 10h.59m.50s. Manila MN = +14·7m., T_o = 10h.58m.45s. Kobe MN = +17·2m. Lemberg +33m.33s. Vienna gives its record as on 28d. Hamburg gives its record one hour too soon. Rocca di Papa eS = +28m.22s. De Bilt gives eN = +28m.20s., eE = +28m.30s. (?SR_1). Moncalieri S = +28m.33s. MN = +43·2m. Oxford i = +19m.10s. Coimbra gives a Milne record in addition to its usual one. San Fernando MN = +55·2m. Chicago L = +70·2m.

May 29d. Records also at 3h. (Manila), 6h. (Toronto), 8h. and 13h. (Taihoku), 18h. (Rio Tinto), 22h. (San Fernando), 23h. (Lick).

May 30d. Records at 0h. (Athens), 4h. (Manila), 12h. and 14h. (La Paz), 15h. (Helwan), 16h. (Osaka), 22h. (San Fernando), 23h. (Osaka).

May 31d. 16h. 2m. 40s. Epicentre 33°·2N. 138°·0E.

$A = -\cdot622$, $B = +\cdot560$, $C = +\cdot548$.

		Δ	P.	O−C.	S.	O−C.	L.	M.
		°	m. s.	s.	m. s.	s.	m.	m.
Osaka		2·6	1 2	+21	—	—	—	6·9
Tokyo		2·8	1 42	+58	—	—	(1·7)	—
Mizusawa	E.	6·4	1 28	−10	2 44	−11	—	—
	N.	6·4	2 26	?S	(2 26)	−29	(4·0)	—
Zi-ka-wei		14·2	e 3 34	+ 5	—	—	—	—
Manila		24·2	5 28	− 2	—	—	—	—
Hamburg		82·3	—	—	—	—	e 50·3	56·3
De Bilt		85·3	—	—	e 23 11	−11	e 47·3	59·4
Helwan		86·4	63 20	?L	—	—	(63·3)	—

Additional records: Osaka gives MN = +6·7m. The Osaka record is given as 30d. De Bilt MN = +53·0m. Helwan PN = +60m.20s.

May 31d. Records also at 0h. (La Paz and Manila), 5h. (Taihoku), 12h. (Denver), 14h. (Batavia), 21h. (De Bilt), 23h. (Mizusawa and Tokyo).

June 1d. 6h. 51m. 13s. Epicentre 25°·7N. 124°·8E.

$A = -\cdot514$, $B = +\cdot740$, $C = +\cdot434$; $D = +\cdot821$, $E = +\cdot571$; $G = -\cdot247$, $H = +\cdot356$, $K = -\cdot901$.

A depth of focus 0·040 has been assumed.

		Corr. for Focus	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	°	m. s.	s.	m. s.	s.	m.	m.
Taihoku		+0·7	3·0	257	0 58	0	—	—	1·4	1·6
Hokoto		+0·1	5·2	247	2 1	+39	—	—	2·8	3·0
Zi-ka-wei		−0·1	6·2	333	e 1 32	− 1	2 33	−13	—	2·7
Manila		−0·6	11·7	199	2 49	+ 3	—	—	5·2	5·4
Kobe		−0·8	12·7	42	2 54	− 4	—	—	5·5	—
Osaka		−0·8	12·8	43	2 56	− 3	—	—	5·4	8·3
Tokyo		−1·2	16·2	48	3 40	+ 1	6 39	+ 7	—	7·6
Mizusawa		−1·5	19·2	42	4 13	0	7 39	+ 6	—	—
Ootomari		−2·1	25·3	30	e 6 17	+58	(9 21)	− 8	9·4	—
Batavia		−3·1	36·4	210	e 6 56	− 3	12 19	−10	—	14·3
Colombo		−3·7	46·7	256	8 47	+29	—	—	—	14·8
Kodaikanal		−3·8	47·3	261	14 35	?S	(14 35)	−20	16·1	17·1
Honolulu		−4·9	69·8	75	—	—	(19 17)	− 7	19·3	20·6
Vienna		−5·2	82·3	321	i 12 5	+ 3	23 23	+93	55·8	—
Hamburg		−5·2	82·9	328	e 12 8	+ 3	e 22 10	+13	e 41·8	48·8
De Bilt	E.	−5·3	86·1	328	12 23	− 1	22 38	+ 3	e 45·8	51·7
Strasbourg		−5·3	86·3	323	12 23	− 2	24 21	+108	48·0	—
Zurich		−5·3	87·1	321	e 12 27	− 2	—	—	—	—
Uccle		−5·3	87·2	327	12 27	− 3	e 22 41	− 4	—	—
Eskdalemuir		−5·4	87·6	333	12 29	− 2	22 49	+ 1	38·8	—
Rocca di Papa		−5·4	88·0	317	12 32	− 2	(e 23 47)	+54	e 23·8	25·0
Besançon		−5·4	88·7	325	12 37	− 1	—	—	—	—
Bidston		−5·4	88·9	330	23 47	?S	(23 47)	+44	—	53·3
Kew		−5·4	89·0	330	—	—	—	—	—	48·8
Moncalieri		−5·4	89·0	320	13 34	+54	24 34	+89	42·3	—
Oxford		−5·4	89·3	330	12 30	−11	i 23 6	− 2	—	—
Paris		−5·4	89·4	326	e 12 39	− 3	i 24 46	+98	46·8	—
Shide		−5·4	90·0	330	12 39	− 7	e 23 7	− 8	—	54·5
Rio Tinto		−5·5	101·8	322	—	—	27 47	?	—	63·8
Chicago		−5·6	106·5	24	i 24 32	?S	(i 24 32)	−92	42·8	—
La Paz		—	164·8	55	i 19 57	[−15]	—	—	46·3	—

Additional records: Zi-ka-wei gives MN = +2·9m., T_o = 6h.51m.30s. Manila MN = +5·3m. Osaka MN = +9·2m. Chicago seems to have an error of some 13m.20s. in the records. De Bilt P_2 = +13m.21s., S_2 = +24m.11s., e = +28m.11s., eN = +34m.29s., T_{e1} = 6h.51m.21s., T_{e2} = 6h.51m.41s. It would seem that De Bilt records a second shock 20s. later than the above from a more distant origin. Uccle P_2 = +13m.23s. Eskdalemuir PR_1? = +15m.58s., T_o = 6h.51m.20s. Rocca di Papa S? = +16m.35s. (?PR_1). Bidston S = +31m.17s.. S? = +36m.50s. Oxford i = +24m.46s. Shide S = +24m.55s. Chicago gives S = +33m.24s. (?SR_1)

June 1d. 12h. 46m. 20s. Epicentre 30°·0N. 71°·0E. (as on 1919 May 23d.).
A = +·282, B = +·819, C = +·500; D = +·946, E = −·326: G = +·163, H = +·473, K = −·866.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Simla		5·5	76	e 2 28	?S	(e 2 28)	− 3	—	—
Bombay		11·2	171	4 42	?S	(4 42)	−17	—	—
Helwan		34·2	280	14 40	?L	—	—	(14·7)	—
Rocca di Papa		47·8	301	8 36	−17	—	—	—	9·8
Hamburg		49·4	319	e 9 22	+19	—	—	—	—
Strasbourg		50·8	310	9 34	+22	—	—	—	—
De Bilt	E.	52·2	315	e 11 22?	PR_1	e 17 8	+22	e 19·7	—
Edinburgh		56·9	320	16 40	?S	(16 40)	−65	—	—

De Bilt gives e = +15m.42s.

June 1d. Records also at 0h. (San Fernando), 6h. (San Fernando, Kobe, and La Paz), 14h. (Batavia and Manila), 15h. (Edinburgh, Helwan, Kodaikanal, Colombo, and Zi-kă-wei), 18h. (Tokyo), 21h. (La Paz and Rio de Janeiro), 22h. (Mizusawa).

June 2d. Records at 0h. (San Fernando), 3h. (Mizusawa), 5h. (La Paz), 6h. (Toronto), 7h. (Victoria), 9h. (Rocca di Papa), 23h. (Rocca di Papa, Osaka, Tokyo, and San Fernando).

June 3d. 7h. 24m. 28s. Epicentre 37°·0N. 20°·5E. (as on 1919 May 28d.).
A = +·748, B = +·280, C = +·602.

	Δ	P.	O−C.	S.	O−C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Athens	2·8	e 0 40	− 4	e 1 19	+ 2	1·4	1·8
Pompeii	5·9	1 34	+ 3	—	—	—	—
Rocca di Papa	7·6	e 1 51	− 4	—	—	—	3·8
Vienna	11·6	e 5 2	?S	(e 5 2)	− 7	(e 6·3)	—
Hamburg	18·1	—	—	—	—	e 8·5	12·5
De Bilt	18·5	—	—	—	—	e 9·8	—

Athens gives iP = +0m.47s., PR_1N = +1m.16s., MN = +1·6m. Vienna gives S as P and L as S.

June 3d. Records also at 0h. (Athens), 1h. (San Fernando), 4h. (De Bilt, Athens, and Rocca di Papa), 11h. (La Paz), 12h. (La Paz and Helwan), 14h. (Bidston and Mizusawa), 17h. (La Paz), 18h. (Rio Tinto), 20h. (Apia), 21h. (Edinburgh and Strasbourg).

June 4d. Records at 0h. (San Fernando), 1h. (Helwan, Simla, and Calcutta), 4h. and 5h. (La Paz), 7h. (Zurich and Chur), 8h. (Apia), 9h. (La Paz, Helwan, and Chicago), 10h. (Helwan), 11h. and 19h. (Manila), 21h. (Rocca di Papa).

June 5d. Records at 0h. (San Fernando), 2h. (Manila and Batavia), 3h. and 8h. (Helwan), 9h. (Sydney), 11h. (Bidston), 15h. (Taihoku), 17h. (Manila and Batavia), 19h. (Helwan), 22h. (Berkeley).

June 6d. Records at 4h. (Helwan), 10h. (Edinburgh), 11h. (Batavia), 13h. (Osaka and Kobe), 18h. (Rio Tinto (2)).

June 7d. 23h. 6m. 30s. Epicentre 26°·0N. 143°·0E. (as on 1919 May 1d.).
A = −·718, B = +·541, C = +·438.

		Δ	P.	O−C.	S.	O−C.	L.	M.
		°	m. s.	s.	m. s.	s.	m.	m.
Tokyo		10·1	2 39	+ 8	4 27	− 5	—	6·9
Osaka		10·9	2 31	−12	—	—	—	6·6
Mizusawa	E.	13·2	2 35	−41	3 50	−119	—	—
	N.	13·2	2 41	−35	3 54	−115	—	—
Zi-ka-wei		19·6	e 4 37	+ 1	—	—	—	—
Apia		59·3	—	—	e 13 48	?PR_1	14·6	—
De Bilt		93·7	—	—	—	—	e 48·5	60·4

Additional records: Osaka gives MN = +6·8m. De Bilt MN = +61·6m. The Apia records may refer to a local shock.

June 7d. Records also at 0h. (San Fernando, Taihoku, Kobe, and Osaka), 6h. (Manila), 8h. (Taihoku, Manila, and Mizusawa), 9h. (Mizusawa), 10h. (Mizusawa and Tokyo), 11h. (Batavia), 14h. (Kodaikanal (2)), 15h. (Rocca di Papa and Kodaikanal), 20h. (Batavia), 22h. (Rocca di Papa).

June 8d. 23h. 14m. 15s. Epicentre 34°·6N. 140°·7E. (as on 1919 May 4d.).

A = −·637, B = +·521, C = +·568.

		Δ	P.	O−C.	S.	O−C.	L.	M.
		°	m. s.	s.	m. s.	s.	m.	m.
Tokyo		1·3	e 0 26	+ 6	0 33	− 3	—	—
Osaka		4·3	—	—	2 4	+ 6	2·8	3·2
Mizusawa	E.	4·5	1 23	+13	1 56	− 8	—	—
	N.	4·5	1 18	+ 8	1 58	− 6	—	—
Kobe		4·6	2 37	+86	—	—	3·0	3·1
Taihoku		19·2	0 21	?	—	—	—	—

Kobe gives MN = +4·1m.

June 8d. Records also at 0h. (San Fernando and Helwan), 8h. (Osaka and Tokyo), 10h. (Simla), 16h. (Mizusawa, Tokyo, and Osaka), 18h. (Taihoku, Tokyo (2), and Zi-ka-wei), 21h. (Lick and Berkeley), 22h. (Mizusawa and Osaka).

June 9d. 7h. 13m. 35s. Epicentre 41°·5N. 34°·0E.

A = +·621, B = +·419, C = +·663: D = +·559, E = −·829:
G = +·549, H = +·371, K = −·749.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	E.	8·7	248	2 12	0	4 2	+ 6	4·5	4·9
	N.	8·7	248	—	—	4 0	+ 4	4·6	4·8
Lemberg		10·8	324	i 2 50	+ 9	i 4 45	− 5	e 5·7	11·4
Budapest	E.	12·2	304	2 31	−31	—	—	—	—
Vienna		14·1	304	3 31	+ 4	6 39	+29	i 8·3	11·3
Pompeii		14·6	273	3 34	0	6 55	+33	10·1	12·4
Rocca di Papa		15·9	278	e 3 50	− 1	8 16	?L	e 10·8	—
		15·9	278	e 3 56	+ 5	e 6 36	−17	e 8·4	10·1
Florence		16·8	285	2 25	−97	5 55	−78	—	7·3
Milan		18·4	291	4 29	+ 7	—	—	—	11·7
Zurich		19·0	297	e 4 31	+ 2	—	—	—	—
Moncalieri		19·4	289	4 36	+ 2	8 9	− 1	10·8	11·9
Strasbourg		19·8	300	4 41	+ 2	8 20	+ 1	10·9	13·6
Hamburg		20·1	315	e 4 46	+ 4	i 8 33	+ 8	e 12·3	16·3
Besançon		20·7	296	4 55	+ 6	8 50	+12	13·4	—
Marseilles		21·1	285	4 52	− 2	—	—	—	—
De Bilt		22·2	308	5 10	+ 3	9 10	+ 1	11·0	16·1
Uccle		22·4	305	e 5 8	− 2	e 9 13	0	e 12·4	14·4
Paris		23·2	299	e 5 17	− 2	e 9 31	+ 2	13·4	18·4
Barcelona		23·7	281	5 4	−21	9 27	−11	11·8	16·4
Algiers		24·3	270	e 5 26	− 5	—	—	13·4	16·9
Tortosa		25·1	280	5 37	− 2	9 55	−10	12·1	17·3
Kew		25·3	305	—	—	—	—	—	16·4
Oxford		26·0	306	5 46	− 2	10 25	+ 3	—	—
Bidston		27·4	308	9 25	?S	(9 25)	−83	(12·1)	18·4
Eskdalemuir		27·8	312	—	—	(10 45)	−10	10·8	—
Rio Tinto		31·2	276	9 25	?S	(9 25)	−149	22·4	—
San Fernando		31·4	273	13 25	?L	—	—	(13·4)	22·4
Simla		35·9	92	e 22 7	?L	—	—	(e 22·1)	—
Colombo		53·3	119	29 25	?L	—	—	(29·4)	—
Cape Town		76·8	193	41 19	?L	—	—	(41·3)	51·3
Chicago		81·5	320	—	—	—	—	e 41·4	—

Additional records: Athens gives iN = +2m.50s., iE = +2m.56s., m_1 = +4m.13s., m_2 = +4m.24s., m_3 = +4m.29s., T_e = 7h.13m.35s. Moncalieri MN = +11·8m., T_e = 7h.13m.46s. Hamburg MN = +12·4m., T_e = 7h.13m.37s. De Bilt i = +5m.16s., MN = +13·6m., T_e = 7h.13m.44s. Uccle iP = +5m.16s., T_e = 7h.13m.36s. Paris ePN = +5m.23s., T_e = 7h.13m.34s. San Fernando MN = +17·9m.

June 9d. 14h. 16m. 10s. Epicentre 39°·5N. 133°·3E.

A = −·529, B = +·562, C = +·636.

		Δ	P.	O−C.	S.	O−C.	L.	M.
		°	m. s.	s.	m. s.	s.	m.	m.
Osaka		5·1	1 19	0	—	—	—	5·5
Mizusawa	E.	6·1	1 33	0	2 47	+ 1	—	—
	N.	6·1	1 50	+17	2 52	+ 6	—	—
Tokyo		6·4	1 36	− 2	5 19	?L	(5·3)	8·0
La Paz		150·5	19 16	[−40]	—	—	—	—

Osaka gives MN = +9·7m.

June 9d. 15h. 47m. 15s. Epicentre 41°·5N. 34°·0E. (as at 7h.).

A = +·621, B = +·419, C = +·663; D = +·559, E = −·829;
G = +·549, H = +·371, K = −·749.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Athens		8·7	248	e 2 1	−11	4 4	+ 8	4·5	4·8
Lemberg		10·8	324	i 4 41	?S	(4 41)	− 9	e 7·1	12·2
Helwan		11·8	191	6 45	?L	—	—	(6·8)	—
Vienna		14·1	304	i 3 25	− 2	—	—	8·6	13·4
Pompeii		14·6	273	4 29	+55	9 46	?L	(9·8)	—
Rocca di Papa		15·9	278	i 3 25	−26	—	—	—	4·2
Moncalieri		19·4	289	e 4 37	+ 3	8 20	+10	10·7	15·0
Strasbourg	Z.	19·8	300	4 34	− 5	—	—	—	—
Hamburg		20·1	315	e 6 45	?	—	—	—	11·8
De Bilt		22·2	308	5 20	+13	—	—	e 12·8	16·3
Uccle		22·4	305	e 5 3	− 7	—	—	e 13·8	—
Paris		23·2	299	—	—	—	—	e 12·8	16·8

Moncalieri gives MN = +15·2m., T_0 = 15h.47m.14s. De Bilt MN = +15·2m.

June 9d. Records also at 0h. and 4h. (La Paz), 16h. (Apia), 17h. (Helwan), 21h. (Rocca di Papa).

June 10d. 20h. 9m. 15s. Epicentre 4°·0N. 144°·0E. (as on 1917 June 18d.).

A = −·807, B = +·586, C = +·070; D = +·588, E = +·809;
G = −·056, H = +·041, K = −·998.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Manila		25·0	297	—	—	e 10 2	− 1	—	—
Zi-ka-wei		34·5	325	e 4 58	−131	—	—	—	—
Sydney		38·5	171	7 45	+ 3	—	—	11·8	14·0
Melbourne		41·8	178	—	—	14 15	−17	16·6	17·8
Honolulu		58·8	67	e 21 21	?SR_1	—	—	27·8	34·8
Victoria		88·8	41	—	—	—	—	53·8	60·2
Helwan	E.	107·4	302	70 45	?L	—	—	(70·8)	—
De Bilt	E.	114·0	334	—	—	e 47 21	?	e 56·8	73·0
	N.	114·0	334	—	—	—	—	e 58·8	72·7
Toronto		118·4	36	—	—	—	—	48·6	49·4

Helwan gives PN = +71m.45s.

June 10d. Records also at 0h. (Mizusawa), 1h. (San Fernando), 2h. (Manila), 4h. (Sydney (2)), 5h. (Sydney), 7h. (Denver), 8h. (La Paz and Taihoku), 9h. (Helwan), 14h. (Manila and Taihoku), 15h. (Athens), 19h. (San Fernando), 21h. (Batavia and Kodaikanal), 22h. (Apia).

June 11d. Records at 3h. (Rocca di Papa), 5h. (Helwan), 6h. (La Paz, Melbourne, Manila, and Victoria), 7h. (Bidston, Sydney, Batavia, and De Bilt), 11h. (Ootomari), 12h. (Osaka), 13h. (La Paz), 14h. (Manila and Osaka), 18h. (San Fernando and Apia).

June 12d. Records at 5h. (La Paz), 11h. (Chicago, Sydney, Apia, and Melbourne), 12h. (Helwan and San Fernando), 13h. (Tokyo, Osaka, and Mizusawa), 16h. (Osaka and Mizusawa), 18h. (Strasbourg), 19h. (Osaka, Mizusawa, and Manila), 20h. (Helwan), 21h. (Hamburg).

June 13d. Records at 6h. (Helwan), 7h. (Bidston), 8h. (Manila), 11h. (La Paz), 12h. (Kodaikanal), 14h. (San Fernando), 17h. (Manila), 18h. (Lick, Kodaikanal, and Hamburg), 22h. (Colombo).

June 14d. Records at 3h. (Athens), 7h. (Berkeley), 8h. (Victoria), 21h. (Kobe and Osaka), 22h. (San Fernando), 23h. (Kobe and Osaka).

June 15d. 18h. 49m. 4s. Epicentre 30°·0N. 71°·0E. (as on June 1d. 12h.).

$A = +\cdot282$, $B = +\cdot819$, $C = +\cdot500$; $D = +\cdot946$, $E = -\cdot326$; $G = +\cdot163$, $H = +\cdot473$, $K = -\cdot866$.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Simla	5·5	76	i 2 32	?S	(i 2 32)	+ 1	—	3·7
Bombay	11·2	171	4 48	?S	(4 48)	−11	—	—
Calcutta	17·3	112	5 20	+71	7 2	−23	8·8	—
Helwan E.	34·2	280	12 56	?S	(12 56)	+13	—	—
Lemberg	40·2	313	8 50	+53	e 15 32	+82	—	18·0
Vienna	45·0	311	i 8 26	− 7	9 44	?	10·7	71·9
Pompeii	46·5	299	9 46	+62	11 30	?PR_1	—	—
Rocca di Papa	47·8	301	i 8 53	0	—	—	—	10·2
Zurich	50·3	310	e 9 7	− 2	—	—	—	—
Strasbourg z.	50·8	310	9 9	− 3	—	—	—	—
Moncalieri	51·1	306	9 21	+ 7	(17 27)	+55	17·4	—
De Bilt	52·2	315	9 18	− 3	—	—	e 68·9	76·6
Uccle	52·8	314	e 9 22	− 3	—	—	—	—
Mizusawa	57·1	60	(10 2)	+ 9	10 2	?P	—	—
Honolulu	110·3	47	—	—	—	—	53·9	56·2

Additional records: Helwan gives PN = +13m.56s. Lemberg M = +15·9m., e = +16m.50s. Vienna PN = +8m.24s., SE = +9m.43s. Rocca di Papa MN = +10·4m. De Bilt e = +20m.2s., MN = +80·8m.

June 15d. Records also at 0h. (Athens), 8h. (Helwan), 10h. (Chicago and Washington), 11h. (Helwan), 14h. (Batavia and Manila), 16h. (Victoria and Toronto), 17h. (Victoria), 18h. (Toronto), 19h. (Mizusawa), 20h. (Manila (2) and Moncalieri).

June 16d. Records at 5h. (Manila), 15h. (Lick and Ascension), 16h. (Colombo and Helwan), 22h. (San Fernando), 23h. (Apia).

June 17d. Records at 6h. (Melbourne and La Paz), 7h. (Helwan), 13h. (Batavia (2)), 14h. (Batavia), 17h. (Rocca di Papa), 22h. (Lick).

June 18d. Records at 0h. (Tokyo, Osaka, De Bilt, Mizusawa, and Zi-ka-wei), 1h. (Helwan and San Fernando), 3h. (Helwan, Zi-ka-wei, De Bilt, Manila, and Ootomari), 4h. (Ootomari and Mizusawa), 5h. (Pompeii), 6h. (Rocca di Papa and Helwan), 7h. (Mizusawa), 22h. (San Fernando).

June 19d. Records at 2h. (Denver), 3h. (Batavia), 4h. and 13h. (Mizusawa), 15h. (Barcelona), 20h. (Zurich), 21h. (Apia (2)), 22h. (Batavia), 23h. (San Fernando).

June 20d. Records at 4h. (Berkeley, Lick, Helwan, La Paz, and Manila), 5h. (Colombo), 12h. (Helwan), 13h. (Manila), 14h. and 17h. (Kodaikanal), 18h. (Lick, Kobe, and Kodaikanal), 21h. (Manila and San Fernando), 22h. (Manila).

June 21d. Records at 3h. (Tokyo), 4h. (Batavia, Apia, and Manila), 6h. and 8h. (Manila), 9h. (Batavia), 11h. (Manila, Lick, and Berkeley), 20h. (Batavia), 23h. (La Paz).

June 22d. Records at 0h. (San Fernando), 6h. (Batavia), 7h. (Strasbourg), 16h. (Manila), 21h. (Apia).

June 23d. 6h. 26m. 10s. Epicentre 41°·0N. 144°·0E. (as on 1917 Nov. 15d.).
$A = -·611$, $B = +·444$, $C = +·656$; $D = +·588$, $E = +·809$; $G = -·531$, $H = +·386$, $K = -·755$.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	2·9	230	0 37	− 8	1 6	−14	—	—
Ootomari	5·7	351	e 1 29	+ 1	—	—	2·4	—
Tokyo	6·3	214	1 44	+ 8	2 56	+ 4	—	5·2
Osaka	9·2	230	2 27	+ 8	(4 13)	+ 5	4·2	5·3
Kobe	9·4	231	2 29	+ 7	(4 17)	+ 4	4·3	5·4
Hamburg	77·5	334	—	—	e 21 50	− 5	e 42·8	46·8
De Bilt	80·3	336	—	—	e 21 50	−37	e 39·8	47·8
Bidston	81·5	341	27 14	?SR_1	33 2	?	—	50·1
Paris	84·0	336	—	—	—	—	e 46·8	53·8
Helwan	85·7	307	50 50	?L	—	—	(50·8)	—

Additional records: Mizusawa gives SN = +1m.5s. Osaka MN = +5·5m. Kobe MN = +5·5m. Hamburg MN = +47·8m. De Bilt MN = +52·1m. Helwan PN = +49m.50s.

June 23d. Records also at 1h. (San Fernando), 2h. (Batavia), 13h. (Apia), 15h. (Helwan).

June 24d. 18h. 34m. 30s. Epicentre 17°·3N. 120°·5E. (determined by De Bilt).
$A = -·485$, $B = +·823$, $G = +·297$; $D = +·862$, $E = +·508$; $G = -·151$, $H = +·256$, $K = -·955$.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. 's.	s.	m.	m.
Manila	2·8	170	e 0 51	+ 7	—	—	1·4	5·8
Taihoku	7·8	7	e 0 30	?	—	—	—	—
Osaka	21·9	35	5 3	− 1	—	—	9·1	10·2
Batavia	27·1	211	e 5 50	− 9	—	—	—	—
Colombo	41·0	261	13 30	?S	(13 30)	−51	—	25·5
Honolulu	76·1	73	—	—	—	—	41·5	51·5
Helwan	80·8	299	23 30	?S	(23 30)	+57	—	—
Hamburg	87·7	327	e 12 47	−16	e 23 30	−19	e 46·5	55·4
De Bilt	91·0	326	—	—	e 23 42	−42	e 45·5	55·4
Strasbourg	91·3	322	—	—	—	—	e 49·5	—
Eskdalemuir	93·3	332	—	—	—	—	50·5	—
Kew	94·1	329	—	—	—	—	—	57·5
Paris	94·2	325	—	—	—	—	48·5	—
San Fernando	106·4	320	12 30	−131	—	—	—	—

Additional records: Manila gives MN = +7·1m. Osaka MN = +10·4m. Helwan PN = +24m.30s. (?S). Hamburg MN = +49·5m. De Bilt MN = +50·8m., also Epicentre 17°·3N. 120°·5E., as adopted.

June 24d. Records also at 0h. (San Fernando), 2h. (La Paz), 5h. (Zurich), 11h. (Mizusawa), 13h. (Helwan and Taihoku), 19h. (Manila (2)), 20h. (Helwan), 21h. (Manila and Point Loma), 22h. (San Fernando), 23h. (Manila).

June 25d. Records at 4h. (Batavia), 9h. (Helwan), 16h. (Manila), 17h. (San Fernando and Helwan), 20h. (Rio Tinto).

June 26d. 18h. 58m. 0s. Epicentre 34°·5N. 10°·0W. (as on 1918 Sept. 15d.).
$A = +·812$, $B = -·143$, $C = +·566$; $D = -·174$, $E = -·985$: $G = +·558$, $H = -·098$, $K = -·824$.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Tortosa		10·4	50	2 51	+15	—	—	6·3	7·6
Algiers		10·9	74	4 38	?S	(4 38)	−14	5·8	6·2
Barcelona		11·8	50	—	—	—	—	e 6·0	8·0
Paris		17·0	29	—	—	—	—	e 10·0	—
Uccle		19·4	28	—	—	—	—	e 11·0	—
De Bilt	E.	20·7	27	—	—	—	—	12·4	14·8
	N.	20·7	27	—	—	—	—	e 12·0	15·2
Hamburg		23·7	30	—	—	—	—	e 14·0	15·2
Helwan		35·0	86	24 0	?L	—	—	(24·0)	—

Additional records: Hamburg gives MN = +16·6m. Helwan PN = +22m.0s. (?L).

June 26d. Records also at 1h. (San Fernando), 2h. (Honolulu), 4h. (La Paz), 8h. (San Fernando), 9h. (Helwan), 11h. (Strasbourg), 17h. (Apia, Kodaikanal, and Melbourne), 18h. (Rio Tinto).

June 27d. Records at 9h. (Manila), 19h. (Melbourne and San Fernando), 20h. (Helwan and De Bilt).

June 28d. 4h. 40m. 50s. Epicentre 4°·5S. 131°·0E. (as on 1915 May 5d.).

$A = -\cdot654$, $B = +\cdot752$, $C = -\cdot078$: $D = +\cdot755$, $E = +\cdot656$: $G = +\cdot051$, $H = -\cdot059$, $K = -\cdot997$.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Manila		21·5	333	e 4 54	− 5	—	—	—	—
Batavia		24·1	267	e 5 24	− 5	—	—	e 13·8	11·1
Taihoku		30·9	343	3 16	?	—	—	—	—
Perth		30·9	206	10 10	?	—	—	—	—
Adelaide		31·2	168	11 58	?S	(11 58)	+ 4	20·0	21·4
Melbourne		35·7	161	—	—	13 4	− 2	21·2	24·9
Colombo		52·4	282	33 10?	?L	—	—	(33·2?)	36·2
Kodaikanal		55·4	286	33 4	?L	—	—	35·1	37·2
Honolulu		74·2	66	e 32 10	?L	—	—	45·0	48·3
Helwan		100·6	298	25 10	?S	(25 10)	−51	—	—
Hamburg		111·6	327	—	—	—	—	e 56·2	—
De Bilt	E.	114·9	326	—	—	—	—	e 58·2	61·3
	N.	114·9	326	e 22 10	?	—	—	e 57·2	61·5
Uccle		115·9	325	—	—	—	—	e 62·2	—
Eskdalemuir		116·0	333	—	—	—	—	55·2	—
Bidston		117·3	331	55 28	?L	62 34	?	(55·5)	77·7
La Paz		151·7	138	20 10	[+12]	—	—	—	—

Additional records: Adelaide gives $PR_1 = +13$m.10s., $S = +15$m.40s., $SR_1 = +16$m.46s. Perth +59m.10s. Melbourne $SR_1 = +16$m.4s., Helwan $PN = +24$m.10s. (?S). De Bilt $T_0 = 4$h.40m.39s. Epicentre 4°·9S. 131°·5E. Bidston $PR_1 = +59$m.16s.

June 28d. 10h. 26m. 53s. Epicentre 35°·0N. 90°·5E.

$A = -\cdot007$, $B = +\cdot819$, $C = +\cdot574$; $D = +1\cdot000$, $E = +\cdot009$: $G = -\cdot005$, $H = +\cdot574$, $K = -\cdot819$.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Simla		11·8	255	e 9 1	?	—	—	—	9·6
Calcutta	E.	12·6	189	3 7	0	5 25	− 9	—	—
	N.	12·6	189	3 7	0	5 43	+ 9	—	—
Zi-ka-wei		26·1	90	—	—	e 8 36	−108	—	—
Kodaikanal		27·5	208	17 55	?L	—	—	(17·9)	—
Taihoku		28·5	102	6 14	+ 1	—	—	8·5	8·9
Colombo		29·8	202	16 7	?L	—	—	(16·1)	—
Manila		34·2	119	e 6 59	− 8	—	—	—	—
Batavia		44·0	156	—	—	—	—	e 18·2	—
Helwan		49·5	282	26 7	?L	—	—	(26·1)	—
Hamburg		57·2	316	—	—	—	—	e 36·1	42·1
De Bilt	E.	60·4	315	—	—	—	—	e 38·1	41·3
	N.	60·4	315	—	—	—	—	e 34·1	39·3
Bidston		63·7	319	17 31	?S	(17 31)	−98	—	43·8

Additional records: Zi-ka-wei gives e = +2m.54s. Helwan PN = +25m.7s.

June 28d. Records also at 1h. (San Fernando and Vieques), 2h. (Helwan and De Bilt), 3h. (Batavia), 16h. (Manila and Helwan), 17h. (San Fernando), 19h. (Athens), 21h. (Mizusawa), 22h. (San Fernando).

June 29d. 8h. 14m. 37s. Epicentre 43°·8N. 11°·2E.

A = +·708, B = +·140, C = +·692; D = +·194, E = −·981; G = +·679, H = +·134, K = −·722.

This earthquake was originally attributed to the epicentre active on 1918 Nov. 6d., viz., 44°·6N. 13°·3E. But the next shock (at 15h.) is obviously from an origin near Florence, and it seems probable that this was a preliminary disturbance from the same place.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Florence		0·0	—	0 0	0	—	—	—	0·2
Pola		2·2	61	e 0 26	− 8	—	—	e 0·8	2·4
Rocca di Papa		2·3	152	e 0 40	+ 4	—	—	—	1·7
Moncalieri		2·8	295	0 57	+13	1 24	+ 7	1·6	—
Pompeii		3·9	142	1 10	+ 9	—	—	2·2	2·7
Zurich	E.	4·0	332	e 1 3	+ 1	i 2 4?	+14	—	2·3
	N.	4·0	332	e 1 2	0	i 2 6	+16	—	2·4
Marseilles		4·3	266	e 1 57	?S	(e 1 57)	− 1	(e 2·7)	—
Besançon		5·0	316	2 21	?S	(2 21)	+ 4	—	—
Strasbourg	Z.	5·3	334	1 21	− 1	2 50	+25	(2·8)	—
Vienna		5·7	37	1 53	+25	2 48	+12	3·2	3·8
Paris		7·8	313	e 2 18	+20	—	—	4·4	6·4
Uccle		8·4	329	e 3 47	?S	(e 3 47)	0	—	—
De Bilt		9·2	336	—	—	—	—	e 4·8	—
Hamburg		9·8	356	—	—	—	—	e 4·6	7·5

Additional records: Zurich gives iPN = +1m.17s., iPE = +1m.18s., ePV = +1m.2s. Hamburg MN = +5·6m.

1919. June 29d. 15h. 6m. 12s. Epicentre **43°·8N. 11°·2E.**
(as at 8h.).

A = +·708, B = +·140, C = +·692; D = +·194, E = −·981; G = +·679, H = +·134, K = −·722.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Florence		0·0	—	0 1	+ 1	—	—	—	—
Pola		2·2	61	i 0 29	− 5	(e 0 51)	− 9	e 0·8	1·5
Rocca di Papa		2·3	152	i 0 39	+ 3	1 8	+ 5	7·7	1·8
Moncalieri		2·8	295	0 50	+ 6	1 17	0	1·8	2·1
Chur		3·2	338	0 52	+ 2	i 1 36	+ 8	—	—
Pompeii		3·9	142	i 1 1	0	—	—	2·2	3·8
Zurich	E.	4·0	332	e 1 2	0	i 2 7	+17	—	2·6
	N.	4·0	332	e 1 2	0	i 2 12	+22	—	2·5
	V.	4·0	332	e 1 2	0	i 2 13?	+23	—	2·5
Marseilles		4·3	266	i 1 10	+ 3	e 2 10	+12	—	3·1
Neuchatel		4·4	318	1 8	0	—	—	—	—
Besancon		5·0	316	1 20	+ 3	1 54	−23	3·8	—
Strasbourg		5·3	334	1 20	− 2	2 24	− 1	—	—
Vienna		5·7	37	i 1 24	− 4	2 13	−23	2·6	3·3
Barcelona		7·0	254	e 1 45	− 1	3 28	+18	4·2	5·3
Paris		7·8	313	e 1 56	− 2	e 3 26	− 5	4·2	5·8
Tortosa		8·4	253	2 10	+ 3	3 51	+ 4	4·2	16·2
Uccle		8·4	329	2 3	− 4	3 35	−12	3·8	—
De Bilt		9·2	336	2 13	− 6	4 3	− 5	4·4	5·8
Algiers		9·3	224	2 22	+ 2	4 18	+ 8	5·6	7·3
Hamburg	E.	9·8	356	e 2 27	0	e 4 15	− 8	—	7·9
	N.	9·8	356	e 2 25	− 2	i 4 31	+ 8	—	5·5
Lemberg		10·7	51	i 2 30	−10	e 4 12	−36	e 6·7	7·8
Kew		10·8	319	—	—	—	—	—	6·8
Athens	E.	11·2	117	e 2 39	− 8	e 5 23	+24	e 6·2	8·1
	N.	11·2	117	—	—	e 5 1	+ 2	e 5·7	8·3
Oxford		11·5	318	2 48	− 4	4 55	−12	5·2	8·3
Bidston		13·4	321	6 30	?L	8 0	?	(6·5)	—
Rio Tinto		14·7	252	1 48	?	—	—	—	6·8
Eskdalemuir		14·8	326	—	—	5 48	−39	—	—
Coimbra	E.	15·0	263	3 29	−10	6 43	+11	—	9·4
	N.	15·0	263	—	—	6 29	− 3	7·8	9·3
San Fernando		15·2	247	3 12	−30	—	—	7·3	7·8
Helwan		21·2	124	4 48	− 7	—	—	—	—
Ottawa		58·6	307	9 58	− 5	e 18 6	0	e 28·3	—
Toronto		61·8	307	—	—	—	—	33·6	37·4
Georgetown		63·2	300	e 11 17	+44	i 15 34	?	—	—
Chicago		67·7	309	19 52	?S	(19 52)	− 6	32·1	—
Victoria		79·5	331	—	—	—	—	—	45·6
La Paz		93·9	253	12 18	−79	—	—	—	—

For Notes see next page.

NOTES TO JUNE 29d. 15h. 6m. 12s.

Additional records: Moncalieri gives MN = +2·0m., T_0 = 15h.6m.26s. Zurich iPE = +1m.17s., iE = +1m.22s., iPN = +1m.16s., iN = +1m.23s., iV = +1m.23s., T_0 = 15h.6m.12s. Marseilles MN = +2·7m., T_0 = 15h.6m.7s. De Bilt MN = +8·6m., T_0 = 15h.6m.11s. Athens e = +4m.32s., T_0 = 15h.5m.57s. San Fernando MN = 10·8m. Ottawa ePR_1N = +12m.28s., T_0 = 15h.6m.5s. Toronto L = +36·3m. Georgetown iN = +15m.36s. Chicago S = +24m.29s. (?SR_1), L = +39·8m.

June 29d. 16h. 36m. 15s. Epicentre 43°·8N. 11°·2E. (as at 15h.).

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Pola		2·2	61	e 0 21	−13	—	—	e 0·7	0·8
Rocca di Papa		2·3	152	i 0 32	− 4	i 1 8	+ 5	—	1·6
Moncalieri		2·8	295	0 56	+12	1 19	+ 2	1·8	—
Chur		3·2	338	e 0 46?	− 4	i 1 22	− 6	—	—
Pompeii		3·9	142	e 1 0	− 1	2 0	+ 13	(2·0)	2·5
Zurich	E.	4·0	332	e 0 55	− 7	i 2 4	+14	—	2·2
	N.	4·0	332	e 0 54	− 8	i 1 46	− 4	—	—
Strasbourg		5·3	334	2 2	?S	(2 2)	−23	2·9	—
Vienna		5·7	37	e 1 10	−18	2 10	−26	2·5	3·6
De Bilt		9·2	336	—	—	—	—	e 4·8	—
Hamburg		9·8	356	—	—	—	—	e 5·0	—

No additional records.

1919. June 29d. 23h. 14m. 15s. Epicentre 14°·5N. 86°·0W.

(as on 1918, June 13d.).

A = +·068, B = −·966, C = +·250; D = −·998, E = −·070; G = +·017, H = −·250, K = −·968.

Lick, Berkeley, and La Paz suggest a possible deep focus, but there is no support for this from the antipodal stations.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Balboa Heights	E.	8·3	130	2 59	+53	4 45	+60	6·0	7·7
	N.	8·3	130	3 5	+59	4 41	+56	6·1	—
Port au Prince		13·7	71	e 3 4	−18	6 51	+50	(6·9)	8·7
Vieques	E.	20·0	77	4 57	+16	8 56	+33	11·2	15·4
	N.	20·0	77	5 12	+31	9 28	+65	11·9	15·8
Cheltenham	E.	25·6	17	5 59	+15	10 39	+25	17·1	16·5
	N.	25·6	17	5 59	+15	10 40	+26	15·1	19·5
Georgetown	E.	25·7	16	e 5 53	+ 8	i 10 33	+17	e 12·2	12·9
	Z.	25·7	16	e 5 53	+ 8	e 10 34	+18	e 12·2	19·0
Washington		25·7	16	5 51	+ 6	10 33	+17	13·2	—
Chicago		27·3	357	6 0	− 1	10 40	− 6	13·1	—
Ann Arbor	E.	27·9	4	6 9	+ 2	11 3	+ 6	13·8	14·8
	N.	27·9	4	6 27	+20	11 21	+24	14·2	15·8
	E.	27·9	4	6 15	+ 8	11 3	+6	—	15·8
	N.	27·9	4	6 27	+20	11 9	+12	15·0	15·8
Tucson		28·8	312	11 45	?S	16 39	?L	24·8	—
Ithaca		29·1	14	e 6 13	− 6	i 10 59	−20	—	—
Toronto		29·7	10	7 39	+74	12 9	+40	18·0	19·2
Northfield		31·8	20	6 45	0	12 5	0	15·0	—
Ottawa		32·1	12	i 6 46	− 2	i 12 9	− 1	17·2	—
La Paz		35·6	151	i 6 53	−25	i 12 18	−46	15·9	21·2
Lick		39·0	315	—	—	e 13 15	−37	—	—
Berkeley		39·7	315	e 7 30	−22	—	—	—	26·1
La Quiaca	E.	41·7	152	33 45?	?	—	—	40·4	41·2
	N.	41·7	152	—	—	—	—	39·8	51·8
Victoria		45·7	326	8 4	−34	14 27	− 57	23·8	34·0
Andalgala		46·2	155	—	—	(15 33)	+ 2	15·6	16·2
Pilar		50·8	155	8 33	−39	—	—	—	24·0
Cipolletti		56·0	163	11 3	?PR_1	—	—	24·2?	40·2
Honolulu		68·4	288	11 3	− 4	e 20 27	+20	e 31·2	35·0
Coimbra		71·3	51	e 11 26	+ 1	i 20 54	+12	31·1	36·8
		71·3	51	11 25	0	21 15	+33	33·2	35·4
Rio Tinto		72·9	55	8 45	?	—	—	62·8	—
San Fernando		73·3	56	11 15	−23	—	—	—	39·8
Eskdalemuir		74·0	35	11 43	+ 1	21 24	+10	36·8	39·6
Bidston		74·2	40	4 27	?	10 45	?	—	31·0

Continued on next page.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Oxford	75·4	41	12 13?	+22	21 35	+ 5	26·1	40·8
Kew	76·1	40	20 45	?S	(20 45)	−53	—	44·8
Tortosa	78·0	50	12 16	+ 9	22 11	+11	31·4	40·7
Paris	78·2	42	e 12 30	+22	e 22 6	+ 4	34·8	42·8
Uccle	79·0	40	e 12 33	+20	e 22 15	+ 3	e 33·8	42·8
Barcelona	79·1	50	e 12 14	0	i 22 18	+ 5	e 31·5	40·1
De Bilt	79·3	39	12 27	+12	22 22	+ 7	38·8	40·7
Algiers	80·7	54	e 12 56	+33	22 32	+ 1	34·8	40·8
Besançon	80·8	44	12 43?	+19	—	—	39·8	—
Marseilles	81·2	48	—	—	—	—	39·8	—
Strasbourg	81·6	42	12 25	− 3	22 43	+ 1	39·8	45·2
Hamburg	81·9	37	e 12 59	+29	i 22 45	0	e 37·2	45·2
Moncalieri	82·4	45	e 1 1	?	i 22 44	− 6	39·3	47·0
Zurich	82·5	44	e 12 32	− 1	—	—	—	—
Pola	86·6	45	e 23 16	?S	(e 23 16)	−21	e 36·8	44·9
Rocca di Papa	86·7	47	e 12 52	− 5	e 23 17	−21	e 41·6	—
Vienna	87·2	40	e 12 57	− 3	23 19	−24	e 39·2	47·8
Pompeii	88·3	48	e 13 45	+38	e 22 45	−70	42·8	—
Apia	89·5	258	—	—	e 23 57	−12	35·0	—
Lemberg	91·3	38	20 15	?	—	—	e 45·2	56·8
Helwan E.	105·1	53	18 45	?PR_1	—	—	—	63·6
N.	105·1	53	25 21	?S	(25 21)	−82	—	76·0
Cape Town	109·8	121	52 9	?L	—	—	(52·2)	58·6
Zi-ka-wei	127·3	330	—	—	—	—	e 64·0	—
Melbourne	129·4	232	—	—	—	—	64·0	67·2
Simla	131·6	20	e 22 3	?PR_1	—	—	—	81·8
Taihoku	132·3	325	—	—	e 45 45	?	—	—
Manila	140·6	316	e 20 14	?PR_1	—	—	—	—
Kodaikanal	150·3	34	89 33	?L	—	—	100·4	102·4
Colombo	154·4	34	36 45	?	—	—	—	—
Batavia	164·9	302	e 20 4	[− 8]	—	—	97·2	—

Additional records: Cheltenham gives its East component as 20h. instead of 23h. Georgetown for Bosch Instrument gives eL = +13·3m., T_o = 23h.14m.15s. Washington L = +15·2m. Chicago L = +15·8m. and +25·8m. An Arbor gives Bosch-Omori records and its Wiechert records in two components. Ithaca ePN = +5m.56s., eE = +13m.13s., T_o = 23h.13m.49s. Toronto iS = +15m.27s., i = +16m.9s., iL = +20·6m., T_o = 23h.16m.12s. Northfield L = +19·8m. Berkeley MN = +23·7m. La Quiaca has been assumed to use mean time four hours west of Greenwich. Coimbra gives a set of Milne records in addition to its usual one. Also PN = +12m.6s., MN = +35·5m., T_o = 23h.14m.12s. San Fernando MN = +44·8m. Uccle PR_1 = +15m.15s., T_o = 23h.15m.6s. Apia gives its S as e_1, also e_2 = +29m.57s. De Bilt eSR_1E = +27m.10s., MN = +38·2m., T_o = 23h.14m.45s. Moncalieri MN = +44·0m. Rocca di Papa L = +45·6m. and +56·7m. Pompeii gives its records as at 0h. on the 30th. Kodaikanal probably records a separate shock.

June 29d. Records also at 0h. (Tucson, Ottawa, and Chicago), 1h. (Victoria and Toronto), 3h. (Florence and Rocca di Papa), 7h. (Pola, Florence, Pompeii, Zurich, and Rocca di Papa), 9h. (Rocca di Papa and Ascension), 10h. (Rocca di Papa and Ascension), 11h. (Rocca di Papa and Ascension), 13h. (Ascension (6)), 15h. (Zurich, Pompeii, Rocca di Papa (6), Pola, and Vienna), 16h. (Zurich (2), Hamburg, Vienna, and Rocca di Papa (4)), 17h. (Vienna, Pompeii, Zurich, Rocca di Papa (4), and Florence), 18h. (Rocca di Papa (3)), 19h. (Rocca di Papa and Pompeii), 20h. (Florence, Zurich, and Rocca di Papa), 21h. (Taihoku and Rocca di Papa), 22h. (Florence), 23h. (Rocca di Papa (3)).

June 30d. 7h. 23m. 40s. (I) } Epicentre 6°·0N. 37°·0E.
7h. 26m. 20s. (II) }

A = +·794, B = +·599, C = +·105; D = +·602, E = −·799;
G = +·083, H = +·063, K = −·994.

The position of the epicentre is unusual (see further note at end), and the supposition of a double shock is made with hesitation, though there seems to be good evidence in favour of it. Only Helwan and Rocca di Papa give double records, though other records may be interpreted in that sense.

Continued on next page.

The first shock was observed at the following stations :—

June 30d. 7h. 23m. 40s.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Helwan N.	24·4	348	5 50	+18	10 38	+50	—	14·4
Rocca di Papa	41·8	333	9 36	?PR_1	—	—	—	—
Cape Town	43·7	200	—	—	—	—	21·2	—
Rio Tinto	50·7	315	9 20	+ 9	—	—	—	—
Coimbra	53·2	318	(9 21)	− 6	9 21	?P	23·6	38·7
Bidston	57·5	331	10 44	+48	—	—	—	34·8

Cape Town records the above L as P, followed by the L for second shock as S. Coimbra records P at 7h.23m.35s. (which must belong to yet another shock); S at 7h.33m.1s. (taken above as P), and L as above recorded, MN = +34·6m.

June 30d. 7h. 26m. 20s. Epicentre 6°·0N. 37°·0E.

A = +·794, B = +·599, C = +·105; D = +·602, E = −·799; G = +·083, H = +·063, K = −·994.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Helwan E.	24·4	348	5 16	−16	10 28	+36	—	13·9
Athens	34·1	341	7 10	+ 4	—	—	19·2	21·4
Bombay	37·2	65	—	—	13 14	−13	—	22·0
Pompeii	40·1	334	7 40	−16	15 40	+92	25·7	—
Kodaikanal	40·2	81	14 28	?S	(14 28)	+18	21·6	26·3
Rocca di Papa	41·8	333	8 2	− 7	(14 26)	− 6	e 25·0	33·0
Colombo	42·5	88	—	—	13 40?	−62	22·7	27·7
Algiers	43·7	320	—	—	—	—	22·7	25·7
Cape Town	43·7	200	—	—	21 16	?L	22·6	25·6
Pola	43·7	336	15 21	?S	(15 21)	+23	e 25·3	34·8
Florence	44·0	331	7 40	−46	—	—	—	23·7
Lemberg	45·1	350	—	—	—	—	e 22·8	41·1
Simla	45·2	50	e 15 10	?S	(e 15 10)	− 8	—	24·1
Vienna	45·7	341	8 45	+ 7	—	—	25·2	41·7
Moncalieri	46·5	330	8 38	− 6	19 18	+22	26·6	28·9
Marseilles	46·5	328	—	—	—	—	28·7	—
Barcelona	47·1	324	—	—	(15 58)	+16	16·0	27·0
Tortosa	47·7	322	9 1	+ 9	—	—	24·7	27·1
Strasbourg	49·3	335	—	—	(15 40)	−30	15·7	—
San Fernando	49·8	314	9 16	+10	17 40	+84	29·7	33·6
Rio Tinto	50·7	315	—	—	—	—	—	30·7
Paris	51·8	331	—	—	e 16 40	− 1	28·7	30·7
Hamburg	52·4	340	9 42	+20	—	—	25·7	43·1
Uccle	52·4	334	—	—	20 40	?SR_1	—	36·7
De Bilt	53·0	337	—	—	(17 40)	+44	17·7	37·8
Kew	54·9	332	21 40	?SR_1	—	—	—	36·7
Oxford	55·6	331	—	—	17 47	+18	—	39·5
Eskdalemuir	58·8	335	—	—	—	—	33·7	—
Batavia	70·7	98	e 11 30	+ 9	20 48	+14	37·0	39·8
Manila	82·6	77	e 12 47	+13	—	—	—	—
Ottawa	101·3	320	e 22 10	?	e 24 58	−70	e 48·7	—
Ithaca	102·8	317	—	—	—	—	61·8	—
La Quiaca	104·1	249	—	—	—	—	—	85·2
Toronto	104·3	319	—	—	—	—	e 56·2	78·9
Andalgala	104·6	241	—	—	—	—	—	76·5
Cipolletti	105·6	230	56 46	?L	—	—	65·8	73·6
La Paz	106·2	255	—	—	28 54	+120	56·1	65·1
Melbourne	107·8	127	—	—	—	—	e 51·7	65·2
Chicago	110·6	320	24 23	?S	28 58	−85	e 56·7	—
Victoria	122·9	345	—	—	—	—	—	77·7
Honolulu	148·9	28	e 76 40	?L	—	—	e 102·2	108·7

Athens MN = +20·4m. Cape Town records above L as S and former L as P. Pola MN = +33·5m. Moncalieri MN = +30·0m. San Fernando MN = +33·1m. Paris S is given as e_1, and e_2 = + 20m.40s. (whole minutes recorded only). Hamburg MN = +34·3m. De Bilt MN = +35·5m. Ottawa L = +93·7m. Chicago. The record of L follows that of the following shock. Another L at 8h.32m.0s. = +65·7m. Toronto gives also another L = +66·5m.

NOTE.—It is remarked above that the position of the epicentre is unusual. The only previous record (in this series of publications) in that neighbourhood is that of 1915 May 21d. 4h. 18m. 44s., epicentre 4°·0N. 32°·0E. To test whether the above position (6°·0N. 37°·0E.) might possibly suit the records

Note continued on next page.

of 1915 May 21d., a fresh discussion of the May residuals was undertaken, with the result that the epicentre was found to be sensibly different from that of 1919. A small change was, however, indicated in the elements for 1915 May 21, and the new reduction stands as below for those stations, giving fair observations of P and S. The former residuals are added for comparison.

New reduction of 1915 May 21d. 4h. 18m. 53s., with new epicentre 5°·4N. 32°·0E.

A = +·844, B = +·528, C = +·092.

	New Δ	Former Az.	New Residls. P.	New Residls. S.	Former Residls. P.	Former Residls. S.
	°	°	s.	s.	s.	s.
Tiflis	38·0	15	+ 3	− 1	0	−12
Rocca di Papa	40·2	338	−17	—	−11	—
Cape Town	41·3	198	—	+42	—	+69
Padova	43·7	340	− 5	−10	− 5	−18
Granada	45·4	320	− 5	− 3	− 3	− 8
San Fernando	46·8	318	—	−31	—	−27
Rio Tinto	47·8	319	−46	—	−43	—
Paris	50·0	335	− 3	+ 2	− 2	− 5
Newport (I.W.)	53·1	335	—	+10	—	+ 2
Pulkovo	54·5	359	− 1	+ 2	− 1	− 5
Ekaterinburg	56·1	18	+ 1	+ 4	+ 1	− 5
Eskdalemuir	57·3	337	+ 3	+ 2	+ 3	− 5
Edinburgh	57·8	338	+ 9	—	+10	—
Irkutsk	74·9	37	+ 4	(+97)	+ 6	(+94)
Batavia	75·6	97	+ 9	+ 7	+20	+19

On the other hand this revised epicentre for 1915 May 21 will clearly not suit 1919 June 30. By way of illustration we may give the (very few) cases of good observations at the same station.

	1919 June 30. P.	1919 June 30. S.	1915 May 21. P.	1915 May 21. S.	Diff. P.	Diff. S.
	m. s.	m. s.	m. s.	m. s.	s.	s.
Rocca di Papa	8 2	—	7 40	—	−22	—
Paris	—	16 40	—	16 21	—	−19
Batavia	11 30	20 49	12 2	21 40	+32	+51

June 30d. 23h. 50m. 40s. Epicentre 43°·8N. 11°·2E. (as on 1919 June 29d.).

A = +·708, B = +·140, C = +·692; D = +·194, E = −·981:
G = +·679, H = +·134, K = −·722.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Florence	0·0	—	1 15	+75	—	—	—	1·4
Pola	2·2	61	e 0 35	+ 1	—	—	e 1·1	1·4
Rocca di Papa	2·3	152	i 0 54	?S	(i 0 54)	− 9	(1·4)	1·7
Moncalieri	2·8	295	e 1 19	?S	(e 1 19)	+ 2	1·9	—
Pompeii	3·9	142	i 2 26	?L	—	—	3·7	—
Zurich E.	4·0	332	e 1 14	+12	2 17?	+27	(2·3)	—
Vienna	5·7	37	e 1 41	+13	2 29	− 7	3·0	3·6
De Bilt	9·2	336	—	—	—	—	e 5·4	—
Hamburg	9·8	356	—	—	—	—	e 5·3	—

Additional records: Pola gives MN = +1·2m. Zurich ePN = +1m.15s., ePZ = +1m.16s., ePE = +1m.27s.

June 30d. Records also at 1h. (Rocca di Papa), 4h. (Apia and Manila), 5h. (Rocca di Papa, Zurich, Vienna, Florence, and Kodaikanal), 12h. (Helwan), 13h. (Manila and Moncalieri), 14h. (Helwan, Rocca di Papa, Pompeii, and Vienna), 16h. (Rocca di Papa (2) and Moncalieri), 20h. (Florence), 21h. (Manila and San Fernando).

EXPANDED TABLES FOR P & S, 90°—130°
(in continuation of those already issued separately).

Δ	P	S	Δ	P	S	Δ	P	S	Δ	P	S
°	m. s.	m. s.	°	m. s.	m. s.	°	m. s.	m. s.	°	m. s.	m. s.
90·0	13 16	24 14	95·0	13 43	25 6	100·0	14 11	25 56	105·0	14 34	26 42
90·1	13 17	24 15	95·1	13 44	25 7	100·1	14 11	25 57	105·1	14 35	26 43
90·2	13 17	24 16	95·2	13 44	25 8	100·2	14 12	25 58	105·2	14 35	26 44
90·3	13 18	24 17	95·3	13 45	25 9	100·3	14 12	25 59	105·3	14 36	26 45
90·4	13 18	24 18	95·4	13 45	25 10	100·4	14 13	26 0	105·4	14 36	26 46
90·5	13 19	24 19	95·5	13 46	25 11	100·5	14 13	26 1	105·5	14 37	26 47
90·6	13 19	24 20	95·6	13 47	25 12	100·6	14 13	26 1	105·6	14 37	26 48
90·7	13 20	24 21	95·7	13 47	25 13	100·7	14 14	26 2	105·7	14 38	26 49
90·8	13 20	24 22	95·8	13 48	25 14	100·8	14 14	26 3	105·8	14 38	26 50
90·9	13 21	24 23	95·9	13 48	25 15	100·9	14 15	26 4	105·9	14 39	26 51
91·0	13 21	24 24	96·0	13 49	25 16	101·0	14 15	26 5	106·0	14 39	26 52
91·1	13 22	24 25	96·1	13 50	25 17	101·1	14 16	26 6	106·1	14 40	26 53
91·2	13 22	24 26	96·2	13 50	25 18	101·2	14 16	26 7	106·2	14 40	26 54
91·3	13 23	24 27	96·3	13 51	25 19	101·3	14 17	26 8	106·3	14 41	26 55
91·4	13 23	24 28	96·4	13 51	25 20	101·4	14 17	26 9	106·4	14 41	26 56
91·5	13 24	24 29	96·5	13 52	25 21	101·5	14 18	26 10	106·5	14 42	26 57
91·6	13 25	24 31	96·6	13 52	25 22	101·6	14 18	26 11	106·6	14 42	26 57
91·7	13 25	24 32	96·7	13 53	25 23	101·7	14 19	26 12	106·7	14 43	26 58
91·8	13 26	24 33	96·8	13 53	25 24	101·8	14 19	26 13	106·8	14 43	26 59
91·9	13 26	24 34	96·9	13 54	25 25	101·9	14 20	26 14	106·9	14 44	27 0
92·0	13 27	24 35	97·0	13 54	25 26	102·0	14 20	26 15	107·0	14 44	27 1
92·1	13 28	24 36	97·1	13 55	25 27	102·1	14 21	26 16	107·1	14 44	27 2
92·2	13 28	24 37	97·2	13 55	25 28	102·2	14 21	26 17	107·2	14 45	27 3
92·3	13 29	24 38	97·3	13 56	25 29	102·3	14 22	26 18	107·3	14 45	27 4
92·4	13 29	24 39	97·4	13 56	25 30	102·4	14 22	26 19	107·4	14 46	27 5
92·5	13 30	24 40	97·5	13 57	25 31	102·5	14 23	26 20	107·5	14 46	27 6
92·6	13 30	24 41	97·6	13 58	25 32	102·6	14 23	26 20	107·6	14 46	27 6
92·7	13 31	24 42	97·7	13 58	25 33	102·7	14 24	26 21	107·7	14 47	27 7
92·8	13 31	24 43	97·8	13 59	25 34	102·8	14 24	26 22	107·8	14 47	27 8
92·9	13 32	24 44	97·9	13 59	25 35	102·9	14 25	26 23	107·9	14 48	27 9
93·0	13 32	24 45	98·0	14 0	25 36	103·0	14 25	26 24	108·0	14 48	27 10
93·1	13 33	24 46	98·1	14 1	25 37	103·1	14 26	26 25	108·1	14 49	27 11
93·2	13 33	24 47	98·2	14 1	25 38	103·2	14 26	26 26	108·2	14 49	27 12
93·3	13 34	24 48	98·3	14 2	25 39	103·3	14 27	26 27	108·3	14 50	27 13
93·4	13 34	24 49	98·4	14 2	25 40	103·4	14 27	26 28	108·4	14 50	27 14
93·5	13 35	24 51	98·5	14 3	25 41	103·5	14 28	26 29	108·5	14 51	27 15
93·6	13 36	24 52	98·6	14 3	25 42	103·6	14 28	26 29	108·6	14 51	27 15
93·7	13 36	24 53	98·7	14 4	25 43	103·7	14 29	26 30	108·7	14 52	27 16
93·8	13 37	24 54	98·8	14 4	25 44	103·8	14 29	26 31	108·8	14 52	27 17
93·9	13 37	24 55	98·9	14 5	25 45	103·9	14 30	26 32	108·9	14 53	27 18
94·0	13 38	24 56	99·0	14 5	25 46	104·0	14 30	26 33	109·0	14 53	27 19
94·1	13 39	24 57	99·1	14 6	25 47	104·1	14 30	26 34	109·1	14 53	27 20
94·2	13 39	24 58	99·2	14 6	25 48	104·2	14 31	26 35	109·2	14 54	27 21
94·3	13 40	24 59	99·3	14 7	25 49	104·3	14 31	26 36	109·3	14 54	27 22
94·4	13 40	25 0	99·4	14 7	25 50	104·4	14 32	26 37	109·4	14 55	27 23
94·5	13 41	25 1	99·5	14 8	25 51	104·5	14 32	26 38	109·5	14 55	27 24
94·6	13 41	25 2	99·6	14 9	25 52	104·6	14 32	26 38	109·6	14 55	27 24
94·7	13 42	25 3	99·7	14 9	25 53	104·7	14 33	26 39	109·7	14 56	27 25
94·8	13 42	25 4	99·8	14 10	25 54	104·8	14 33	26 40	109·8	14 56	27 26
94·9	13 43	25 5	99·9	14 10	25 55	104·9	14 34	26 41	109·9	14 57	27 27

EXPANDED TABLES FOR P & S
(in continuation of those already issued separately).

Δ °	P m. s.	S m. s.	Δ °	P m. s.	S m. s.	Δ °	P m. s.	S m. s.	Δ °	P m. s.	S m. s.
110·0	14 57	27 28	115·0	15 20	28 10	120·0	15 42	28 49	125·0	16 6	29 26
110·1	14 58	27 29	115·1	15 21	28 11	120·1	15 43	28 50	125·1	16 6	29 27
110·2	14 58	27 30	115·2	15 21	28 12	120·2	15 43	28 51	125·2	16 7	29 27
110·3	14 59	27 31	115·3	15 22	28 12	120·3	15 44	28 51	125·3	16 7	29 28
110·4	14 59	27 32	115·4	15 22	28 13	120·4	15 44	28 52	125·4	16 8	29 29
110·5	15 0	27 33	115·5	15 23	28 14	120·5	15 45	28 53	125·5	16 8	29 30
110·6	15 0	27 33	115·6	15 23	28 15	120·6	15 45	28 54	125·6	16 8	29 30
110·7	15 1	27 34	115·7	15 24	28 16	120·7	15 46	28 55	125·7	16 9	29 31
110·8	15 1	27 35	115·8	15 24	28 16	120·8	15 46	28 55	125·8	16 9	29 32
110·9	15 2	27 36	115·9	15 25	28 17	120·9	15 47	28 56	125·9	16 10	29 32
111·0	15 2	27 37	116·0	15 25	28 18	121·0	15 47	28 57	126·0	16 10	29 33
111·1	15 3	27 38	116·1	15 25	28 19	121·1	15 48	28 58	126·1	16 10	29 34
111·2	15 3	27 39	116·2	15 26	28 20	121·2	15 48	28 58	126·2	16 11	29 34
111·3	15 4	27 40	116·3	15 26	28 20	121·3	15 49	28 59	126·3	16 11	29 35
111·4	15 4	27 41	116·4	15 27	28 21	121·4	15 49	29 0	126·4	16 12	29 36
111·5	15 5	27 42	116·5	15 27	28 22	121·5	15 50	29 1	126·5	16 12	29 37
111·6	15 5	27 42	116·6	15 27	28 23	121·6	15 50	29 1	126·6	16 12	29 37
111·7	15 6	27 43	116·7	15 28	28 24	121·7	15 51	29 2	126·7	16 13	29 38
111·8	15 6	27 44	116·8	15 28	28 24	121·8	15 51	29 3	126·8	16 13	29 39
111·9	15 7	27 45	116·9	15 29	28 25	121·9	15 52	29 3	126·9	16 14	29 39
112·0	15 7	27 46	117·0	15 29	28 26	122·0	15 52	29 4	127·0	16 14	29 40
112·1	15 7	27 47	117·1	15 30	28 27	122·1	15 53	29 5	127·1	16 14	29 41
112·2	15 8	27 48	117·2	15 30	28 28	122·2	15 53	29 6	127·2	16 15	29 41
112·3	15 8	27 48	117·3	15 31	28 28	122·3	15 54	29 6	127·3	16 15	29 42
112·4	15 9	27 49	117·4	15 31	28 29	122·4	15 54	29 7	127·4	16 16	29 43
112·5	15 9	27 50	117·5	15 32	28 30	122·5	15 55	29 8	127·5	16 16	29 44
112·6	15 9	27 51	117·6	15 32	28 31	122·6	15 55	29 9	127·6	16 16	29 44
112·7	15 10	27 52	117·7	15 33	28 32	122·7	15 56	29 10	127·7	16 17	29 45
112·8	15 10	27 52	117·8	15 33	28 32	122·8	15 56	29 10	127·8	16 17	29 46
112·9	15 11	27 53	117·9	15 34	28 33	122·9	15 57	29 11	127·9	16 18	29 46
113·0	15 11	27 54	118·0	15 34	28 34	123·0	15 57	29 12	128·0	16 18	29 47
113·1	15 12	27 55	118·1	15 35	28 35	123·1	15 57	29 13	128·1	16 19	29 48
113·2	15 12	27 56	118·2	15 35	28 36	123·2	15 58	29 13	128·2	16 19	29 48
113·3	15 13	27 56	118·3	15 35	28 36	123·3	15 58	29 14	128·3	16 20	29 49
113·4	15 13	27 57	118·4	15 36	28 37	123·4	15 59	29 15	128·4	16 20	29 50
113·5	15 14	27 58	118·5	15 36	28 38	123·5	15 59	29 16	128·5	16 21	29 51
113·6	15 14	27 59	118·6	15 36	28 39	123·6	15 59	29 16	128·6	16 21	29 51
113·7	15 15	28 0	118·7	15 37	28 40	123·7	16 0	29 17	128·7	16 22	29 52
113·8	15 15	28 0	118·8	15 37	28 40	123·8	16 0	29 18	128·8	16 22	29 53
113·9	15 16	28 1	118·9	15 38	28 41	123·9	16 1	29 18	128·9	16 23	29 53
114·0	15 16	28 2	119·0	15 38	28 42	124·0	16 1	29 19	129·0	16 23	29 54
114·1	15 16	28 3	119·1	15 38	28 43	124·1	16 2	29 20	129·1	16 24	29 55
114·2	15 17	28 4	119·2	15 39	28 43	124·2	16 2	29 20	129·2	16 24	29 55
114·3	15 17	28 4	119·3	15 39	28 44	124·3	16 3	29 21	129·3	16 25	29 56
114·4	15 18	28 5	119·4	15 40	28 45	124·4	16 3	29 22	129·4	16 25	29 57
114·5	15 18	28 6	119·5	15 40	28 46	124·5	16 4	29 23	129·5	16 26	29 58
114·6	15 18	28 7	119·6	15 40	28 46	124·6	16 4	29 23	129·6	16 26	29 58
114·7	15 19	28 8	119·7	15 41	28 47	124·7	16 5	29 24	129·7	16 27	29 59
114·8	15 19	28 8	119·8	15 41	28 48	124·8	16 5	29 25	129·8	16 27	30 0
114·9	15 20	28 9	119·9	15 42	28 48	124·9	16 6	29 25	129·9	16 28	30 0

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