HARVARD UNIVERSITY, CAMBRIDGE, MASS., U.S.A.

RECORD OF THE SEISMOGRAPHIC STATION

DEPARTMENT OF GEOLOGY AND GEOGRAPHY

$\phi = 42° 22' 36''$ N. $\lambda = 71° 06' 59''$ W. Gr. $= 5.367$ M. FOUNDATION: Glacial sand over clay.

TIME: Mean Greenwich, midnight to midnight.

INSTRUMENTS: Two Bosch-Omori 100 kg. horizontal pendulums (mechanical registration).

No.	Date	Phase	Time	Periods	Amplitudes	Δ	REMARKS
			h. m. s.	s.	μ.	Kms.	
	1920 Jun 2	0?	22 12 35			2733?	Distance may be greater and and 0 earlier by one or more minutes. Phases on both components indistinct before 22h 24m ca. N record distorted by local disturbances and microseisms.
		e_E	22 21 38	4			
		S_E?	22 22 29	6			
		L_E	22 23 51	12			
		eL_N	22 24 34	10			
		M_N	22 25 23	11			
		M_E	22 26 42	8			
		C_E?	22 28 43	7and10			
		F?	23.2 ca				F uncertain, in microseisms.
	Jun 4	0	13 postea				Earlier phases not distinguishable from microseisms before and after this record. Press despatches mention two earthquakes felt at Ferrara, Italy on June 5th.
		eL_E?	13 48 51	12			
		M_E	13 48 52	10			
		M_N?	13 55 06	10			
		F?	16 15 ca.				
	Jun 5	0	4 21 26			11,560	104.04° of arc.
		eP_E?	4 39 06				eL-0 gives V_L=228 kms. sec.
		iP_E	4 40 45				
		iP_N	4 40 51	6			
		S_E	4 50 30	10			
		S_N	4 51 45	13			
		S_{RN}?	4 56 32				
		eL_E	4 12 08	54			
		eL_N	4 12 42	54			
		L_N	4 13 32	50			
		L_E	4 15.0	40			
		L_E	4 19.0	30			
		L_E	4 30.0	20			
		M_E	4 27 08	18	107?		E damped 1.5/1 only.
		M_E	5 31.0	16	170?		Chief maximum.
		C_E	5 34.0				
		F	6 30 ca.				

(For explanation of Symbols see other side)

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$$2\pi\sqrt{\frac{1}{g}}$$

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			h. m. s.	s.	μ.	Kms.	
	1920						
	Jun 9.	O	11 postea.				13,000kms. plus.
		e_E	11 50 15	6			
		e_N	11 50 27	6			E record changed from 12h14m
		e_N	11 53 21	10			to 12h 30m; N record has hiatus
		e_E	11 53 24	12			between 12h 4m and 12h 16m
		e_N	11 54 39	12			
		eL_N	12 34 40	60			eL=e-44m 25s: in 13-11-21;
		eL_E	12 34 46	40			8 secs. L waves very flat.
		L_E	12 35 24	60			S well marked for flat LL.
		L_E	12 36 08	60			
		L_E	12 39 48	30			
		L_E	12 55 34	20			
		L_N	13 08.0	20			
		C_{EN}	13 11.0	15			
		F	.....	....	After	15h 35m	lost in artificial motion and microseisms.
	Jun 12	O	20 postea				Not recognizable on E.
		eL_N?	20 56 26	28			
		L	21 01 21	14			
		L	21 05 17	12			
		F?	21 46 ca				
	Jun 16	e_E?	20 12 56				Record of doubtful origin;
		I?	20 14 54	8			microseisms only on N.
		e_E	20 17 53	8			
		L_E	20 26 04	15			
		....	20 28 ca.	8			
		F?	20 30 ca.				Lost in winding drums.
	Jun 18	O	9 postea				Apparently seismic; masked by
		$P?_N$	9 03 54				microseisms; and not clear
		$S?_N$	9 05 30	6			
		$L?_N$	9 05 42	10			
		--	- -- --				
		L?	9 08 47	10			
		$L?_N$	9 11 13	15			
		L?	9 13 12	10			
		F?	9 15.				
	Jun 18	O	9 postea				Apparently seismic and not
		$S?_N$	9 45 36	6			distant.
		L?	9 47 29	8			
	Jun 18	O	10 22 27			1450	E masked by microseisms
		eP_E?	10 25 42	3			Distance from epicentre and
		eP_N	10 25 49	3			O from eL_N AND S_N-P_N
		S_N	10 28 25	6			
		eL_N	10 29 00	13			
		eL_E?	10 29 01				
		M_N	10 29 20	11			A 625 μ trace.
		M_E	10 31.5				Perceptible.
		F	.....	...	....	....	In next.

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June 18, 1920

No. From to 191

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	1920		h. m. s.	s.	μ.	Kms.	
	Jun 18	O?	10 36 31			675?	Confused with last record
		P_N	10 38 02	3			on E, and somewhat masked
		S_N	10 39 16				by microseisms. No reports;
		eD_N	10 39 56	12			may be part of last record.
		F?	10 48 ca.				
	Jun 21	O?	14 06 23			3080?	Forephases masked by micro-
		S_N	14 17 20	6			seisms. No.M.
		eL_N?	14 19 57	28			
		LE	14 20 01	20			
		C_N	14 22 40	6			
		F	14 26.3				
	Jun 22	O?	1 45 ca.			3866?	O from press-despatches,
		*eLE?	2 01 19	24	Faint		giving time of a destruct-
		iE	2 07 58	3			ive shock at Inglewood,
		iN	2 08 15	10			about 10 miles sw from
		iN	2 08 26		M		Los Angeles, at 6h 45m,
		iN	2 08 29	14			6h 46m, 6h 47m, on June
		cE	2 08 31	12			21, 120th meridian time west.
		eN	2 08 43	6			Distance from Station to
		eE	2 08 51	6 and 8			Court House in Los Angeles
		FN	2 22 ca.				= 3850 kms. Press report
		FE	2 35 ca.				state 21 buildings were de-

*Possibly of different origin.

stroyed and several persons slightly injured. In Los Angeles, plate-glass windows were shattered! The shock causing the damage was followed by two slight tremors a few minutes later. At 10h 40m p.m. a 4th tremor was felt at Inglewood and in s.w. part of Los Angeles. A slight shock was felt at 4 a.m. June 22nd. Other press notices give time as 5 h a.m. 120 th meridian west.

The Harvard record after 2-07-58, from the time given for O, would appear to be C vibrations.

Mimeographed and Issued July 20 1920.

J. B. Woodworth

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No. From August 1,1920 to 191

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	1920						
1015	Aug 3	O	19 57 15	3		7770	69°.93 arc.
		P_N	20 08 24.5	3			E gives P and S less
		S_N	20 17 32.5				distinct. M phases dis-
		eL_N	20 31 32.5	58			torted by winding drums.
		M_E	20 36.	20			
		C	20 40 ca.				
		F_E	21 44 ca.				
1016	Aug 13	e_N	2 13 04	3			Possibly only a group
		F	2 14 37				of microseisms. Not re-
		e_N	2 21 24	3			cognizable as possibly
		F	2 23 56				seismic on E record.
							Weak micro. were running
							before and after these
							phases.
1017	Aug 20	O?	16 14 59			9315?	Distance from L-S; L
		e_E	16 27 07				difficult to fix.
		S_E	16 37 53				Record indistinct on
		L??	16 51 47	20			N component.
		L_E	16 55 49	25			
		L	17 05 20	18			
		L	17 17.0	16			
		L	18 04 31	16			
		F	18 41 ca				
1018	Aug 21	L_E?	21 32 20	15			Not legible on N.
		L	21 34 36	15			Periods decrease rap-
		F	21 38 37				idly to 8 secs.
1019	Aug 26	O?	22 58 55			8050?	Deduced terms from E.
		iP_E?	23 10 19	2			L-O/8050 kms. gives
		S_N	23 18 59	6			V_L=231.6 kms. per sec.
		S_E	23 19 41	6			S_N doubtfully fixed.
		e_N	23 30 54	7			iP_N 23-10-18.
		eL_N	23 33 10	26			Great irregularity in
		eL_E	23 33 17	25			period, after initial
		L_E	23 36.5	20			L.
		L_N	23 39.0	20			
		L_N	23 43.0	15			
	Aug 27	F_E	0 36 ca.				

Mimeographed and Issued Nov.8,1920

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	1920						
1026	Sep 21	O	(2 38 54			0	from Riverview NSW Δ2700; φ17°S; λ169°W.
		e?	3 52 17	12			Faintly & poorly registered on EW only.
		L	3 55 36	20			
		to	3 56 25				
1027	Sep 21	O	(17 42 46)			0	from Tokyo Δ1220; cf. DeBilt Δ8750; O: 17 42 23.
		e	-- -- --				
		eL?E	18 27 17	24			Not recorded NS.
		L	18 34 08	20			
		L	18 37 50	15			
		F	18 50 ca.				
1028	Sep 24	O	21 54 08			3950	35½° of arc.
		P_{NE}	22 02 30	3			
		i_E	22 03 35	3			
		i_N	22 03 45	4			
		S_E	22 08 04	7			
		S_N	22 08 10	7			
		eL_E	22 10 45	26			
		eL_N	22 10 50	8&10			M 0; 5mm trace
		F	23 03 ca				
1029	Sep 27	O	5 postea				Phases indistinct.
		e_N?	5 37 15				
		e_N	5 38 41	6			
		e_E	5 44 04	4			
		e_E	5 44 39	2			
		e_N	5 44 36				
		L_E	5 45 02	8			
		e_N	5 45 07	6			
		L_E	5 46 01	11			ME 5 46 01; A 3½mm. trace.
		L_N	5 47 29	19			
		F_E	6 30 ca.				

Mimeographed and Issued February 8, 1921.

J. B. Woodworth.

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$\phi = 42°\ 22'\ 36''$ N. $\lambda = 71°\ 06'\ 59''$ W. Gr. $h = 5.367$ M. FOUNDATION: Glacial sand over clay.

TIME: Mean Greenwich, midnight to midnight.

INSTRUMENTS: Two Bosch-Omori 100 kg. horizontal pendulums (mechanical registration).

No.	Date	Phase	Time	Periods	Amplitudes	Δ	REMARKS
	1920		h. m. s.	s.	μ.	Kms.	
1024	Sept 17	0	23 50 59			2800	25.2° of arc. Cf. Δ3600; 0:23-51-19.
		e?	-- -- --				
	18	S_E	0 01 05	10			DeBilt eL 0-10-0
		eL_E	0 03 16	24			North Atlantic Region? P in microseisms.
		L	0 03 51	20			
		C	0 10.0	16			Cf. La Paz P 0-58-48 Δ330.
		C	0 15 39	16			
		F	0 24 ca				
1025	Sep 20	0	(14 38 36)			(13,780)	0 from the mean of Tokyo Δ7690; 0:14-38-14.3. Osaka Δ7100; 0:14-28-52.
		P_{R1E}	14 59 14				
		P_{R1N}	14 59 46				
		i_E	15 00 56	14			
		P_{R2E}	15 05 08	11			Honolulu Δ6340; 0:14-38-33.
		iS_E	15 07 56				Riverview Δ2320; 0:14-28-46.
		i_E	15 11 30	12			Harvard distance from eL-0=55.1 mins. at V_L 228 kms. =12,563 kms. Riverview (*) φ18½°S., 167°W., gives distance on 8-in. globe=124°= 13,780 kms. P_{R2} not found. iS-0 as given=29m 20s. Cf. Brit. Assoc. Table for 124°=29m 19s. N undamped. E damped by magnet: 1½/1 only.
		i_N	15 11 43	6			
		S_{R1E}	15 15 57	20			
		S_{R1N}	15 16 28	18			
		e_E	15 19 02	26			
		S_{R2E}	15 21 42	18			
		eL_N	15 33 42	40			
		eL_E	15 35 47	40			
		M_E	15 43.0	24			
		eM_N	15 44 44	26			
		M_N	15 46 05	20	28.3		
		C_N	15 46 59	16			
		eM_N	15 48 42	20			
		M_N	15 49 26	19	51mm		trace
		M_E	15 49.0	19	5.9mm		trace The MM on N form a long spindle-shaped group having their middle M at this epoch.
		M_N	15 50 08		46½mm		trace
		M_N	15 50 44		62mm		trace Stylus off drum to an M_N? 15-58-21
		C_N	15 54.0				
		eM_N	15 58 52	18	3mm		trace 3 waves.
		eM_N	16 04 42	18	2.1mm		trace 3 waves.
		eM_N	16 11 04	18			4 waves.
		?L_{R1E}	16 44 ca	24			
		F	17 37				

Point of reflection for P_{R1} round φ21°N; λ142°W. on Pacific east of Hawaiian Id. Effect weak.

Point of reflection P_{R2}; A 4593kms, from epicentre, in about φ10°N; λ160°W.; B about 9187 kms. outward in about 33°N, 127°W; both on Pacific floor; no recognizable impulse N or S.

Points of reflection P_{R3}; A at 3445 kms. outward round φ3°N. λ167W; B round φ23°N; λ145°W. both on Pacific floor; C round φ40°N, λ113°W. or under the Basin Range of western Utah; impulse strong. The i was registered EW but not NS. i 15h 11m 30s is not explained, arriving 33 mins. after 0 adopted.

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No. From Sept. 1, 1920 to Sept. 9, 1920 192

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	1920		h. m. s.	s.	μ.	Kms.	
1020	Sept 4	O	14 08.5			10,600	95.4° of arc.
		PE	14 22 10				Steady-mass jerked W.
		S	14 30 29	7			
		e	14 34 56	6			Microseisms only on N.
		eLE	14 55 10	46			ME very low; weak.
		L	15 06 20	20			
		LE	15 33 26	18			LR1 not found.
		Ln	16 34 07	8&10			Probably of different origin and less distant.
		to	16 35 07				
		F?	16 45 ca.				
							Cf. La Paz Δ 7260; O: 14-08-59.
							Cf. Uccle S? 14-33.9; eL 14-58. Southern hemisphere; not reported by Riverview, NSW. With Ln 15-35-26 cf. La Paz Δ2310; O: 16h 11m 56s.
1021	Sept 7	O	5 55 44			6215	53.9° of arc. Not clearly shown on EW. Off set eastward.
		eE	6 06 22				
		i	6 06 49				
		SE	6 13 26	8			
		eLE	6 23 07	28			L not distinct.
		L	6 29.0	20			Earthquake in northern Italy.
		F?	7 09 ca.				
1022	Sept 8	O	1 46 17			10,540	94.86° of arc. Δ&O from eL-S.
		eE	2 04 52				eL difficult to determine. Cf. Tuscon Δ9130; O: 1-46-01; La Paz Δ9025; O: 1-46-40; Honolulu Δ4450; O: 1-46-40. Osaka Δ8750 O: 1-45-18. Roughly around φ20°S. λ153°W. by above data.
		iE	2 06 32				
		SE	2 11 07	6			
			2 12 29	6			
			2 15 16	10			
			2 16 42	12			
			2 22 42	24			
		eLE	2 32 32	30			
		L	2 51 04	23			
		F	3 37 ca				
1023	Sept 9	(O)	(18 55 36)			13,750	O taken from Riverview Δ 3150 Harvard Δ from eL-(O Riverview), at v_L 228 kms. per minute. A increases. Microseisms only on N.
		eE	19 15 47				
		e	19 27 27				
		e	19 34 18	24			
		eLE	19 55 49	30			
		L	19 58 01	26			
		L	20 01.4	20			
		L	20 13.0	16			
		LR1	20 59.3	20			
		F	21 16 ca.				

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