

SEISMOLOGICAL REPORTS.

SEISMOLOGICAL REPORTS FOR JANUARY, 1920.

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Weather Bureau, Washington, D. C., March 3, 1920.

SEISMOLOGICAL ABBREVIATIONS USED IN THE INSTRUMENTAL REPORTS.

CHARACTER OF THE EARTHQUAKE.

I=noticeable.
 II=conspicuous.
 III=strong.
 d=(*terræ motus domesticus*)=local earthquake (sensible or felt).
 v=(*terræ motus vicinus*)=near-by earthquake (within 1,000 km.).
 r=(*terræ motus remotus*)=distant earthquake (1,000 to 5,000 km. distant).
 u=(*terræ motus ultimus*)=very distant earthquake (beyond 5,000 km.).
 Δ =distance to epicenter.

PHASES.

P=(*undæ primæ*)=first preliminary tremors.
 PR_n =P waves reflected n times at the earth's surface.
 S=(*undæ secundæ*)=second preliminary tremors.
 SR_n =S waves reflected n times at the earth's surface.
 PS=transformed waves; longitudinal (P) to transversal (S) or vice versa.

L=(*undæ longæ*)=long waves in the principal portion.
 M=(*undæ maximæ*)=greatest motion in the principal portion.
 C=(*coda*)=trailers.

O=time at epicenter.
 L_{rep1} =Long waves reaching the station from the antiepicenter (40,000 km. - Δ).
 L_{rep2} =long waves again reaching the station from the antiepicenter (40,000 km. + Δ).
 F=(*finis*)=end of perceptable trace.

NATURE OF THE MOTION.

i=(*impetus*)=abrupt beginning.
 e=(*emersio*)=gradual appearance.
 T=period=twice time of oscillation.
 A=amplitude of earth's movement, reckoned from the zero line.
 E, N, or Z attached to a symbol signifies the E-W, the N-S, or the vertical component, respectively, thus:
 P_E is the E-W component of P.
 P_N is the N-S component of P.
 P_Z is the vertical component of P.

μ =micron, $\frac{1}{1,00}$ mm.

INSTRUMENTAL CONSTANTS.

T_0 =period of instrument.
 V =magnification of instrument.
 e =damping ratio.

List of instrumental stations from which reports are received.

Location.	Latitude, N.	Longitude, W.	Eleva- tion, meters.	Description of instruments.	Instrumental constants.						Institution.	In charge.
					E-W.			N-S.				
					V	T ₁	e	V	T ₁	e		
ALABAMA.	° ' "	° ' "										
Mobile.....	30 41 44	88 08 46	80	Wiechert 80-kg., astatic, horizontal pendulum.							Spring Hill College, seismic observatory.	Cyril Ruhman, S. J.
ALASKA.												
Sitka.....	57 03 00	135 30 03	15.2	Two Bosch-Omori 10 and 12 kg.	10	17		10	15		U. S. Coast and Geodetic Survey, Magnetic Observatory.	F. P. Ulrich.
ARIZONA.												
Tucson.....	32 14 48	110 50 06	769.6	.....do.....	10	17		10	18		.....do.....	Wm. H. Cullum.
CALIFORNIA.												
Point Loma.....	32 43 03	117 15 10	91.4	Two-component C. D. West seismoscope.							Theosophical University.	F. J. Dick.
COLORADO.												
Denver.....	39 40 36	104 56 54	1,655	Wiechert 80-kg., astatic, horizontal pendulum.							Sacred Heart College, earthquake station.	A. W. Forstall, S. J.
DISTRICT OF COLUMBIA.												
Washington.....	38 54 25	77 04 24	42.4	Wiechert 200-kg., astatic, horizontal pendulum; 80-kg. vertical.	165	5.4	0	143	5.2	0	Georgetown University.	F. A. Tondori, S. J.
Do.....	38 54 12	77 03 03	21	Marvin, vertical pendulum, undamped, mechanical registration.	110	6.4		110	6.4		U. S. Weather Bureau.	W. J. Humphrey.
HAWAII.												
Honolulu.....	21 19 12	158 03 48	15.2	Milne seismograph of the Seismol. Comm. Brit. Assoc.		18.4	10".40				U. S. Coast and Geodetic Survey, Magnetic Observatory.	Frank Neumann.
ILLINOIS.												
Chicago.....	41 47 00	87 37 00	180.1	Two Milne-Shaw horizontal pendulums, 0.45-kg.	150	12	20:1	150	8	20:1	University of Chicago.	H. J. Cox.
KANSAS.												
Lawrence.....	38 57 30	95 14 58	301.1	Wiechert.....	177	3.4	4:1	205	3.4	4:1	University of Kansas, department physics and astronomy.	F. E. Kester.
MARYLAND.												
Cheltenham.....	38 44 00	76 50 30	71.6	Two Bosch-Omori 10 and 12-kg.	10	14		10	14		U. S. Coast and Geodetic Survey, Magnetic Observatory.	George Hartnell.
MASSACHUSETTS.												
Cambridge.....	42 22 36	71 06 59	5.4	Two Bosch-Omori 100-kg., horizontal pendulum, mechanical registration.	80	23	0	50	25	4:1	Harvard University seismographic station.	J. B. Woodworth.
MISSOURI.												
St. Louis.....	38 38 15	90 13 58	160.4	Wiechert 80-kg., astatic, horizontal pendulum.	80	7	5:1				St. Louis University, geophysical observatory.	J. B. Goesse, S. J.
NEW YORK.												
Buffalo.....	42 53 02	78 52 40	180.5	Wiechert 80-kg., horizontal.	80	7	5:1				Canisius College.	John A. Curtin, S. J.
Ithaca.....	42 28 58	76 29 09	242.6	Two Bosch-Omori 25-kg., horizontal pendulum, mechanical registration.	13	22	4:1	14	25	4:1	Cornell University.	Heinrich Ries.
New York.....	40 51 47	73 53 08	23.9	Wiechert 80-kg.....	72	5.0	0	72	5.0	0	Fordham University.	D. H. Sullivan, S. J.
PANAMA CANAL ZONE.												
Balboa Heights...	8 57 39	79 33 29	27.6	Two Bosch-Omori 100-kg. and 25-kg.	35	20		10	20		Panama Canal, Department Operation and Maintenance.	Governor, Panama Canal.
PORTO RICO.												
Vieques.....	18 09 00	65 27 00	19.8	Two Bosch-Omori.....	10	17		10	19		U. S. Coast and Geodetic Survey, Magnetic Observatory.	W. M. Hill.
VERMONT.												
Northfield.....	44 10 00	72 41 00	256	Two Bosch-Omori mechanical registration.	10	15		10	16		U. S. Weather Bureau.	Wm. A. Shaw.
CANADA.												
Ottawa.....	45 23 38	75 42 57	83	Two Bosch photographic horizontal pendulum, one Spindler & Hoyer 80-kg. vertical seismograph.	120	26					Dominion Observatory, earthquake station.	Otto Klotz.
Toronto.....	43 40 01	79 23 54	113.7	Milne horizontal pendulum, North, in the meridian.		18					Dominion Meteorological Service.	
Victoria.....	48 24 00	123 19 00	67.7	Wiechert, vertical; Milne horizontal pendulum, North, in meridian.		18					.....do.....	

¹ Sensitivity.

For the reports of the stations at the University of California, Berkeley, Calif., and at the Lick Observatory, Mount Hamilton, Calif., see *Bulletin of the Seismographic Stations, University of California*; for the report of the station at the University of Santa Clara, Santa Clara, Calif., see *Record of the Seismographic Station, University of Santa Clara*.

TABLE I.—Noninstrumental earthquake reports, January, 1920.

Day.	Approximate time, Greenwich civil.	Station.	Approximate latitude.	Approximate longitude.	Intensity, Rossi-Forel.	Number of shocks.	Duration.	Sounds.	Remarks.	Observer.
CALIFORNIA.										
1920.	<i>H. m.</i>		<i>° ' "</i>	<i>° ' "</i>			<i>Sec.</i>			
Jan. 1.	2 20	Corona	33 52	117 35	4	1	Short.	None	Doors rattled.	T. C. Sias.
	2 25	Escondido	33 06	117 05	5	1	5	do.	Felt by many	H. L. Harlow.
	2 30	Warner Springs	33 15	116 45	5	1	60	Faint rumbling	Cracked adobe walls.	J. A. Ream.
	2 34	Nellie	33 22	116 52	5	1	5	do.	Rapid trembling shock.	J. P. Rolaris.
		Calexico	32 41	115 30	3	1	5	do.		H. M. Rouse.
		Elsinore	33 37	117 15	5	1		None	Felt by many	W. L. Wilhite.
		Hemet	33 45	116 58	5	2	4	Rumbling	do.	C. S. McManigal.
	2 35	San Diego	32 40	117 10	4	1	1	None	Chandeliers moved.	U. S. Weather Bureau.
	2 37	El Cajon	32 48	116 58	4	1	1	Rumbling	Felt by several.	E. P. Kessler.
	2 40	Julian	33 05	116 37	5	2	6	Loud rumbling	Felt by many	J. H. L. Vogt.
		Mesa Grande	33 11	116 42	5	2	13	Muffled	Jarring motion	E. H. Davis.
		Mount Wilson	34 13	118 16	2	1	12	Faint	Star images in 60-inch telescope vibrated rapidly.	Mount Wilson Observatory.
	2 46	Aguanga	33 26	116 51	5	1	2	Loud	Abrupt bumping motion.	A. J. Berg.
	23 30	Santa Barbara	34 23	119 40	3	1	2	None	Felt by several.	A. W. Mütter.
	23 33	do.			2	1	2	do.	do.	Do.
	23 35	do.			2	1	2	do.	Felt by one	Do.
	23 38	do.			2	1	2	do.	do.	Do.
	1 09	do.			3	1	2	do.	do.	Do.
	1 03	do.			3	1	2	do.	do.	Do.
	1 07	do.			3	1	2	do.	do.	Do.
WASHINGTON.										
	7 09	Clallam Bay	48 15	124 15	5	3	10-15	Rumbling	Most severe ever noticed.	M. Rasmussen.
	7 10	Blaine	49 00	122 45	4	1	8	do.	Felt by many	J. Orilly.
	7 12	Marietta	48 47	122 35	4	1	5	do.	do.	S. B. Mayhew.
	7 14	Anacortes	48 50	122 40	5	2	5	Loud rumbling	Long duration	D. Almond.
	7 15	Tatoosh	48 23	124 45	2	3	Few.	None	Felt by one	Mrs. A. K. Willis.
	7 20	Forks	47 56	124 20	5	2	60	Faint rumbling	Many awakened	Mrs. Ruth Johnson.

TABLE 2.—Instrumental seismological reports, January, 1920. (Time used: Mean Greenwich, midnight to midnight. Nomenclature: International. [For significance of symbols and descriptions of instruments and stations, see this REVIEW, p. 62.]

Date.	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.
					A _m	A _N		

ALABAMA. Spring Hill College, Mobile.

1920.		<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Jan. 4	eP	4 26 48				1,410?	Southern Mexico; record peculiar—periods all short; P and S have same period; interval S-P too short; L absent. E damped, N undamped, yet records identical. Seems to be a superimposition of P waves of different shocks.
	S or P	4 29 14	3.5				
	M	4 29 13	3.5	*5,300	*5,300		
	F	4 43 00					

* Trace amplitude.

ARIZONA. U. S. C. & G. S. Magnetic Observatory, Tucson.

1920.		<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Jan. 1	eP _m	2 35 41					Time marks missing for 12 minutes before L on N; times of P and S interpolated over that interval.
	P _N	2 36 12					
	L _m	2 36 22					
	M _m	2 37 11		50			
	M _N	2 36 46			20		
	F _m	2 41 00					
	F _N	2 40 00					
4	P _m	4 25 33	4				
	P _N	4 25 44					
	S _m	4 29 03					
	S _N	4 29 14					
	L _m	4 31 00	16				
	L _N	4 31 00					
	M _m	4 33 15		720	400		
	M _N	4 33 05	9				
	C _m	4 39 00	9				
	C _N	4 37 00	8				
	F _m	5 00 00	6				
	F _N	4 43 00	6				
12	e _N	23 04 38					Irregular record; possibly not seismic. Time marks missing.
	M _N	23 10 35		50			
	F _N	23 18 00					
25	e _N	0 13 35					Do.
	F _N	0 28 00					
25	e _N	20 25 01					Do.
	M _N	20 37 55		20			
	F _N	20 42 00					

TABLE 2.—Instrumental seismological reports, January, 1920—Contd. CALIFORNIA. Theosophical University, Point Loma.

1920.		<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Jan. 1		2 42 00					Intensity, 2-3; Rossi-Forel. Tremors during the hours preceding 15 h.
14				100	100		

COLORADO. Sacred Heart College, Denver.

1920.		<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>		
Jan. 4	P	4 26 00					Prather indistinct.	
	S	4 30 00						
	L _N	4 35 00	8		*2,000			
	L _m	4 35 00	8		*2,500			
	M _N	4 35 00	8		*3,000			
	M _m	4 36 30	6		*6,000			
	C _m	4 40 00						
	C _N	4 38 00						
	F _N	4 46 00						
	F _m	4 44 00						
15	L	13 30 00						Distinct but too small to be analyzed.
	F	13 40 00						
17							Activity visible at intervals during day.	
20	L _N	13 46 00						
22	F _N	13 59 00					Distinct but very small. Wavelets at intervals during day. Thickening of penmarks and wavelets during day.	
25								

* Trace amplitude.

WASHINGTON, D. C. Georgetown University.

1920.		<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Jan. 4	eP _m	4 27 53					No distinct M.
	eP _N	4 27 53					
	S _m	4 32 52					
	S _N	4 32 46					
	eL	4 35 18					
	F	5 20 00					
30	eP _m	18 33 18					Heavy micros.
	eP _N	18 33 18					
	S _m	18 39 11					No distinct M.
	eL _m	18 43 18	10				
	L _m	18 44 48	16				
	L _N	18 46 22	18				
	F	19 ca.					

TABLE 2.—Instrumental seismological reports, January, 1920—Con.

WASHINGTON, D. C. U. S. Weather Bureau.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Jan. 4	P	4 28 00					Time correction uncertain.
	S	4 32 40					
	P?	4 34 00					
	S?	4 39 05					
	eL	4 40 00					
F	5 15 ca.						L nowhere well defined. Lost in micros. Whole record jumbled; apparently two quakes superimposed.
26	eL	21 37 30					Time correction not certain.
	F	21 45 ca.					
26	P	23 06 40					Time correction not certain.
	S?	23 10 35					
F	23 15 ca.						
30	eP	18 33 45					
	P	18 39 15					
	S	18 41 50					
	L	18 44 45					
	F	19 10 ca.					

HAWAII. U. S. C. & G. S. Magnetic Observatory, Honolulu.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Jan. 1	P	12 34 30					
	eL	12 34 30					
	M	12 46 42	15	*200			
	C	12 52 42					
	F	13 36 42					
1	eP	15 47 00					
	L	15 01 30					
	M	16 09 30	18	*100			
	C	16 15 00					
	F	16 22 00					
2	e	13 33 24					
	M	13 37 12	15	*100			
	C	13 40 00					
	F	13 45 00					
4	S	4 39 36	15				First recorded motion!
	Sa	4 45 48	20				
	L	4 50 00					
	M	4 54 30	18	*1200			
	F	4 57 00					
7	eP	9 33 00					Beginning and end obscured by continuous slight tremors, probably microseismic.
	L	9 43 00					
	M	9 47 00	15	*300			
	C	9 50 00					
12	P	13 57 42					Air tremors present throughout.
	S	14 02 24	18				
	L	14 06 36					
	M	14 17 42	16	*2100			
	F	14 26 00					
13	eP	23 10 12	16				
	L	23 23 36					
	M	23 34 36	19	*1400			
	C	23 43 00	17				
	F	24 19 00	16				
14	eP	14 49 00	15				Phases ill-defined.
	S	14 56 24	20				
	L	15 05 54					
	M	15 10 06	17	*300			
	F	15 02 00	20				
21	P	6 18 30	19				
	L	6 21 00					
	M	6 21 42	15	*200			
	C	6 23 00	20				
	F	6 44 00	18				
22	IP	21 35 24	20				
	S	21 40 24	18				
	eL	21 43 42					
	M	21 46 30	20	*400			
	F	22 40 00	19				
26	eP	11 35 48	20				
	eL	11 52 00	20				
	M	11 55 06	17	*200			
	C	11 57 00	18				
	F	12 13 00	20				
30	eP	19 47 12	16				
	S	19 50 00	15				
	eL	19 52 42					
	M	19 57 30	19	*800			
	F	20 47 00	18				

* Trace amplitude.

TABLE 2.—Instrumental seismological reports, January, 1920—Con.

ILLINOIS. U. S. Weather Bureau, Chicago.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Jan. 1	L	12 59 ca.	22				
	L	13 08 00	16				
	F	13 40 00					
1	L	16 29 00	20				Lost in micros. Very heavy micros: may not be seismic.
	F	16 40 ca.					
4	P	4 27 26				2,670	From beginning of S. record very confused.
	L	4 31 44					
	F	5 50 ca.					
13	L	23 56 00	24				Lost in very heavy micros.
	L	0 05 00	18				
F	0 30 ca.						
14	eL	15 37 30					Lost in heavy micros.
	L	15 37 35	18				
	F	16 10 00					
22	eL	22 11 00					Lost in micros.
	L	22 15 00	22				
	L	22 18 00	18				
F	23 ca.						
26	e	21 31 00					Phases indeterminate. Do.
	F	22 10 ca.					
26	Pz	23 12 00					
	F	23 30 ca.					
30	P	18 34 50					Lost in micros.
	PR	18 39 50					
	S	18 42 35					
	L	18 47 00					
	F	18 57 00	15				

KANSAS. University of Kansas, Lawrence.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Jan. 4	eP	4 26 48		*500		2,020	
	eS	4 30 13					
	L	4 33 12					
	M	4 35 00					
	F	4 59 15					

* Trace amplitude.

MARYLAND. U. S. C. & G. S. Magnetic Observatory, Cheltenham.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Jan. 4	P	4 27 37	4				L waves not definitely shown on E.
	P	4 27 44	4				
	S	4 32 36	3-8				
	S?	4 32 23	2-8				
	eL	4 33 47					
	M	4 32 50		10			
	M	4 42 30	12		40		
	F	5 01 09					
	F	5 05 50					

MISSOURI. St. Louis University, St. Louis.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Jan. 4	P	4 26.85				2,330	L not distinguishable.
	S	4 30.65					
	M	4 37.50					
	F	4 58 00					

PORTO RICO. U. S. C. & G. S. Magnetic Observatory, Vieques.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Jan. 4	eP	4 28 33					No definite phases.
	eP	4 28 45					
	eL	4 36 50		10			
	F	4 50 00					
15	P	16 26 30					Small waves of period from 1 1/2 to 3 seconds overlie the longer waves for most of the record.
	P	16 26 30					
	L	16 26 51	2				
	L	16 26 56					
	M	16 27 33	9	80			
	M	16 27 21			100		
	C	16 28 00					
	C	16 30 00	5				
	F	16 38 00	5				
26	P	21 23 51	1				Felt strongly in Porto Rico. On N there is a faint disturbance beginning 21:23:27, which may be P of an earlier shock.
	L	21 24 22					
	M	21 24 54	9	60			
	M	21 24 47	13		140		
	C	21 27 00	6				
	C	21 26 00	6				
	F	21 43 00	6				

* Trace amplitude.

TABLE 2.—Instrumental seismological reports, January, 1920—Con.
PORTO RICO.—U. S. C. & G. S. Magnetic Observatory, Vieques—Con.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Jan. 26	P.	23 02 37	2				Felt strongly in Porto Rico.
	L.	23 03 01					
	M.	23 03 29	3	90			
	M _s .	23 03 24	19		266		
	F.	23 12 00	4				
30	P _m .	18 31 33	7				P distinct on both components; other phases indefinite.
	P _n .	18 31 32	5				
	eS _m .	18 35 24					
	M _m .	18 39 30					
	M _n .	18 39 45		20			
	F _n .	18 51 00					

VERMONT. U. S. Weather Bureau, Northfield.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Jan. 4	eL.	4 45 00					Amplitude very small.
	F.	5 05 00					

CANADA. Dominion Observatory, Ottawa.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Jan. 4	O.	4 22 03				3,440	S waves seem to have short period P waves of a second shock superimposed upon them.
	eP.	4 28 39					
	eS.	4 33 08					
	eL.	4 37 42					
	L.	4 45 00	15				
	L.	4 55 00	8				
	F.	5 15 00					
14		0 00 00					Traces of disturbances; phases lost in very heavy micros; may not have been seismic.
		14 49 00					
30	O.	18 28 07				3,820	
	eP.	18 35 12					
	eS.	18 38 08					
	S.	18 40 49					
	L.	18 44 20	24				
	L.	18 49 00					
	F.	19 10 00					
30	L _m .	20 30 to 20 40 00	29				

CANADA. Dominion Meteorological Service, Toronto.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Jan. 1							Small micros masked sheet at 2h. 42m. when other station records quake.
1	L.	13 01 48					Micros masked initial phases.
	eL.	13 06 24					
	M.	13 10 30		*300			
	L.	13 13 30					
	F.	13 13 30					
1	eL.	16 37 18					Gradual thickening, well marked. Lost in micros.
	M.	16 40 36		*200			
	F.	16 40 36					
2							Small micros masked sheet at 13h. 20m. when other station records quake.
4	P.	4 27 36				3,600	Disastrous Mexican quake.
	P.	4 28 48					
	S.	4 30 00					
	L.	4 41 54					
	L.	4 43 24					
	M.	4 44 48		*1,000			
	F.	4 51 18					
7							Irregular instrumental clockwork prevented record of quake recorded at other station at 9h. 44m.
12	L.	14 16 42					May not be seismic.
	L.	14 22 42		*100			
12	L.	14 36 04					
	eL.	14 44 12					
	M.	14 46 30		*200			

* Trace amplitude.

TABLE 2.—Instrumental seismological reports, January, 1920—Con.
CANADA.—Dominion Meteorological Service, Toronto—Continued.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Jan. 13	P?	23 27 30					
	L.	23 34 00					
14	L.	0 00 06					
	L.	0 04 18					
	eL.	0 06 12					
	M.	0 13 30		*300			
	eL.	0 20 36					
	F?	0 54 30					
14	L.	1 02 06					May not be seismic.
	eL.	1 18 36					
	M.	1 19 48		*200			
14	P.	15 41 48					
	L.	15 43 12					
14	eL.	15 50 30					*800
	M.	15 54 42					
	F.	16 51 36					
14	L.	17 33 18					*100
15	L.	12 37 36					Last two phases may not be seismic.
	L.	12 47 54					
30	M.	12 49 42					*200
30	L.	17 09 24					*200
	M.	17 01 48					
	P.	17 17 36					
22	eL.	22 25 06					*300
	M.	22 30 12					
	F.	22 45 00					
22	eL.	23 58 18					*300
	M.	23 59 18					
	F.	9 06 24					
23	L.	7 17 54					*100
	L.	7 37 54					
24	L.	7 17 54					*100
	L.	7 37 54					
30	P?	18 37 00					Small micros render P. entry doubtful.
30	eS.	18 43 18					*1,300
	L.	18 47 30					
	M.	18 49 54					
	F.	18 49 54					
30	L.	20 29 18					*300
	L.	20 32 12					
	F.	20 32 12					

* Trace amplitude.

CANADA. Dominion Meteorological Service, Victoria.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Jan. 1	P.	2 42 06					*100
	M.	2 43 02					
	F.	2 49 58					
1	L.	12 49 04					*100
	M.	12 59 59					
	F.	13 21 29					
2	P.	13 20 55				665	May be off west coast.
	L.	13 22 04					
	M.	13 22 33					
2	L.	13 30 25					*500
	M.	13 22 33					
	F.	13 30 25					
4	P.	13 20 10				530	*500
	S. & L.	13 21 20		7			
	M.	13 25 00		8			
4	P.	4 30 29				2,300?	Destructive Mexican quake.
	S.	4 34 25					
	L.	4 40 49					
	L.	4 45 38					
	M.	4 47 42		*1,500			
	F.	5 33 55					
7	P.	4 29 25				3,170	*200
	S.	4 34 29					
	L.	4 43 39		12			
	M.	4 47 49		10	4		
	F.	4 47 49					
7	M.	9 44 56					*200
	F.	9 50 53					
12	P.	14 00 50				3,620	Mexican?
	S.	14 05 15					
	L.	14 12 38					
	M.	14 13 32					
13	L.	14 53 56					*400
	P.	23 23 32					
	L.	23 40 16					
	F.	1 45 10					

* Trace amplitude.

TABLE 2.—*Instrumental seismological report, January, 1920—Con.*
CANADA. Dominion Meteorological Service. Victoria—Continued.

Date	Time	Amplitude	Direction	Notes
1920. Jan. 14	P. 15 02 25			Mexico?
	S. 15 08 19			
	L. 15 19 08			
	M. 15 27 29	*400		
15	F. 17 03 53			
	L. 12 28 04			
	M. 12 32 29	*100		
21	F. 12 39 52			
	M. 6 30 47		*50	
22	F. 6 42 41			
	P. 21 42 00			Probably Mexico?
S. 21 48 06				
L. 21 55 46				
M. 22 08 22	*500			
F. 22 43 29				
24	P. 7 09 16			Probably under Strait of Georgia and northeast of Victoria.
	M. 7 09 20	*2,000		
	F. 7 24 01			
30	P. 7 09 16	1		35
	L. 7 09 18	2		
	M. 7 09 20	2	214	
	F. 7 12 30			
30	P. 18 44 23			3,620?
	S. 18 49 48			
	L. 18 54 42			
	M. 19 12 30	*500		
30	F. 19 24 00			
	M. 20 13 01		*400	
	F. 20 24 25			

* Trace amplitude.

The following stations recorded no earthquakes during January, 1920:

ALASKA. U. S. C. & G. S. Magnetic Observatory, Sitka.

Reports for January, 1920, have not been received from the following stations:

- Massachusetts. Harvard University, Cambridge.
- New York. Canisius College, Buffalo; Cornell University, Ithaca; Fordham University, New York.
- Canal Zone. Department of Operation and Maintenance, Panama Canal.

SEISMOLOGICAL DISPATCHES.¹

Mexico City, Mexico, January 3.—One of the earth shocks that are not uncommon here was felt at 10 o'clock to-night. The shock was more severe than that of December 17, but did not cause as much apprehension as the December seismic disturbance, which came on the date of a groundless prediction of a cataclysm from astronomical causes. Incomplete press reports indicate that the State of Vera Cruz suffered more than any other section, although seismic disturbances were felt throughout the entire Republic. Advices from Cordoba say that 30 dead have already been accounted for in the village of San Juan Coscomatepec, where many houses were destroyed. There are unconfirmed reports of a similar catastrophe in the village of Huatusco. At Jalapa, farther north, 50 victims of the earthquake have been counted, including numerous dead. Lack of communication with the other small towns and villages in the theater of disturbance makes even approximate esti-

mates of the casualties impossible. The earthquake caused great alarm in the large cities. Marine disturbances have occurred off Vera Cruz city, and there were some casualties there, although the number is not known, with considerable destruction of property. Late reports received here say that the death list in San Juan Coscomatepec was augmented as a result of the collapse of the church tower, which crashed in upon the crowds gathered inside the edifice to pray, following the first shock. Vera Cruz city is without water, while the lighting systems of Orizaba and Jalapa are out of commission. The villages of Teocelo and Couztlan, in the State of Vera Cruz, were virtually destroyed by the earthquake last night, and heavy casualties have resulted, according to late press reports received here.—(A)

Mexico City, Mexico, January 5.—Reports received up to 11 o'clock last night indicated the center of the seismic convulsion was in the neighborhood of Mount Orizaba, a volcano situated about 70 miles west of Vera Cruz on the line between the States of Vera Cruz and Puebla. It was in this neighborhood that the most serious damage was done. Teocelo, a village 35 miles northeast of the volcano, has been virtually destroyed, and a similar fate befell Couztlan, a small hamlet in that neighborhood. Wires have been torn down by the violence of the tremor, and only fragmentary reports have reached this city, but it is stated that there were many casualties in both towns. Many houses and churches in Jalapa, a city 50 miles northwest of Vera Cruz, were damaged, while reports from Orizaba, a city 10 miles south of the volcano, state that several business blocks and churches near the center of the town were cracked. In the suburbs of Orizaba the shock was very severe, many persons being reported killed beneath their wrecked houses. Fifteen shocks were experienced at Cordoba, a city 10 miles east of Orizaba, where 11 were distinctly felt. First reports received here stated that the tremor centered at Acambaro, a town near Toluca, about 25 miles southwest of Mexico City, but more recent advices state the shocks were not severe there.—(A)

Mexico City, Mexico, January 8.—A violent volcanic eruption has been caused by the recent earthquake near Cordoba, where Cerro de San Miguel, a small and apparently extinct volcano, has been burst in twain. The new crater is throwing out smoke, ashes, and flame, while lava is flooding the near-by territory in a stream more than 200 yards wide, resulting in not less than 200 deaths.—(A)

Mexico City, Mexico, January 13.—San Joaquin, a village of 3,000 inhabitants in the Jalapa district, State of Vera Cruz, was destroyed this morning by an earthquake, according to advices given out by the department of agriculture, which gave no details as to casualties. Shocks were detected at the astronomical observatory near this city at 5:18 o'clock this morning.—(A)

Mexico City, Mexico, January 22.—Strong earthquake shocks were felt in the city of Vera Cruz from 3 to 5 o'clock this morning. There were no casualties, although some residences were damaged. Reports from Vera Cruz state the tremors demolished at Couztlan all structures which were not destroyed in the earthquake of January 6, while shocks lasting 20 minutes caused further damage at Salmoral and San Francisco de las Penas.—(A)

¹ Reported by the organization indicated and collected by the seismological station at Georgetown University, Washington, D. C. [(A) Indicates Associated Press.]

Paris, January 23.—Earth shocks along the coast of the Sea of Marmora are reported in a Havas dispatch from Constantinople under date of January 19.—(A)

Seattle, Wash., January 24.—Three distinct earthquake shocks were felt here at 11:08 o'clock last night. The tremors extended through Washington and British Columbia. At Bellingham, Wash., windows were broken and brick walls cracked. At Vancouver, B. C., people fled from buildings in alarm, but the only damage reported was to telephone lines. Victoria, B. C., and numerous towns in northwest Washington felt the quake. No damage was reported in Seattle.

Madrid, Spain, January 25.—The observatory at Toledo has issued a communique stating that at 5 o'clock Saturday afternoon (Jan. 24) the instruments at the observatory recorded a seismic disturbance at an estimated distance of approximately 275 miles.—(A)

Buenos Aires, Argentina, February 2.—Dispatches from the State of Minas Geraes, Brazil, report that an earthquake Sunday shook down a number of houses in the country districts, creating great panic among the inhabitants. The dispatches say that in intensity the earth shock is without precedent in that region.—(A)

LATE REPORTS (INSTRUMENTAL).

KANSAS. *University of Kansas, Lawrence.*

1919.		H. m. s.	Sec.	μ	μ	Km.	
June 20	eP _N ...	23 19 38			*500		
	eS _N ? ..	23 24 23			*2,000		
	eL _N ...	23 23 00			*2,000		
	P _T ...	23 59					
July 6	eP _N ...	7 09 24			*1,000		S and L not distinct.
	eP _N ...	7 09 25		*300			
	S _N ...	7 11 41?					
	eL _N ? ..	7 13 27			*1,500		
	L _N ? ..	7 13 30			*2,000		
	F _N ...	7 30 17					
	F _N ? ..	7 20 40					
9	eP _N ...	19 24 41				25 30	
	eP _N ...	19 24 42					
	eS _N ...	19 28 48					
	eS _N ...	19 28 54					
	L _N ...	19 31 57					
	L _N ...	19 31 59					
	M _N ...	19 32 15			*3,600		
	M _N ...	19 32 15			*1,900		
22	F _N ...	19 56					
	F _N ...	20 00					
	eP _N ...	22 03 09					Extremely minute record; phases obscure.
	eP _N ...	22 03 11			*500		
	L _N ? ..	22 07 42?					
L _N ? ..	22 07 41?			*400			
F _N ...	22 17?						
Sept. 15	F _N ...	22 18 30					
	eP _N ...	17 34 31					N-S component shows only L.
	eL _N ...	17 40 49					
	L _N ? ..	17 41 03			*1,500		
	M _N ...	17 41 28			*4,000		
	F _N ...	17 47?					
F _N ...	17 49						
Dec. 18	eP _N ...	1 25 02					No record by N-S component.
	eL _N ...	1 31 52			*900		
	P _T ...	1 38 10					

* Trace amplitude.

SEISMOLOGICAL REPORTS.

W. J. HUMPHREYS, Professor in Charge.

[Dated: Weather Bureau, Washington, D. C., Apr. 3, 1920.]

TABLE I.—Noninstrumental earthquake reports, February, 1920.

Day.	Approximate time, Greenwich civil.	Station.	Approximate latitude.	Approximate longitude.	Intensity Rosol-Forel.	Number of shocks.	Duration.	Sounds.	Remarks.	Observer.
CALIFORNIA.										
1920. Feb. 9	H. m.	Julian.....	33 05	116 37	5	1	Sec. 5 8 13	Loud rumbling....	Felt by many.....	J. H. L. Vogt.
	11 30	do.....	116 45	33 12	3	1		Rumbling.....	Felt by several.....	Do.
	11 30	Mesa Grande.....			3	1	Faint.....	do.....	E. H. Davis.	
MISSOURI.										
28	2 55	Springfield.....	37 10	93 10	5	1	10	Loud rumbling....	Felt with much severity in Rolla and Lebanon, and at many other places.	W. B. Hare, U. S. Weather Bureau.
WYOMING.										
2	0 45	Clark.....	44 46	109 10	3	1	15	Rumbling.....	Felt by several.....	A. C. Snow.

TABLE 2.—Instrumental Reports, February, 1920.

[For significance of symbols and abbreviations, and for a description of stations and instruments, see the Review for January, 1920, pp. 62-63.]

Date.	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.
					A _m	A _x		
ALABAMA. Spring Hill College, Mobile.								
1920. Feb. 10			H. m. s.	Sec.	μ	μ	Km.	
	O		22 07 24				2,570	
	eP		22 12 38					
	IS		22 16 49	7	*1,000	*3,500		
	L		22 18 57	6.5	*2,000	*3,000		
	M		22 20 38	6.5	*3,000	*1,000		
	F		23 32 00					

* Trace amplitude.

ALASKA. U. S. C. & G. S. Magnetic Observatory, Sitka.

1920. Feb. 2	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.
					A _m	A _x		
	eP		11 44 66					Probably the quake which caused destructive tidal wave on island of Makatea. L is the only well-defined phase.
	eP		11 40 26					
	L		12 03 10	20				
	eL		12 04 00					
	M		12 05 10	19	50			
	M		12 07 26	18		10		
	F		13 59 ..					
	F		12 50 ..					
10	eP		22 22 45					
	eP		22 40 25					
	L		22 40 26					
	M		22 49 28	13	20			
	M		22 44 06			20		
	F		23 32 ..					
	F		23 17 ..					

ARIZONA. U. S. C. & G. S. Magnetic Observatory, Tucson.

1920. Feb. 10	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.
					A _m	A _x		
	eL		9 55 35					Nothing on N.
	F		10 12 ..					
10	F		22 14 50					Nothing on N.
	F		22 16 30					
	F		22 21 00					
	L		22 28 50	45				
	M		22 37 32	14	20			
	C		22 46 ..	13				
	F		23 24 ..					

TABLE 2.—Instrumental Reports, February, 1920—Continued.

COLORADO. Sacred Heart College, Denver.

1920. Feb. 2	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.
					A _m	A _x		
	L		12 14 ..					Intermittent sinusoidal. No preliminaries visible. Much stronger on E.-W. Small amplitude, long period.
	L		12 12 ..					
	F		12 19 ..					
2	L		12 22 ..	15-20	*250			Recurring of sinusoidal.
	F		12 33 ..					
2	L		13 32 ..					Hardly perceptible on N.-S.
	M		13 41 ..	20	*500			
	F		13 44 ..					
5	L		2 30 ..					Visible activity.
	F		3 44 ..					
28								Visible activity at intervals during day. Stronger on E.-W.

* Trace amplitude.

DISTRICT OF COLUMBIA. U. S. Weather Bureau, Washington.

1920. Feb. 2	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.
					A _m	A _x		
	eP		11 46 ca.					Time corrections uncertain throughout.
	S		11 51 40					
	eL		12 03 30					
	L		12 31 ..	30				
	L		12 40 ..	18				
	L		13 30 ..	20				
	F		14 20 ca.					
	eL		12 09 ca.	15				
	F		12 20 ca.					
	eL		10 15 ..					
7	L		10 20 ..	18				Time correction uncertain.
10	F		11 20 ca.					
10	P		22 12 08			2,400		Time corrections uncertain.
	S		22 16 04					
	L		22 17 50	20				
	L		22 30 ..	16				
	L		22 53 40	12				
	F		24 00 00					
12	P		0 31 18					Time corrections uncertain throughout. L indistinguishable. After 18h. 1m. amplitudes very small.
	S		0 35 18					
	eL		0 40 30	14				
	F		0 50 ca.					
	P		17 53 58					
	S		17 57 ..					
	F		18 20 ca.					
22	P		17 50 20					
	S		18 00 08					
	M		18 00 32		*7,500			
	F		18 45 ..					
28	P		18 50 08					
	S		18 57 40					
	eL		19 08 20					
	F		19 25 ..					

TABLE 2.—Instrumental Reports, February, 1920—Continued.

HAWAII. U. S. C. & G. S. Magnetic Observatory, Honolulu.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Feb. 1	P	13 42 48	18				
	L	13 59 30					
	M	14 01 00	17	*100			
	C	14 04 ..					
	F	14 14 ..	20				
2	P ₁	11 22 12	17				
	P ₂	11 36 24					
	L ₁	11 44 30					
	L ₂	11 49 18					
	M	11 56 30	19	*11,200			
3	C	12 45 ..	19				
	L _{rep}	14 03 ..					
	F	15 27 ..	19				
	P	7 03 30	18				
	eL	7 07 18					
3	M	7 12 30	17	*200			
	C	7 14 ..					
	F	7 26 ..	18				
	P	45 21 00	15				
	S	45 24 00	17				
3	L	45 28 12					
	M	45 33 30	18	*300			
	C	45 37 ..	19				
	F	45 41 ..	19				
	eP	20 07 18	20				
3	L	20 12 18					
	M	20 20 00	17	*100			
	F	20 42 ..					
	eP	9 29 00	19				
	M	9 41 00	18	*100			
7	F	9 57 ..	18				
	P	15 24 06	18				Phases fairly definite but not consistent.
	S	15 40 00	16				
	L	15 51 00					
	M	15 56 24	17	*500			
C	16 00 ..	17					
8	F	16 51 ..	19				P very faint.
	P	5 59 00	19				
	L	6 20 12					
	M	6 26 24	17	*300			
	C	6 38 ..	16				
9	F	6 44 ..	20				
	P	19 35 54					
	L	19 38 24					
	M	19 43 00	19	*100			
	F	20 00 ..	18				
10	P	9 22 18	18				End overlaps the beginning of the next quake. L may be 30 or 40 sec. earlier.
	iS	9 29 00	16				
	eL	9 36 00					
	M	9 44 18	17	*1,800			
	C	9 50 ..	16				
10	P	10 19 18	17				
	eS	10 24 24	17				
	eL	10 28 00					
	M	10 33 06	16	*600			
	C	10 39 ..	17				
10	F	11 10 ..	19				
	eP	22 21 12	17				
	iS	22 30 24	20				
	eL	22 53 48					
	M	22 58 42	18	*500			
10	C	23 11 ..	20				
	F	25 15 ..	19				
	eP	20 22 36					
	eL	20 29 00					
	M	20 31 00	20	*300			
22	C	20 34 ..	20				
	F	20 44 ..	20				
	iP	17 51 30	17				Phases well defined, but not consistent. Possibly two quakes.
	iS	17 53 30	17				
	L	17 57 00					
M	17 58 00	17	*600				
C	18 04 ..	20					
25	F	18 20 ..	20				
	eP	23 02 24					Beginning at 23:14:30, there are 3 or 4 waves of 30 sec. period.
	eL	23 22 00					
	M	23 27 00	17	*300			
	C	23 31 ..					
F	23 39 ..	18					
27	eP	7 27 42					
	eS	7 33 06					
	L	7 36 30					
	M	7 43 24	18	*600			
	C	7 47 ..	18				
27	F	8 01 ..					
	eP	10 52 42					
	L	11 00 00					
	M	11 05 54	16	*100			
	C	11 10 ..	20				
27	F	11 16 ..					

* Trace amplitude.

TABLE 2.—Instrumental Reports, February, 1920—Continued.

ILLINOIS. U. S. Weather Bureau, Chicago.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Feb. 2	P	11 42 13					
	PR ₁	11 47 33					
	S	11 51 54	22				
	eL	12 11 ..					
	M	12 30 10		*8,000			
3	M	12 32 10					
	M	13 38 40					
	F	17 20 ..					
	eL	7 40 ..	18				
	L	7 55 ..	16				
7	F	8 20 ca.					
	P	11 59 25					2,700
	S	12 03 50					
	eL	12 07 40					
	L	12 12 ..	15				
F	12 40 ca.						
7	eL	16 19 ca.					
	L	16 23 30	18				
	L	16 45 ..	15				
	F	17 ca.					
	L	6 47 30	24				
8	F	7 40 ca.					
	eL	3 35 ca.					Possibly not seismic.
	F	4 ca.					
	PP?	9 37 48					
	S?	9 47 32					
L	10 08 30	18					
10	L	11 02 ..	18				
	F	12 ca.					
	P	22 13 18					2,900
	S	22 18 ..					
	L	22 20 13	22				
M	22 37 30		*16,000				
F	1 ca.						
11	P	0 32 02					
	S	0 37 07					
	L	0 43 13					
	F	1 35 ca.					
	PP	17 52 15					
12	S	17 57 15					
	L	18 03 ca.	18				
	F	18 40 ca.					
	S?	12 08 10					
	eL	12 20 ..					
20	L	12 29 ..	16				
	F	13 20 ca.					
	P	17 47 18					7,950
	S	17 56 35					
	L	18 08 35	18				
F	19 10 ca.						
eL	3 07 30						
22	F	8 50 ..					
	eL	8 04 ..					
	L	8 11 ..	18				
	F	8 30 ca.					
	eL	11 34 ca.					
24	F	11 50 ca.					
	P	18 50 48					6,200
	S	18 58 34					
	L	19 08 10					
	L	19 12 ..	24				
F	20 ca.						

* Trace amplitude.

MARYLAND. U. S. C. & G. S. Magnetic Observatory, Cheltenham.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Feb. 2	eL _M	12 35 26		10			Nothing on N. This and the following one may be part of the same quake.
	F _M	12 42 ..					
2	eL _M	13 29 19			10		Felt in Porto Rico.
	F _M	13 35 ..					
10	iP	22 12 56		4			All the waves have a period of about 5 sec., indicating that it is probably an unusually large micro-seismic tremor.
	S	22 17 00					
	eL	22 20 20			60		
	M	22 24 22					
	M _N	22 27 20	6		80		
	C _N	22 38 ..					
	F _N	22 37 ..					
	F _N	22 03 ..					
22	F _N	22 54 ..					
	P _N	17 58 10					
	P _N	17 58 09					
	M	17 58 27	5	80	30		
	F _N	18 00 ..					
22	F _N	18 02 ..					

TABLE 2.—Instrumental Reports, February, 1920—Continued.
MASSACHUSETTS. Harvard University, Cambridge.

1920.		H. m. s.	Sec.	μ	μ	Km.			
Feb. 2	O	11 30 20	6				E component stopped from trouble with the governor at 9h. 18m. N component undamped. Seismogram suggests two quakes, but 2d M may be Mrepl as recorded, indicating an epicenter distant 13,400 Km. ca.		
	eP	12 39 29	10						
	S	12 27 22	28						
	M	12 38 33	19		*9,500				
	M	12 42 00	20		*9,500				
	L	12 38 51	46		*21,500				
	M	12 36 23	21		*4,500				
	F?	14 55 ca.	18						
7	O?	11 48 35				3,723	P and F masked by microseisms. Distance obtained from I-S.		
	S	12 01 21	8						
	S	12 01 23	8						
	eL	12 05 20							
	L	12 06 05	14						
	M	12 07 18	15						
	F?	12 08 34	14						
7	O	13 32 00	11				N component out of commission before 13h. 29m. and E component before 13h. 28m.		
	L	13 26 08	13						
	M	13 26 08	13						
	L	13 36 32	20						
	F	13 50 ca.							
7	O?	16 35 03					Doubtful record. Steady mass jerked W.		
	L?	16 35 03							
	F?	16 44 40	207						
8	O	6 51 39	247				Earlier and later phases in micros.		
	L	7 00 24	15						
	L	7 02 51	167						
	F?	7 09 ..							
10	O	9 41 45					Sinusoidal.		
	eP	9 50 24	14						
	L	10 13 14	20						
	L	10 30 23							
	F?	11 09 20	20						
	F?	11 44 ca.							
	F?	11 44 ca.							
10	O	22 07 23				2,430	Probably north of Hart. I from South.		
	eP	22 12 32	2						
	S	22 12 35							
	S	22 16 31							
	M	22 16 43							
	M	22 20 18		*56,000					
	M	22 21 ca.		*57,500					
	M	22 22 00		*56,000					
	C	22 47 00	14						
	F	0 28 ca.							
	11	O	0 26 17					2,630	Sinusoidal.
		P	0 31 26						
S		0 35 51							
eL		0 38 22	35						
L		0 38 43	15						
L		0 41 44	12						
L		0 43 32	10						
F		1 29 ca.							
12	L	17 58 22	13				Unrest from 13h 40m at set-up to as late as 13d. 2h. 30m. ca., periods above 10 sec. Motion less on E damped 1.5/1. Quite possibly nonseismic.		
	L	18 01 36	13-10						
	F?	19 03 ca.							
	F?	19 03 ca.							
22	O	17 35 40				8,580	Probably quakereported in Gori district, near 44° E. and 42° N., distance from which position to this station by cosine-haersine formula is 8,599 km. S of this record displayed exceptional A for weak, distant, record. Overlapping from last.		
	P	17 47 45	3						
	P	17 47 48	2						
	S	17 57 35	8						
	S	17 57 40	8						
	S	17 57 49	6						
	S	17 57 49	7	W*2000					
	eL	18 13 50	15						
	L	18 24 06	16						
	L	18 24 12	20						
	F	18 40 ca.							
	24	S	8 13 ca.	6					* Trace amplitude.
L		8 13 42	16-23						
L		8 41 23	16						

TABLE 2.—Instrumental Reports, February, 1920—Continued.
MASSACHUSETTS, Harvard University, Cambridge—Continued.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Feb. 28	O	18 50 44	3				Masked by micros. Distance 6,150 km. to 7,100?
	eP	18 58 28	8				
	S	18 58 46	67				
	S	19 09 06	16				
	eL	19 10 28	40				
	eL	19 10 45	15				
	eL	19 19 49	30				
	L	19 14 53	20				
	C	19 18 20					
	F	19 36 ca.					
	F	19 36 ca.					

NEW YORK. Cornell University, Ithaca.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Feb. 2	eL	11 48 32	5				
	eL	12 04 30	11				
7	L	12 07 45	15				Earlier phases lost in micros.
	F	12 22 ..					
10	P	22 12 55	4				
	P	22 13 31	4				
	S	22 17 17	7				
	L	22 18 55	28				
	F	24 02 ..					

CANAL ZONE. Department of Operation and Maintenance, Panama Canal, Balboa Heights.

1920.		H. m. s.	Sec.	μ	μ	Km.			
Feb. 2	O	15 06 49				232	Slight movement from a distant quake between 13h. 30m. and 13h. 30m.; direction unknown.		
	P	15 07 14							
	S	15 07 17							
	M	15 07 20		*1,800	*1,500				
	M	15 07 24							
	P	15 09 50							
	F	15 10 05							
	7	P	22 10 45						Slight movement from a distant quake between 13h. 30m. and 14h. 30m.; distance and direction unknown.
		P	22 10 54						
		S	22 13 40						
S		22 13 45							
L		22 15 20							
L		22 14 56							
M		22 13 54		*2,500	*2,000				
M		22 13 54							
F		22 40 00							
L		22 45 00							
28	P	15 45 52				535	Direction probably W. or NW. (?)		
	S	15 46 50							
	L	15 47 16							
	L	15 47 12							
	M	15 47 34		*500	*700				
28	P	18 48 00				1,529	Direction probably NW. (?)		
	S	18 48 40							
	L	18 50 20							
	M	18 51 28		*300	*300				
	F	19 03 00							

* Trace amplitude.

TABLE 2.—Instrumental Reports, February, 1920—Continued.

PORTO RICO. U. S. C. & G. S. Magnetic Observatory, Vieques.

1920		H. m. s.	Sec.	μ	μ	Km.		
Feb. 2	eP _N	11 45 39						
	eP _N	11 45 32						
	eL _N	12 38 15						
	eL _N	13 19 50						
	M _N	13 19 58	22	40				
	M _N	13 22 53	21		19			
	F _N	13 50						
10	iP _N	22 07 48					About 45 sec. after the beginning, the stylus of N went off the paper and caught. The stylus of E went off at 22:09:08, but freed itself at 22:14:20. The amplitudes are measured to the edge of the paper. Felt in Porto Rico.	
	iP _N	22 07 48						
	iL _N	22 08 02						
	iL _N	22 08 02						
	M _N			8,400	8,500			
	C _N	22 16						
	F _N	23 33	17					
10	eP _N	22 37 34					Slight shock during the end portion of the large one.	
	eP _N	22 37 56	2	10				
	F _N	22 42						
11	eP _N	0 10 53					N not recording.	
	M _N	0 11 39		20				
	F _N	0 17	5					
11	eP _N	8 13 15						
	S _N	8 13 38						
	S _N	8 13 37						
	M _N	8 14 16	7	30				
	M _N	8 14 32	7		40			
	F _N	8 22	5					
	F _N	8 20	5					
12	iP _N	0 26 59						
	iP _N	0 26 58						
	eL _N	0 27 11						
	eL _N	0 27 34						
	M _N	0 28 14	11	190	330			
	C _N	0 30	7					
	F _N	0 39	6					
12	eP _N	15 39 35						
	eP _N	15 39 37						
	M _N	15 40 30		10				
	F _N	15 44						
12	eP _N	17 49 49						
	eP _N	17 49 32						
	S _N	17 50 08						
	M _N	17 50 45	8	90				
	M _N	17 50 29			110			
	C _N	17 52						
	F _N	18 00	5					
12	eP _N	22 39 38						
	eP _N	22 39 48						
	M _N	22 40 10		5				
	F _N	22 42						
	F _N	22 43						
21	eP _N	13 54 11						
	P _N	13 54 11						
	S _N	13 54 21	2					
	S _N	13 54 27						
	M _N	13 54 50		80				
	M _N	13 54 47			100			
	C _N	13 56	4					
F _N	14 02	4						

VERMONT. U. S. Weather Bureau, Northfield.

1920		H. m. s.	Sec.	μ	μ	Km.	
Feb. 2	e	11 47					
	eL	12 29		20			
	L	12 44 30		18			
	L	13 24		18			
10	F	13 50 ca.					
	e	22 13 48					
	S	22 17 11					
	L	22 19 22					
22	L	22 22	14				
	F	23 35 ca.					
	e	17 51 40					
22	S	18 00 56					
	F	18 05					

TABLE 2.—Instrumental Reports, February, 1920—Continued.

CANADA. Dominion Observatory, Ottawa.

1920		H. m. s.	Sec.	μ	μ	Km.			
Feb. 2	PR ₁ ?	11 42 44				(12,500 ca.)	Early phases lost. Distance from eL and LR ₁ , both well marked.		
	e?	11 48 16							
	eL	12 13	50						
	L	12 28	23						
	L	12 40	18						
	L	12 54	17						
	L	13 11	16						
	LR ₁	13 15	25						
	L	13 25	22						
	L	13 35	18						
	L	13 45	16						
	LR	14 09	13						
	F								
	HALIFAX RECORD.								
		PR ₁ ?	11 44 58						Epicenter probably in the East Indies.
	e?	11 50							
	eL	12 15 30							
7	ix	12 01 28					Early phases lost in heavy micros.		
	eL	12 05 to 12 09	15						
	L	8 54 to 7 10	19						
8	L	8 54 to 7 10	19				Faint traces only.		
	L	8 54 to 7 10	19						
10	e?	9 42 20							
	LR	9 46 16							
	L?	10 11							
	LR	10 19 to 10 40	18						
	L	11 10 to 11 15	18						
	L	11 20							
	F	11 40							
10	O	22 07 22				2,900			
	P	22 13 09							
	S	22 17 44							
	LR	22 20 20							
	L	22 22 to 22 31	21						
	L	22 35 to 22 47	15						
	L	22 50	14						
L	23 05	13							
11	LR	23 25	13						
	F	0 50							
	O	22 07 26				2,610			
	P	22 12 44							
	S	22 17 08							
	e	0 35 02							
	eL	0 41							
22	F	0 55							
	L	17 47 25							
	L	17 56 51							
	e	17 59 36							
	L?	18 10 to 18 25							
	L	18 25							
	F	18 35							
28	O	18 44 ca.				(5,000)	P on deformation instrument only. Early phases poor on the stes-mographs, due to micros.		
	P?	18 52 30							
	S?	18 59 12							
	eL	19 06							
	L	19 15	25						
	L	19 25							
	F	19 25							

TABLE 2.—Instrumental Reports, February, 1920—Continued.

TABLE 2.—Instrumental Reports, February, 1920—Continued.

CANADA. Dominion Meteorological Service, Toronto.

CANADA. Dominion Meteorological Service, Victoria.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Feb. 1							Gas out when other station records quake.
2	e ²	11 33 18					
	e ²	11 34 36					
	P	11 40 48					
	S	11 42 12					
	e	11 43 36					
	eS	11 52 30					
	iL	12 10 12					P not defined.
	L	12 27 42					
	M	12 35 06		*7,300		11,600	
2	P & S						Merged into previous quake; disastrous quake reported from Province of Minas Geraes, Brazil.
	iL	13 31 54					
	L	13 38 06					
	M	13 41 12		*2,800			
	eL	14 00 30					
	F						Lost, inspecting the instrument.
3	eL	7 49 54					Gradual thickening, may not be seismic.
	M	7 53 00		*200			
	F	7 57 36					
7	eL	12 06 36					
	iL	12 08 00					
	M	12 09 00		*400			
	F	12 24 36					
7	L	16 25 06					Thickening.
	eL	16 30 18					
	M	16 34 54		*300			
	L	16 41 00					
7	L	16 52 42					Do.
	M	16 55 18		*100			
	L	17 06 18					
	F	17 10 42					
8	eL	6 59 42					
	M	7 01 48		*200			
	F	7 07 54					
10	L	9 48 30					
	L	10 11 54					
	eL	10 16 12					
	M	10 21 48		*300			
10	eL	11 06 48					
	M	11 13 24		*300			
	F	11 34 00					
10	L	13 03 42					May not be seismic.
	F	13 08 36		*100			
10	eP	22 13 18				2,990	P well defined.
	iS	22 18 00					
	iL	22 20 24					
	M	22 25 12		*3,000			
11	F	1 26 18					
12	L	0 31 06					
	L	0 33 06					
	eL	0 42 06					
	M	0 44 12		*200			
	F	1 15 12					
16	L	15 47 06					May not be seismic.
	F	15 50 30		*50			
20	L	12737 12					Small micros going on.
22	L	17 54 00					
	L	17 57 06					
	M						Changing paper.
28	eL	16 04 24					Gradual thickening.
	M	16 07 06		*200			
	F	16 12 12					
28	eL	19 06 06					P and S not recorded.
	eL	19 10 54					
	eL	19 16 18		*50			
	F	19 53 18					

* Trace amplitude.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Feb. 1	P or L	15728 43					
	M	15 33 08		*200			
	F	15238 03					
2	P	11 35 11				9,790	
	S	11 46 00					
	L	12 05 41					
	M	12 10 36		*7,500			
							VERTICAL
	P	11 55 25		3		9,700	
	S	11 48 00		12			
	L	12 04 45		19			
	M	12 13 40		17	70		
2	P & S						Merged into former quake; quake occurred at Minas Geraes, Brazil. Severest on record for that region.
	L	13 45 31					
	M	13 48 57		*4,000			
	F	16 07 39					
							VERTICAL
	M	13 42 00		23	09		
2	P	16257 20					
	M	17 32 45		*400			
	F	18 01 46					
3	P	7218 31					
	M	7 24 55		*200			
	F	7 33 46					
3	P	15737 13					
	M	15 42 08		*100			
	F	15 48 02					
3	P or L	20723 28					
	M	20 29 52		*100			
	F	20736 45					
7	P	12213 24					
	L	12 15 51					
	M	12 20 46		*400			
	F	12 33 56					
7	P	15740 27					
	L	15 43 49					
	M	16 08 59		*400			
	F	16 55 09					
8	P	6732 38					
	L	6 40 01					
	M	6 42 58		*400			
8	P	7 01 41					
	L	7 07 35					
	M	7 11 01		*200			
	F	7 35 07					
10	P	9 36 04				4,180	
	S	9 42 01					
	L	9 50 27					
	M	9 58 02		*1,000			
10	M	10 47 34		*400			
	F	11 08 14					
10	P	22 15 48				5,850	
	S	22 23 16					
	L	22 23 39					
	M	22 40 35		*2,000			
	F	0 55 37					
							VERTICAL
	M	22740 ..		12	6		
15	L	16 06 43					
	M	16 09 40		*200			
	F	16 21 28					
20	S	12 27 18					
	L	12 34 11					
	M	12 47 57		*100			May be quake reported in Spain.
	F	12 58 46					
22	P	17 52 12					
	S	17 55 07					
	L	17 58 33					
	M	17 39 31		*200		1,720	
	F	18 09 22					
25	P	23 16 15					
	S	23 20 17					
	L	23 25 40					
	M	23 31 37		*200		2,460	
27	P	7 35 54					
	M	7 37 02		*300			
28	P	10 02 33					
	L	10 13 46					
	M	10 25 36		*400			

* Trade amplitude.

The following station recorded no earthquakes during February, 1920:

CALIFORNIA. *Theosophical University, Point Loma.*

Reports for February, 1920, have not been received from the following stations:

ALASKA. Sitka, U. S. C. & G. Survey.

DISTRICT OF COLUMBIA. Washington, D. C., Georgetown University.

KANSAS. Lawrence, University of Kansas.

MISSOURI. St. Louis, St. Louis University.

NEW YORK. Buffalo, Canisius College; New York, Fordham University.

For the reports of the stations at the University of California, Berkeley, Calif., and at the Lick Observatory, Mount Hamilton, Calif., see *Bulletin of the Seismographic Stations, University of California*. For the report of the University of Santa Clara station, see *Record of the Seismographic Stations, University of Santa Clara*.

SEISMOLOGICAL DISPATCHES.¹

Buenos Aires, February 2, 1920.—Dispatches from the state of Minas Geraes, Brazil, report that an earthquake Sunday shook down a number of houses in the country districts, creating great panic amongst the inhabitants. The dispatches say that in intensity the earth shock is without precedent in that region. (Associated Press.)

¹ Collected by the organization indicated, and reported by the Seismological Station, Georgetown University, Washington, D. C.

Mexico City, Mexico, February 6, 1920.—Earth shocks were felt at 12.50 o'clock this morning in the Vera Cruz region, according to report. (Associated Press.)

Paris (Haver), February 16, 1920.—The ministry colonies reported to-day that a tidal wave had swept over the French possessions in Oceania in the Pacific. The damage caused was important, the ministry added, and the losses were great on Makalea Island. (Associated Press.)

Cadiz, Spain, February 20, 1920.—A slight earthquake occurred yesterday at Benemargosa, Grazalema, and other centers of Andalusia. Considerable damage was done to various hamlets and villages but no loss of life was reported. (Associated Press.)

Rome (Havas), February 23, 1920.—Tiflis dispatches say that a great earthquake has occurred in the district of which the town of Gori is the center. There have been numerous casualties and serious damage. (Associated Press.)

Washington, D. C., February 28, 1920.—Two earthquakes occurred in the South Pacific Ocean to-day, resulting in the breaking of both South American cables. No further details are available. (Associated Press.)

Washington, D. C., February 28, 1920.—A report on the breaking of the cables, both of which were south of Callao, has been made to the Navy Department by the cable companies, but the department has received no reports concerning the disturbances from ships or wireless stations in the Pacific. (Associated Press.)

SEISMOLOGICAL REPORTS.

W. J. HUMPHREYS, Professor in Charge.

[Dated: Weather Bureau, Washington, D. C., May 3, 1920.]

TABLE 1.—Noninstrumental earthquake reports, March, 1920.

Day.	Approximate time, Greenwich civil.	Station.	Approximate latitude.	Approximate longitude.	Intensity Rossi-Forl.	Number of shocks.	Duration.	Sounds.	Remarks.	Observer.
CALIFORNIA.										
1920. Mar. 4	H. m. 3 25	Ft Segundo	33 56	118 22	4	1	Several.	Loud rumbling.	Felt by many.	Associated Press.
		Manhattan Beach	33 52	118 22	4	1	do.	do.	do.	Do.
		Redondo Beach	33 50	118 22	4	1	do.	do.	do.	Do.
	9 5 50	Calexico	32 41	115 30	3	1	5	None.	Felt by several.	H. M. Rouse.
	18 13 40	Hemet	33 45	116 58	2	1	2	Faint.	do.	C. E. McManigal.
	20 7 04	San Luis Obispo	35 13	120 45	2	1	2	None.	do.	J. E. Hissong.
	20 17 30	Blocksburg	40 17	123 39	4	1	1	do.	do.	Humboldt Times.
		Eureka	40 45	124 13	4	1	1	do.	do.	J. M. Jones.
WASHINGTON.										
2	4 20	Glenoma	46 30	122 07	4	1	1	Faint rumbling	Dishes rattled.	J. A. Ullsh.

TABLE 2.—Instrumental reports, March, 1920.

[For significance of symbols and abbreviations, and for a description of stations and instruments, see the REVIEW for January, 1920, pp. 62-63.]

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _E	A _N		
ARIZONA. U. S. C. & G. S. Magnetic Observatory, Tucson.								
1920. Mar. 20	eP _E		H. m. s. 17 54 35	Sec.	μ	μ	Km.	
	eN		17 56 05					
	S _E		17 56 35	5	10			
	F _E		18 01 . .					
	F _N		17 58 . .					
20	e _E		18 51 21					Nothing on N.
	L _E		18 59 00					
	M _E		19 00 30		20			
	F _E		19 34 . .					
23	P _E		15 26 49	3				N not in good ad-justment.
	P _N		15 26 55					
	L _E		15 33 44					
	L _N		15 34 19					
	M _E		15 34 32	4	30			
	M _N		15 34 22			20		
	C _E		15 37 15					
	F _E		15 41 . .					
	F _N		15 37 . .					
29	iP _E		5 31 21	3				S and L not well defined. N not in good adjust-ment.
	iS _E		5 13 22					
	eL _E		5 21 10					
	eL _N		5 23 14					
	M _E		5 23 30	12	130	60		
	C _E		5 28 . .	8				
	F _E		5 25 . .					
	F _N		5 54 . .	8				
	F _N		5 27 . .					
COLORADO. Sacred Heart College, Denver.								
1920. Mar. 13			H. m. s.	Sec.	μ	μ	Km.	Visible activity and irregular waves from 12 to 15.
20	L _N		17 56 . .					
	L _E		17 57 . .					
	M _N		17 57 . .	7		*3,500		
	M _E		(?)					
	F _E		18					
21								Activity at intervals during day.
24								Wavelets at intervals during day. Some with a doubtful as to being seismic.
29	P		5 12 . .					Preliminaries not distinct.
	S		5 16 . .					
	L		5 20 . .					
	M _N		5 22 . .	8		*2,000		
	M _E		5 22 . .	12		*3,000		
	C _N		5 23 . .					
	C _E		5 26 . .					
	F		5 36 . .					

*Trace amplitude.

TABLE 2.—Instrumental reports, March, 1920—Continued.

DISTRICT OF COLUMBIA. Georgetown University, Washington.

1920. Mar. 10	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _E	A _N		
	e _E		H. m. s. 16 30 03	Sec.	μ	μ	Km.	
	e _N		16 30 08					
	F		16 35 . .					
15	L _E		13 04 09	22				Sheets changed at 13h. 15m., quake still on. Early phases lost in micros.
	L _N		13 05 09	22				
19	e _E		17 55 . .					
	e _N		17 55 . .					
	F		18 03 . .					
20	e _E		18 04 27					Heavy micros. F in second quake.
	e _N		18 04 05					
	S _E		18 08 05					
	S _N		18 08 05					
	eL _E		18 10 18	9				
	eL _N		18 09 48	9				
	L _E		18 11 05	13				
	eL _E		18 10 18	17				F lost in second quake.
	L _E		18 14 17					
20	eP _E		18 43 33					
	eP _N		18 43 26					
	eS _E		18 53 43					
	iS _N		18 53 40					
	eL _E		19 07 12	16				
	eL _N		19 07 30	16				
	L _E		19 11 11	28				
	L _N		19 12 00	27				
	F		21 ca. . .					
	eP _E		18 43 18					No distinct M.
	S _E		18 53 49					
	eL _E		19 07 12	14				
	L _E		19 15 00	19				
	F		20 ca. . .					
22	L _E		[20 58 00 to 21 01 00]	21				
23	eP _E		15 28 05					No distinct M.
	eP _N		15 28 05					
	S _E		15 33 07					
	S _N		15 33 07					
	eL _E		15 35 42					
	eL _N		15 35 42					
	L _N		15 41 04	10				
	F		15 50 . .					
29	eP _E		5 15 15					S _N not discernible. Record from Mai-ka Machine—V, A _N 59, A _E 47, To 9.0.
	eP _N		5 15 33					
	eS _E		5 21 05					
	eL _E		5 24 24	9				
	eL _N		5 24 30	8				
	M _E		5 29 51	11	*10,900			
	M _N		5 31 57	13	*2,400			
	M _E		5 31 54	13	*13,500			
	F		6 40 . .					
	eP _E		5 15 15					eL _E doubtful.
	eS _E		5 21 27					
	M _E		5 31 31	13	*2,700			
	F _E		6 55 . .					

*Trace amplitude.

TABLE 2.—Instrumental reports, March, 1920—Continued.

DISTRICT OF COLUMBIA. U. S. Weather Bureau, Washington.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Mar. 9	eL	4 50	16				Nothing on E-W.
	F	4 55 ca					
	eL	13 03	20				
15	F	13 20 ca					
	e	17 55					
19	F	18 10					
	e	18 03					Confused by micros.
20	F	18 20					
	ep?	18 43 30				9,000?	
20	S	18 53 43					
	L	19 07 06					
	L	19 12	24				
	L	19 14					
	F	19 25 ca					
23	eP	15 27 25					No distinct L. Record much confused: appearance of 2d quake, P 15-34-10, superimposed.
	S?	15 32 40					
	F	16 ca.					
29	P	5 15 00				4,200	L not defined.
	S	5 21 ca					
	M	5 29 40				*22,000	
	M	5 33 30				*30,000	
	F	6 35 ca					

* Trace amplitude.

ILLINOIS. U. S. Weather Bureau, Chicago.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Mar. 1	eL	11 49 40	20				P not well defined.
	L	12 02	15				
	F	12 20 ca					
9	P?	4 40 27				3,000?	P not well defined.
	S	4 45 12					
	L	4 47 12					
10	F	5 10 ca					Very feeble; possibly not seismic.
	e	16 27 05					
	L?	16 30 29					
15	F	16 35 ca					Very feeble; possibly not seismic.
	P	12 32 20				5,000	
	S	12 39 20					
17	L	12 53	30				Very feeble; possibly not seismic.
	L	13	22				
	F	13 40 ca					
	iP	19 00 00				11,800	
	S?	19 12 12					
19	eL	19 46	20				Very feeble; possibly not seismic.
	L	19 57					
	F	20 30 ca					
	e	17 51 10					
	L?	17 55					
20	F	18 20 ca					Very feeble; possibly not seismic.
	P	17 59 10				1,600?	
	S?	18 01 55					
20	L	18 03 08					Very feeble; possibly not seismic.
	F	18 30 ca					
	iP	18 43 37				8,700	
	S	18 33 35					
	L	19 07	22				
22	L	19 23	15				Very feeble; possibly not seismic.
	F	21 40 ca					
	e	0 15 20					
	eL	0 20	18				
	F	0 35					
22	eL	2 33	22				Very feeble; possibly not seismic.
	L	2 38	18				
	F	3 20 ca					
22	e	20 22	22				Very feeble; possibly not seismic.
	L	20 52	16				
	L	20 58	16				
	L	21 04	16				
	F	22 ca.					
23	iP	15 27 24					Very feeble; possibly not seismic.
	S	15 31 58					
	L	15 36 30	30				
	F	16 20 ca.					
	iP	5 14 08				8,200	
29	S	5 19 08					Very feeble; possibly not seismic.
	L	5 22					
	M	5 25				*18,000	
	M	5 25					
	F	7 20 ca.					

* Trace amplitude.

TABLE 2.—Instrumental reports, March, 1920—Continued.

MARYLAND. U. S. C. & G. S. Magnetic Observatory, Cheltenham.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Mar. 20	e	17 57 36					Phases indefinite, except S.
	eSN	18 08 00				20	
	F	18 13					
	FN	18 14					
20	P	18 43 52					Micros obscure record on E-W.
	S	18 53 45					
	SN	18 53 50					
	LN	19 12 15	25				
	MN	19 15 48	17	10	80		
	ON	19 19	15				
	FN	19 07					
23	P	15 27 49					Waves irregular, phases uncertain.
	eP	15 28 12					
	eSN	15 33 00					
	eSN	15 33 02					
	LE	15 37 17		10			
	eLN	15 37 20			20		
	CE	15 40 30					
	CN	15 41 45	10				
	LE	15 45					
	LN	15 55	9				
29	eP	5 15 13					Waves irregular, phases uncertain.
	eP	5 15 15					
	eSN	5 24 07	6				
	LE	5 28 58					
	LN	5 28 20	20				
	ME	5 31 48		100			
	MS	5 31 50	13		400		
	C	5 37	7				
	FE	5 51	7				
	FN	6 08	7				

MASSACHUSETTS. Harvard University, Cambridge.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Mar. 15	O?	12 10 ca.				11,955?	P and S masked by microseisms and too much entangled to be read on N-S.
	eP?	12 35 11					
	eP	12 36 39	6				
	eL	12 42 07	12				
	eL	12 02 32	36				
	L	13 03 43	20				
	L	13 13 06	14				
	L	14 23 14					
	F?	14 ca.					
	20	O	18 00 37				
FN?		18 05 15	4				
P		18 05 23					
IS		18 05 26	2				
eS		18 06 46					
SN		18 08 50	6				
LN		18 09 22	6				
eL		18 10 10	12				
LN		18 11 53	10				
MN		18 12 11					
20	LN	18 12 46	15				F in microseisms
	LN	18 20 ca.					
	FN	18 24 ca.					
	O	18 29 30				10,600	
	FN	18 43 01					
	eP	18 44 02					
	SN	18 54 25	16				
	SN	18 54 29	7				
	IS	18 55 26	14				
	IS	18 55 32					
22	eL	19 06 40	44				Distance on supposition that M_{rep} was registered as given. Record indistinct on E-W.
	LN	19 12 29	37				
	eLN	19 13 06	21				
	MN	19 15 46	22			*6,225	
	FN	19 21 35					
	M	20 10 ca.					
	M	20 43 46					
	F	20 51 ca.					
	O?	19 07 ca.				11,370?	
	eP	19 54 10					
23	eL	19 57 10	10-23				51°. S of arc. E-W record difficult to diagnose into S and L waves. First phases of N-S masked by micros. Distance from eLn 15-33-16 and S 15-24-39. Distance would be 7,845 by L 40s period.
	L	20 00 49	15-16				
	FN	20 30 00					
	M	21 22 11	14				
	F	21 24 18					
23	O?	15 08 00				5,760?	51°. S of arc. E-W record difficult to diagnose into S and L waves. First phases of N-S masked by micros. Distance from eLn 15-33-16 and S 15-24-39. Distance would be 7,845 by L 40s period.
	SN	15 24 39	7				
	e	15 28 02	8				
	eLN	15 33 16	20				
	L	15 34 11	20				
	LN	15 38 22	40				
	M	15 41 40	20				
	C	15 43 ca.	15				
	F	16 27 ca.					

* Trace amplitude.

TABLE 2.—Instrumental reports, March, 1920—Continued.

MASSACHUSETTS. *Harvard University, Cambridge—Continued.*

1920.		H. m. s.	Sec.	μ	μ	Km.	
Mar. 28	O?	13 04					Record masked by micros of 8 sec. period. Possibly not seismic. Then 15. 38° .4 of arc. P ₁ -eP gives distance 4,625 km. N record masked by micros and tangled lines: stylus left drum in M13h-30-25.
	eN ₁	13 13 09					
	eN ₂	13 21 22	6				
	eN ₃	13 35 09	8				
	eN ₄	13 36 06					
	eN ₅	13 36 51	6				
	eN ₆	13 44 24					
	eN ₇	13 53 02	22				
	eN ₈	13 53 45	8				
	L ₁ ?	13 58 15	26				
	eP	14 01 23	8				
	F ₁	14 14 ca.					
	28	O?	23 06 38				
eP ₁		23 14 16					
P		23 14 21					
P ₁ ?		23 15 43					
S ₁		23 23 18	6				
eL ₁		23 26 02	38				
M ₁		23 28 03		*4,000			
M ₂		23 31 05		*12,000			
C ₁		23 32 00					
F		0 38 ca.					

* Trace amplitude.

NEW YORK. *Cornell University, Ithaca.*

1920.		H. m. s.	Sec.	μ	μ	Km.	
Mar. 15	eL ₁	13 03 25	22				
	eL ₂	13 04 25	20				
	F	13 24 ..					
20	e ₁	13 04 ..	12				Short period waves.
	F	13 18 ..					
20	eP ₁	18 43 39	4				
	P ₁	18 47 04	6				
	S ₁	18 53 54	11				
	S ₂	18 54 04	10				
	L ₁	19 06 02	20				
	L ₂	19 08 25	28				
	F	20 17 ..					
23	e	15 34 52	7				
	L ₁	15 39 22	27				
	F	16 01 ..					
29	P	5 15 02	4				
	S	5 20 50	7				
	L	5 26 ..	28				
	F	6 25 ..					

CANAL ZONE. *Panama Canal, Balboa Heights.*

1920.		H. m. s.	Sec.	μ	μ	Km.		
Mar. 5							Very slight tremor at 1-41-00; distance and direction unknown.	
6							Very slight tremor at 7-30-30; distance and direction unknown.	
7							Very slight tremor at 15-55-20; distance and direction unknown.	
16	P	4 06 29				212	Dir. probably SW.	
	S	4 06 52						
	M	4 07 00		*3,000	*1,500			
	F ₁	4 10 20						
	F ₂	4 10 30						
19	P ₁	1 44 38				85	Dir. probably W or SW.	
	P ₂	1 44 40						
	S ₁	1 44 48						
	S ₂	1 44 50						
	M ₁	1 44 49		*10,500	*3,500			
	M ₂	1 44 52						
	F ₁	1 45 35						
F ₂	1 45 30							
20	P	18 40 38				6,115		
	S	18 48 20						
	L ₁	18 56 14						
	L ₂	18 56 04						
	M ₁	19 00 04		*500				
	M ₂	18 58 14						
	F ₁	19 30 00						
	F ₂	19 35 30						

* Trace amplitude.

TABLE 2.—Instrumental reports, March, 1920—Continued.

PORTO RICO. *U. S. C. & G. S. Magnetic Observatory, Vieques.*

1920.		H. m. s.	Sec.	μ	μ	Km.			
Mar. 20	eP ₁	18 44 42					Time marker on P-W not operating.		
	eP ₂	18 42 54							
	eS ₁	18 51 36	8						
	eS ₂	18 51 38							
	L ₁	19 03 50	30						
	eL ₁	19 05 30							
	M ₁	19 04 54	16	40					
	M ₂	19 09 25	18		30				
	C ₁	19 10 00	14						
	C ₂	19 13 00	16						
	F ₁	19 52 00							
	F ₂	19 19 00							
	31	P ₁	23 13 22						Probably near by.
		P ₂	23 13 22						
L ₁		23 13 41							
L ₂		23 13 45							
M ₁		23 14 32		10					
M ₂		23 14 28			10				
C ₁		23 15 25							
C ₂		23 15 35							
F ₁		23 19 00							
F ₂		23 19 00							

VERMONT. *U. S. Weather Bureau, Northfield.*

1920.		H. m. s.	Sec.	μ	μ	Km.	
Mar. 20	e	18 53 00					
	eL	19 09 00					
	F	19 25 00					
23	e	15 34 00					
	F	15 46 00					
29	P?	5 16 25					
	S?	5 21 53					
	L	5 28 12	15				
	F	6 20 ca.					

CANADA. *Dominion Observatory, Ottawa.*

1920.		H. m. s.	Sec.	μ	μ	Km.	
Mar. 9	L	4 52 00					
	F	5 10 00					
10	e ₁	16 27 14					
	e ₂	16 27 52					
	F	16 33 00					
15	O	12 16 43				9,860	
	eP ₁	12 29 48					
	e ₂	12 35 42					
	eS ₁	12 40 30					
	L ₁	13 00 00	32				
	L ₂	13 06 00	22				
	L ₃	13 09 00	18				
F	13 17 00	17					
19	eP ₁	17 52 22					
	e ₂	17 53 36					
	L	17 54 22					
	L?	17 56 44					
20	e	18 00 52					
	e	18 07 30					
	eL?	18 09 42					
20	O	18 31 23				9,560	
	P ₁	18 44 04					
	S	18 54 42					
	S ₁	19 00 30					
	eL?	19 09 to					
	L	19 17	35				
	L	19 18 to	18				
F	20 55 00						
22	L	2 42 to					Irregular L waves.
	L	2 47					
	L	2 50 to					
	L	3 05					
	F	3 10					
22	eP ₁	20 30 04					
	eP ₂	20 43 36					
	L	20 55 to					
	L	20 58	30				
	L	20 59 to					
	L	21 10	22				
	L ₁	21 15 to					
	F	21 20	16				

TABLE 2.—Instrumental reports, March, 1920—Continued.

TABLE 2.—Instrumental reports, March, 1920—Continued.

CANADA. Dominion Observatory, Ottawa—Continued.

CANADA. Dominion Meteorological Service, Victoria.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Mar 28	O.	15 21 33				3,400	
	iP?	15 28 28					
	iS?	15 33 35					
	L.	15 36 30					
	F.	16 13					
29	O.	5 07 50				3,780	Wellmarked quake, but small and irregular L waves after M.
	P.	5 14 55					
	S.	5 20 36					
	L.	5 25					
	M.	5 27 to 5 31					
	L.	5 35 to 5 45	42				
	F.	6 45					

CANADA. Dominion Meteorological Service, Toronto.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Mar. 9	L.	4 51 54		*50			Micros going on.
10	L.	16 32 12		*100			Do.
12	L.	16 27 54		*200			Do.
12	L.	18 31 18					
12	L.	18 37 12					
13	eL.	5 04 48		*300			Micros.
	M.	5 07 54					
15	P?	12 25 06					
	S.	12 31 12					
	S.	12 34 42					
	e.	12 39					
	L.	13 02 06					
	eL.	13 04 42		*2,400		8,330	
	M.	13 11 48					
	F.	14 23 06					
20	eL.	0 07 35		*300			
	M.	0 08 39					
	F.	0 10 42					
20	S?	18 09 36					Inspecting instrument at first phase. Possibly West Indies.
	L.	18 12 24					
	M.	18 22 12		*200			
20	P.	18 42 48				11,330	Approximate Lat. 23° 40' S., Long. 163° W.
	iS.	18 54 48					
	L.	19 07 36					
	eL.	19 17 12		*1,400			
	M.	19 18 36					
	eL.	19 22					
	eL.	19 43		*1,000			
	M2.	19 48		*200			
	Lsp.	20 43 30					
	L?	20 54 12					
	F?	20 59 18					
22	L.	2 09 42					Abnormal L waves.
	L.	2 20 30					
	L.	2 49 12					
	L.	3 27 36		*200			
22	S?	20 42 18					
	L.	20 58 30					
	eL.	21 02 06					
	M.	21 05 42		*500			
	F.	21 40 48					
23	P.	15 25 12					
	S.	15 32 18					
	i.	15 34 24					
	L.	15 36 24					
	eL.	15 41 06		*700		5440?	
	M.	15 45 36					
	F.	16 16 12					
29	S.	5 20 36					P not recorded.
	eL.	5 26 00					
	iL.	5 26 42					
	M.	5 27 30		*2,200			Very irregular movements between two maxima.
	iL.	5 30 00		*2,200			
	M2.	5 30 12					
	F.	6 21 54					

* Trace amplitude.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Mar. 9	M.	4 51 35		*200			
11	M.	12 53 44		*50			
11	M.	19 20 49		*50			
12	M.	16 05 46		*200			
	L.	16 26 54					
12	S?orL.	18 17 34					
	M.	18 27 24					
	L.	18 37 43		*300			
13	L?	4 40 43					
	M.	4 47 36		*300			
15	P.	12 19 25				7,420	Probably Japan or Peru.
	S.	12 28 16					
	L.	12 29 35					
	M.	12 43 55		*500			
	F.	13 28 16					
20	L?	0 03 17					
	M.	0 14 06		*300			
	F.	70 23 59					
20	L.	17 42 39					
	M.	17 43 38		*200			
20	L.	17 52 00					
	M.	17 53 23		*1,000			
	F.	18 24 23					
20	P.	18 45 07				8,000	Do.
	S.	18 54 27					
	L.	19 06 18					
	M.	19 14 38		*2,000			
	Lrep.	21 05 23					
	F.	21 21 17					
22	M.	0 06 22		*100			
	F.	0 18 10					
22	M.	2 23 05		*300			
	F.	2 41 46					
22	P?	20 22 10					
	L.	20 36 26					
	M.	20 43 10		*400			
	F.	21 07 28					
23	P.	15 35 16					
	L.	15 43 11					
	M.	15 46 49		*400			
	F.	15 59 34					
29	P.	5 09 15					
	L.	5 09 44					
	M.	5 11 13		*17,500		220	
	F.	5 17 36					
	P.	5 08 04				630	Probably in east Washington or west Montana.
	L.	5 19 29					
	M.	5 19 59					

* Trace amplitude.

The following stations recorded no earthquakes during March, 1920:

- CALIFORNIA. Theosophical University, Point Loma.
- ALABAMA. Spring Hill College, Mobile.

Reports for March, 1920, have not been received from the following stations:

- ALASKA. U. S. C. & G. S. Magnetic Observatory, Sitka.
- HAWAII. U. S. C. & G. S. Magnetic Observatory, Honolulu.
- KANSAS. University of Kansas, Lawrence.
- MISSOURI. St. Louis University, St. Louis.
- NEW YORK. Canisius College, Buffalo; Fordham University, New York.

For the reports of the stations at the University of California, Berkeley, Calif., and at the Lick Observatory, Mount Hamilton, Calif., see *Bulletin of the Seismographic*

Stations, University of California. For the report of the University of Santa Clara Station, see Record of the Seismographic Stations, University of Santa Clara.

SEISMOLOGICAL DISPATCHES.¹

Jiguero Light Station, San Juan, P. R., January 27, 1920.

Yesterday at 5:10, 6:50, and 8:08 p. m., three earthquakes were felt, lasting 4, 6, and 7 seconds respectively.—Special Observer (belated dispatch).

Jiguero Light Station, San Juan, P. R., February, 11, 1920.

An earthquake that lasted from 11 to 12 seconds was felt here yesterday.—Special Observer (belated dispatch).

Redondo Beach, Calif., March 3, 1920.

A sharp earthquake shock was felt here and at Manhattan Beach and El Segundo at 7:25 o'clock to-night. The quake lasted several seconds. No damage was done.—Associated Press.

Tiflis, February 24, via Constantinople, March 8, 1920.

Several hundred persons are dead and thousands of others are homeless as the result of an earthquake to-day which destroyed Grakali and other villages within a radius of sixty miles west of Tiflis.—Associated Press.

Fort de France, Martinique, March 21, 1920.

A rather strong earth shock was felt here early this morning. No damage was done.—Associated Press.

LATE REPORTS (INSTRUMENTAL).

CAHAL ZONE. Department of Operation and Maintenance, Balboa Heights.

1920		H. m. s.	Sec.	μ	μ	Km.	
Jan. 4							Slight tremors from distant quake, beginning 4-26-56. Probably disturbance in Mexico.
9	P	16 23 56				547	Dir. probably NW.
	S	16 24 54					
	M	16 24 56			*7,000		
	M	16 24 58			*4,000		
	F	16 32 20					
	F	16 31 30					
26	P	22 26 00				77	Probably W. or SW. Generally felt.
	S	22 26 09					
	M	22 26 11			*3,500		
	M	22 26 12			*1,500		
	F	22 27 40					
	F	22 27 45					
30	J	18 28 14				869	Probably NW.
	P	18 24 14					
	S	18 29 48					
	S	18 29 46					
	L	18 30 16					
	L	18 30 14					
	M	18 31 08			*15,000		
	M	18 30 38			*13,000		
	F	18 58 20					
	F	18 53 00					

* Trace amplitude.

¹ Reported by the organization indicated, and collected by the Seismological Station, Georgetown University, Washington, D. C.

DISTRICT OF COLUMBIA. Georgetown University.

1920		H. m. s.	Sec.	μ	μ	Km.	
Feb. 2	e	11 40 00					e possibly sooner; heavy micros; apparently two quakes overlapping.
	e	11 40 00					
	S	11 48 45					
	e	12 04 42	17				
	e	12 05 12	17				
	L	12 27	25				
	L	12 26 23	26				
	M	12 37 09	24	*1,000			
	M	12 35 00	24		*700		
	M	12 41 16	16	*900			
	F	14 cu					
7	e	12 09 36	16				Very heavy micros; first phases lost in above.
	L	12 10 21	21				
	F	12 20					
7							Sheets put on at 13h 30m. Very heavy micros; suspicion of quake; impossible to evaluate.
10	i	22 12 10					
	i	22 16 15					
	e	22 17 30	15				
	e	22 17 24	15				
	L	22 20 25	19				
	L	22 13 10	18				
	M	22 26 06	14	*4,100			
	M	22 26 10	14		*3,000		
	F	0 10					
							VERTICAL.
10	P	22 12 10					
	S	22 16 15					
	e	22 17 24	19				
	L	22 19 10	19				
	F	23 cu					
12	e	0 31 18					
	e	0 31 13					
	S	0 35 18					
	L	0 40 11	11				
	L	0 40 00	11				
	F	0 50					
12	e	17 54 10					Heavy micros.
	e	17 53 59					
	L	18 06 17	24				
	F	18 10					
22	P	17 47 52					
	P	17 47 52					
	S	17 57 41					
	i	17 57 52					
	i	17 57 52					
	F	18 25					
28	P	18 50 09					E-W component not so well defined; heavy micros.
	P	18 50 09					
	S	18 57 53					
	e	19 05 06					
	L	19 14 20	19				
	L	19 14 31	22				
	F	19 20					

* Trace amplitude.

SEISMOLOGICAL REPORTS.

W. J. HUMPHREYS, Professor in Charge.

[Weather Bureau, Washington, D. C., June 3, 1920.]

TABLE I.—Noninstrumental earthquake reports, April, 1920.

Day.	Approximate time, Greenwich civil.	Station.	Approximate latitude.	Approximate longitude.	Intensity Rossi-Forel.	Number of shocks.	Duration.	Sounds.	Remarks.	Observer.
CALIFORNIA.										
1920. Apr. 13 20	H. m. 4 35 6 20	Calexico.....	32 41	115 30	3	2	Sec. 3-5 2	Rumbling.....	Felt by several.....	H. M. Rouse. J. M. Jones.
		Eureka.....	40 45	124 15	3	1		None	Felt by many.....	
ILLINOIS.										
30	15 12	Centralia.....	38 30	89 10	4	2	Few.	.....do.....	.....do.....	D. Tuft.
TENNESSEE.										
7	20 45	Springville.....	35 52	85 27	2	1	.....do.....	.....do.....	Heavy jar.....	H. A. Boden.

TABLE 2.—Instrumental reports, April, 1920.

[For significance of symbols and abbreviations, and for a description of stations and instruments, see the REVIEW for January, 1920, pp. 62-63.]

Date.	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.				
					A _N	A _S						
ALABAMA. Spring Hill College, Mobile.												
1920. Apr. 19	eP.....	S?	H. m. s.	Sec.	μ	μ	Km.	Only a trace on E. W.; N. — S. undamped; E.—W. damped.				
			21 11 10									
			21 11 30									
			21 11 48	3			*3,200					
			21 13 26									
			21 13 50									
			21 14 02	3			*2,000					
21 14 20	3			*3,000								
21 33 00												
*Trace amplitude.												
ALASKA. U. S. C. & G. S. Magnetic Observatory, Sitka.												
1920. Apr. 18	eP.....	S?	H. m. s.	Sec.	μ	μ	Km.	Record irregular; instrument apparently not in good adjustment.				
			21 08 39									
			21 09 43									
			21 09 30									
			21 10 42		40							
			21 11 43			10						
21 15 ..												
ARIZONA. U. S. C. & G. S. Magnetic Observatory, Tucson.												
1920. Apr. 6	eP.....	S?	H. m. s.	Sec.	μ	μ	Km.	Times uncertain. N. not in operation.				
			16 54 38									
			16 54 49									
			16 53 12		50							
			16 58 ..									
			17 01 ..									
			19	iP.....	S?	H. m. s.	Sec.		μ	μ	Km.	Probably in Mexico. N. not in operation.
						21 10 51	3				2,170	
						21 14 29						
						21 16 40						
						21 17 41	5		120			
						21 19 ..						
						21 28 ..						
COLORADO. Sacred Heart College, Denver.												
1920. Apr. 5	L.....	S?	H. m. s.	Sec.	μ	μ	Km.	Visible activity at intervals during day.				
			23 31 ..									
			23 41 ..									
7	L.....	S?	H. m. s.	Sec.	μ	μ	Km.	P not discernible; waves very small but clear.				
			21 23 ..									
			21 27 ..									
14-15	L.....	S?	H. m. s.	Sec.	μ	μ	Km.	Wavelets discernible.				
			2 30 ..									
19	L.....	S?	H. m. s.	Sec.	μ	μ	Km.	4 sets of waves at an interval of about 2 minutes. P not discernible.				
			21 09 30									
			21 09 30									
			21 10 ..	3-4			*2,000					
			21 10 ..	3-4			*2,000					
			21 19 ..									
21 26 ..												
*Trace amplitude.												
DISTRICT OF COLUMBIA. U. S. Weather Bureau, Washington.												
1920. Apr. 11	eP.....	S?	H. m. s.	Sec.	μ	μ	Km.					
			23 16 17									
			23 26 03									
			23 41 30									
			23 50 ca.									
			16	eL.....	S?	H. m. s.	Sec.		μ	μ	Km.	16
						23 03 30						
						21 10 ..						
			18	L.....	S?	H. m. s.	Sec.		μ	μ	Km.	
						21 31 38						
						21 35 ..						
			19	P.....	S?	H. m. s.	Sec.		μ	μ	Km.	2,900
						21 50 ca.						
21 12 10												
L not defined.	L.....	S?	H. m. s.	Sec.	μ	μ	Km.					
			21 16 48									
21 45 ..												
DISTRICT OF COLUMBIA. Georgetown University, Washington.												
1920. Apr. 6	eP.....	S?	H. m. s.	Sec.	μ	μ	Km.	Heavy micros.				
			16 49 37									
			16 55 10									
			17 12 ..									
			11	e.....	S?	H. m. s.	Sec.		μ	μ	Km.	Do.
						23 16 00						
						23 26 17						
						23 52 04	18					
			16	e.....	S?	H. m. s.	Sec.		μ	μ	Km.	Do.
						22 46 29						
						23 10 18	19					
						23 10 18	16					
			18	S.....	S?	H. m. s.	Sec.		μ	μ	Km.	e masked in very heavy micros.
21 31 49												
21 33 12	10											
22 13 ..												
VERTICAL.												
1920. Apr. 6	S.....	S?	H. m. s.	Sec.	μ	μ	Km.	Micros.				
			21 21 49									
			21 35 17	8								
			21 55 ..									
			19	P.....	S?	H. m. s.	Sec.		μ	μ	Km.	No distinct M. Phases identical on photographic machine.
						21 12 13						
						21 16 55						
						21 16 56						
						21 18 42	7					
						21 18 42	7					
			21 55 ..									
			VERTICAL.									
			1920. Apr. 6	P.....	S?	H. m. s.	Sec.		μ	μ	Km.	
21 12 12												
21 18 42	8											
21 28 15	10											
21 55 ..												

TABLE 2. -Instrumental Reports, April, 1920—Continued.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _x	A _y		

ILLINOIS. U. S. Weather Bureau, Chicago.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Apr. 6	P	16 49 27				3,000	
	S	16 54 23					
	L	17 00 23	15				
	F	17 30 ca.					
6	P?	19 31 15					High winds.
	L	19 55 30	30				
	F	20 09 ..	18				
11	eP	23 18 15				5,000?	
	S	23 24 48					
	L?	23 33 30					
	F	24 30 ca.					
13	P	14 33 35					
	S	14 34 17					
	L	14 34 43					
13	P?	17 33 05					
	S?	17 37 18					
	L	17 44 45					
	F	18 ca.					
16	P	22 31 40?				1,300?	
	S	22 36 45					
	L	22 42 50	18				
	F	22 59 ..	18				
17	L	23 10 ..	16				
	F	0 20 ca.					
18	P	21 26 50					
	S	21 27 45					
	L?	21 28 10					
	F	21 40 ca.					
19	iP	21 11 55				2,700	
	S	21 16 17					
	L?	21 18 15	30				
	F	22 20 ca.					

MARYLAND. U. S. C. & G. S. Magnetic Observatory, Cheltenham.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Apr. 18	eP	21 31 11					Phases ill-defined except PR ₁ .
	eP ₂	21 31 42					
	PR ₁	21 32 12	3				
	Se	21 33 28	9				
	eS	21 35 28		10			
	eS ₂	21 35 02			10		
	LN	21 40 46	9				
	CN	21 42 ..	9				
	FN	22 20 ..					
	FN	22 19 ..	9				
19	P	21 12 12	3			2,930	Probably in Mexico.
	PR ₁	21 12 39					
	eS	21 12 59					
	SN	21 16 50					
	eLN	21 24 01					
	LN	21 26 45					
	MS	21 30 22		10			
F	MS	21 30 39	8		10		L uncertain.
	F	21 40 ..					

MASSACHUSETTS. Harvard University, Cambridge.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Apr. 6	?N	12 02 52	9				Microseismic group. Less definite on E.
	?N	12 03 37	8				
	F	12 04 48					
11	?N	23 25 16	5 5.5				Amplitude *500. Do. Do.
	?N	23 25 30	5 8.0				
	?N	23 25 54	5 10.0				
	?N	23 26 05	5 10.0				
	?N	23 26 10	5 10.0				

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _x	A _y		

MASSACHUSETTS. Harvard University, Cambridge—Continued.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Apr. 13	L?	17 37 44					N record looks like micro seismic, chiefly of 6s. per., rarely 7 and 8, having increased A.
	to	17 42 21					
16	O?	22 27 42				8,300?	Distance and O doubtful. N masked by microseisms of 4s. per.
	S?	22 49 03	6				
	eS	22 50 54	6				
	LN	23 04 15	21				
	LN	23 04 48	22				
18	M?	23 10 30	15				A slightly increased. Do.
	M?	23 10 47	16				
	F	23 40 ca.					
18	O?	21 22 ca.					Cf. next record.
	LN	21 32 04	8				
	M?	21 32 56	7		*1,000		
	CN	21 33 24					
19	O	21 07 48				2,520	Beginning and end lost in microseisms. 22°.68 of arc. Impulse from the east. Phases much masked by microseisms.
	eP ₁	21 12 57					
	Pe	21 12 58	2				
	PR ₁	21 44 08					
	PR ₂	21 14 12					
	Se	21 17 04	6				
	eLN	21 18 04	12				
eLN	21 18 13	8					
Fe	21 46 ca.						

Both components failed to record at certain hours during the month.

*Trace amplitude.

NEW YORK. Cornell University, Ithaca.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Apr. 16	L	23 05 ..	18				
	F	23 28 ..					
18	e	21 30 20	3				Short period waves; may not be seismic.
	F	21 38 ..					
19	P	21 12 25	4				
	S	21 17 22	4				
	L	21 21 40	28				
	F	21 42 ..					

CANAL ZONE. Panama Canal, Balboa Heights.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Apr. 9	PL	4 00 22				351	
	PN	4 00 26					
	SN	4 01 00					
	SN	4 01 04					
	M	4 01 11		*800			
	MN	4 01 14			*1,000		
	FN	4 02 48					
	FN	4 03 00					
27	P	18 18 54				85	
	PN	18 18 54					
	S	18 19 04					
	M	18 19 06					
	MN	18 18 58			*500		
	FN	18 19 30					
FN	18 19 50						

*Trace amplitude.

TABLE 2.—Instrumental Reports, April, 1920—Continued.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _E	A _S		

PORTO RICO. U. S. C. & G. S. Magnetic Observatory, Vieques.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Apr. 12	eP ₂	17 39 18					Very faint on N.
	eP ₃	17 39 15					
	eL ₂	17 39 21					
	eL ₃	17 39 26					
	M ₂	17 39 47		10			
	F	17 40					
19	P ₂	21 13 02					Do.
	S ₂	21 14 00					
	S ₃	21 18 10					
	eL ₂	21 22 25					
	M ₂	21 25 35		20			
	C ₂	21 32					
	F ₂	21 36					
	F ₃	21 27					

VERMONT. U. S. Weather Bureau, Northfield.

1920.		H. m. s.	Sec.	μ	μ	Km.
Apr. 18	eL	21 50 50				
	eL	21 54				
	F	21 45				
19	e	21 17				
	F	21 25				

CANADA. Dominion Observatory, Ottawa.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Apr. 6	O?	16 43 22				3,500?	Lost in micros about 17-10.
	iP?	16 50 25					
	S?	16 56 00					
	F						
11	e	23 25 08					Very irregular small waves possibly not seismic.
	F	24 00 00					
16	e ₂	22 47 30					May not be seismic.
	e ₃	22 48 48					
	eL	23 00	24				
	F	23 12	17				
18	e	21 29 28	2				Lost in micros about 21-35.
	F	21 29 55	4				
19	O	21 06 26				3,420	No regular simu- solidal periods. Irregular small waves with mi- cros until F.
	P	21 13 00					
	S	21 18 12					
	eL?	21 53					

CANADA. Dominion Meteorological Service, Toronto.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Apr. 2	L ₂	2 10 24					Other phases lost; light turned down.
	eL	2 11 30					
	eL	2 15 18					
	M	2 17 42		*200			
	eL	2 27 05					
	F	2 47 18					
6	S?	17 03 12					
	L	17 09 51					
6	L?	19 37 03					
	L	19 46 12		*50			
6	L	20 04 18					
	L	20 16 18					
	M	20 17 48		*100			
6	L	21 12 24					
	M	21 17 48		*200			
	F	21 23 36					
9	L	15 07 24					
	L	15 10 48		*50?			

*Trace amplitude.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _E	A _S		

CANADA. Dominion Meteorological Service, Toronto—Continued.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Apr. 11	L	23 30 42					
	L	23 48 54		*50			
	L	23 52 06					
16	L?	22 48 00					
	L	22 57 18					
	eL	23 03 18					
	M	23 04 18		*360			
18	L	21 26 18					Paper paid out irregularly; record doubtful.
	P	21 13 24					
19	S	21 17 36					P very minute; amplitude of S waves large; may be a dual quake.
	eS	21 19 00					
	i	21 27 06					
	i	21 28 06					
	eL	21 30 00					
	M	21 35 00		*450			
	eL	21 40 00					
	F						
	F						
	F						

* Trace amplitude.

CANADA. Dominion Meteorological Service, Victoria.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Apr. 2	P	1 24 31					
	M	1 54 20		*200			
	F	2 15 00					
2	M	7 53 00		*200			
	F	7 58 46					
2	P	15 37 38					
	M	15 56 49		*300			
	P	16 13 13					
6	P	16 57 16					P may be S phase.
	L	17 03 40					
	M	17 07 36		*500			
6	S?	19 18 26					
	L	19 23 51					
	M	19 31 43		*500			
	F	20 24 20					
6	M	21 25 19		*100			May not be seismic.
	F	21 27 17					
9	P	15 07 08					
	M	15 14 04		*200			
	F	15 21 01					
10	M	8 36 49		*100			
	P						
11	P	23 14 11					P may be S phase.
	L	23 20 35					
	M	23 27 28		*200			
16	L	22 41 06					
	M	22 50 27		*200			
	F	23 22 25					
18	L	21 14 51					
	M	21 16 20		*400			
	F	21 24 46					
19	P	21 15 50				2,080	
	S	21 19 17					
	L	21 24 12					
	M	21 29 36		*1,000			
	F	21 53 12					

* Trace amplitude.

The following stations recorded no earthquakes during April, 1920:

CALIFORNIA. Theosophical University, Point Loma.

Reports for April, 1920, have not been received from the following stations:

- HAWAII. U. S. C. & G. S. Magnetic Observatory, Honolulu.
- KANSAS. University of Kansas, Lawrence.
- MISSOURI. St. Louis University, St. Louis.
- NEW YORK. Canisius College, Buffalo.

For the reports of the stations at the University of California, Berkeley, Calif., and at the Lick Observatory, Mount Hamilton, Calif., see *Bulletin of the Seismographic Stations, University of California*. For the report of the University of Santa Clara station, see *Record of the Seismographic Stations, University of Santa Clara*.

TABLE 3.—Late Reports. (Instrumental.)

ALASKA. U. S. C. & G. S. Magnetic Observatory, Sitka.

[For significance of symbols and abbreviations, and for a description of stations and instruments, see the REVIEW for January, 1920, pp. 62-63.]

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.			Dis-tance.	Remarks.
					A _E	A _N	μ		
1920. Mar. 20	L _W		H. m. s.	Sec.	μ	μ	Km.	N out of adjust-ment.	
			19 23	15	20				
			19 31	8					
29	eP		5 09 55					Phases ill-defined; both components in poor adjust-ment.	
			5 10 57						
			5 10 35						
			5 11 27	10					
			5 11 32	12	1080				
			5 12 27	8		340			
			5 17	8					
			5 16	7					
			5 04	8					
			5 44	8					

HAWAII. U. S. C. & G. S. Magnetic Observatory, Honolulu.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.			Dis-tance.	Remarks.
					A _E	A _N	μ		
1920. Mar. 11	eP		H. m. s.	Sec.	μ	μ	Km.		
			12 30 30	20					
			12 30 00						
			12 44 30	17	*200	*200			
			12 48	17					
11	P		19 02 00						
			19 04 00						
			19 10 30	18	*200	*200			
			19 14	17					
12	eP		15 45 00	21					
			15 53 42						
			16 01 30	15	*300	*300			
			16 06	17					
13	P		4 21 42	15					
			4 24 54	15					
			4 28 00	20	*200	*200			
			4 36	20					
15	eP		12 17 00					Phases difficult to harmonize.	
			12 21 18	17					
			12 24 42	17					
			12 30 30						
			12 34 48	16	*1,800	*1,800			
20	iS		18 53 18	15				Judging from the time at the origin indicated by the Cheltenham and Vieques records, the first recorded motion is S.	
			19 02 12	15					
			19 08 54						
			19 12 36	19	*1,500	*1,500			
22	eP		1 56 24					Phases doubtful.	
			2 00 42	20					
			2 02 56						
			2 13 00	17	*500	*500			
22	C		2 16	17					
			2 37	18					
			2 37	18					

*Trace amplitude.

HAWAII. U. S. C. & G. S. Magnetic Observatory, Honolulu—Con.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.			Dis-tance.	Remarks.
					A _E	A _N	μ		
1920. Mar. 22			H. m. s.	Sec.	μ	μ	Km.		
			20 17 30	17					
			20 20 36	17					
			20 23 00						
			20 29 30	17	*1,700	*1,700			
23			15 32 48					Phases doubtful. Instrument not in operation from 28d 7h until 29d 19h	
			15 41 30						
			15 51 06						
			15 53		*100	*100			
			16 08	10					

*Trace amplitude.

MASSACHUSETTS. Harvard University, Cambridge.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.			Dis-tance.	Remarks.
					A _E	A _N	μ		
1920. Jan. 3			H. m. s.	Sec.	μ	μ	Km.	Frost crack at station; bare frozen ground and protracted low temperatures.	
			6 43 14	0.1					
			6 43 14						
4			4 21 44				3,530	Destructive earthquake reported in the state of Vera Cruz, Mexico, at Teocelo, Coscomatepec, Coutzlan, San Francisco, de la Pena; with rise of the sea at Port Barranca to 25 meters. Damped 1.5/l. W. 230 kms. per min. eP on microseisms of 6 secs. period.	
			4 28 37	2					
			4 28 40	2					
			4 28 45	3					
			4 28 49	3					
13	O		23 plus.					In micros 6.5 secs. per.	
			0 07 34						
			0 11 11	20					
			0 11 25						
			0 23 48	20					
24			4 37 07	13				Pulsations from 23h to 24h. Possibly local and nonseismic.	
			4 37 07	13					
			4 46 39	13	*2,500				
			5 45 ca						
			23 01 59			2,500?			
27	O		23 07 11	2				O and distance very doubtful.	
			23 07 17	2					
			23 11 26	8					
			23 11 31						
			23 16 46	20					
28			23 17 05	12				This record followed on 28th, by irregular waves up to 9h.	
			23 20 10						
			0 10 ca						
			18 13 16			4,790?			
			18 54 17	2					
30			18 56 12	6				Distance from L-P. P ₂ suppressed.	
			18 40 ca						
			18 47 04	22					
			18 47 06	20					
			19 40 ca						

*Trace amplitude.

SEISMOLOGICAL REPORTS.

W. J. HUMPHREYS, Professor in Charge.

[Weather Bureau, Washington, D. C., July 3, 1920.]

TABLE I.—*Noninstrumental earthquake reports, May, 1920.*

Day.	Approximate time, Greenwich civil.	Station.	Approximate latitude.	Approximate longitude.	Intensity Rossi-Forl.	Number of shocks.	Duration.	Sounds.	Remarks.	Observer.
CALIFORNIA.										
1920.	H. m.		° ' "	° ' "			Sec.			
May 7	1 59	San Luis Obispo.....	35 13	120 45	4	1	5	None.....	Felt by many.....	J. F. Hissong.
18	6 25	El Centro.....	32 50	115 35	5	2	10	do.....	Alarmed many.....	J. M. Bartley.
		Warner Springs.....	33 15	116 45	3-4	1	30	do.....	Felt by many.....	J. A. Ream.
	6 26	Calexico.....	32 41	115 30	5	2	22	do.....	Felt by several.....	H. M. Rouse.
	6 30	El Cajon.....	32 48	116 58	4	1	5	do.....	Awakened observer.....	E. P. Kessler.
20	13 30	San Diego.....	32 40	117 10	5	1	1	do.....	Felt by several.....	F. Matthews.
	14 30	San Diego.....	32 40	117 10	4	1	2	do.....	do.....	H. F. Alciatore.
ILLINOIS.										
1	15 00	Mount Vernon.....	38 20	89 00	5	2	30	Rattling.....	Felt by many.....	H. B. Setzekorn.
	15 15	McLeansboro.....	38 07	88 33	2	1		Faint.....	Felt by several.....	
	15 30	Du Quoin.....						None.....	do.....	G. H. Knetzger.
	17 00	McLeansboro.....	38 07	88 33	2	1		do.....	do.....	
MISSOURI.										
1	15 15	Columbia.....	38 55	92 15	4	1	30	None.....	Felt by several.....	Preston Shearer.
	15 17	Columbia.....	38 55	92 15	5	2	30	do.....	do.....	W. B. Shearer.
	15 18	Warrenton.....	38 50	91 10	3	1	2-3	do.....	Felt by one.....	O. M. Stewart.
		Warrenton.....	38 50	91 10	3	1	Short.	Rattling.....	Felt by many.....	J. H. Frick.
NEW HAMPSHIRE.										
23	8 ca	Concord.....	43 10	71 30	3	2	Few.....	Rumbling.....	Distinct jar.....	E. C. Vose.

TABLE 2.—*Instrumental Reports, May, 1920.*

[For significance of symbols and abbreviations, and for a description of stations and instruments, see the REVIEW for January, 1920, pp. 62-63.]

Date.	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.	Date.	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.
					A _x	A _y								A _x	A _y		
ALASKA. U. S. C. and G. S. Magnetic Observatory, Sitka.																	
1920.			H. m. s.	Sec.	μ	μ	Km.		1920.			H. m. s.	Sec.	μ	μ	Km.	
May 7			21 54 18						May 7			21 59 ..					Micros. No distinct M.
			21 54 19									22 03 35					
			22 07 25	26								22 03 24					
			22 13 22	24	60							22 14 05	22				
			22 13 00			40						22 27 33	16				
			22 18 ..	19								22 28 22	16				
			22 14 ..									23 45 ..					
			22 53 ..														
			22 27 ..														
13			2 28 21					Nothing on N.	13			eP ₂ ?	2 10 ..				Entire record doubtful.
			2 33 ..	21	10							eP ₂ ?	2 10 ..				
			2 53 ..									S ₂ ?	2 20 04				
												eL ₂ ?	2 20 05				
												eL ₂ ?	2 47 00				
												L ₂ ?	2 51 ..	27			
												L ₂ ?	2 50 ..	29			
												F ₂ ?	4 ca.				
ARIZONA. U. S. C. and G. S. Magnetic Observatory, Tucson.																	
1920.			H. m. s.	Sec.	μ	μ	Km.		1920.			H. m. s.	Sec.	μ	μ	Km.	
May 7			22 14 43	38				N not in operation.	13			2 09 16					
			22 15 17	29	30							2 50 23	30				
			22 29 ..	17								4 10 ..					
			22 49 ..	15										30			Micros.
13			2 36 30	35				Nothing on N.	20			8 22 ..					
			2 41 ..	20	10							8 26 ..	22				
			2 56 ..	16								8 52 ..					
			3 21 ..														
20			7 49 50					Do.	30			e ₂ ?	21 04 19				Do.
			8 06 54	34								e ₂ ?	21 04 19				
			8 09 ..	26	20							e ₂ ?	21 06 19				
			8 17 ..	19								F ₂ ?	21 14 ..				
			8 34 ..	16													
30			20 51 40					Probably local.	1920.			H. m. s.	Sec.	a	a	Km.	
			20 51 20						May 7			6 02 06				8,850	All amplitudes very small.
			20 51 66									6 12 09					
			20 51 57									6 29 30					
			20 52 25	9	50							6 45 30	24				
			20 52 35	8	30							7 06 ..	20				
			20 54 ..									7 20 ca.					
			20 58 ..	8													
			21 00 ..														
30			21 13 18					Apparently a slight local shock.	7			21 51 54					
			21 13 19									22 01?					
			21 14 50		10							22 09 ..					
			21 18 ..									22 32 ..	24				
												22 45 ..	20				
												22 50 ..	16				
												24 ca.					

TABLE 2.—Instrumental Reports, May, 1920—Continued.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _E	A _N		
DISTRICT OF COLUMBIA. U. S. Weather Bureau, Washington—Continued.								
1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
May 8	e		21 23					
	F		21 42					
8	e		23 41					
	F		23 52					
10	P		19 11 36					Other phases in-distinguishable.
	F		19 40 ca.					
13	eP		2 09 50					
	eL		2 44					
	L		2 50	24				
	L		3 02	20				
	F		3 30 ca.					
20	eL		8 16					
	L		8 21	40				
	L		8 24	24				
	L		8 26	20				
	F		8 45 ca.					
26	eL		13 16 30					
	F		13 45 ca.					
30	c		21 04 25					
	F		21 10					

ILLINOIS. U. S. Weather Bureau, Chicago.								
Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _E	A _N		
1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
May 2	eL		9 16 30					Possibly not seis-mic.
	L		9 28 30	22				
	L		9 30 30	18				
	F		9 50 ca.					
7	iP		6 01 20				8,700	
	S		6 11 14					
	L		6 33	50				
	L		6 40	30				
	L		6 45	24				
	L		6 55	18				
	L		7 11	16				
	F		8 20 ca.					
7	P		21 50 42				8,450	
	S		22 00 25					
	L		22 07 57					
	L		22 12 35	22				
	L		22 26	30				
	L		22 30	24				
	L		22 35	18				
	F		1 40					
8	P?		20 40 54					
	S		20 50 53					
	F		21 07 ca.					
8	P?		21 17 ca.					
	S		21 27 45					
	F		22 ca.					
8	P?		23 26 06					
	S		23 36 30					
	F		24 ca.					
9	P?		8 18 45					
	S?		8 28 40					
	eL		8 55					
	L		8 57	24				
	F		9 30 ca.					
	P		19 11 24				10,000	
	S		19 22 12					
	eL		19 51					
	L		19 57	22				
	F		21 30 ca.					
13	P		2 09 08				8,300?	
	S?		2 18 40					
	eL		2 41					
	L		2 50	22				
	L		3 20	16				
	F		4 50 ca.					
20	P		7 45 02				8,200	
	S		7 54 50					
	L		8 18	35				
	L		8 22					
	L		8 27	18				
	L		8 42	15				
	F		10 10 ca.					
22	eL		17 59 30					
	L		18 02	22				
	F		18 15 ca.					
26	P?		12 46 00					
	S?		12 53 16					
	L		13 12 15	18				
	L		13 20	16				
	F		14 30 ca.					

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _E	A _N		
ILLINOIS. U. S. Weather Bureau, Chicago—Continued.								
1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
May 27	P?		6 09 30					Amplitudes very small.
	S?		6 19 37					
	F		7 10 ca.					
30	P		20 58 14				1,700	
	S		21 01 10					
	L		21 02 30					
	F		21 30 ca.					

MARYLAND. U. S. C. and G. S. Magnetic Observatory, Cheltenham.								
Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _E	A _N		
1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
May 7	eL		21 53 43					
	eL		22 14 03					
	eL		22 31 20					
	eL		22 29 43	14				
	M		22 41 45	18	40	10		
	C		23 08	16				
	C		22 48					
	F		23 59					
	F		23 19					
13	eL		3 01 40					
	eL		2 55 12	19				
	M		3 04 00	19				
	M		3 03 12	20		10		
	F		3 13					
	F		3 12	18				
20	eL		8 22 10	20				Nothing on N.
	F		8 35					
30	eP		21 05 16					Apparently not far off, but shocks were recorded at about the same time at Cambridge and Tucson.
	P		21 04 48					
	eL		21 07 10	8				
	M		21 06 22			20		
	F		21 10					
	F		21 09					

MASSACHUSETTS. Harvard University, Cambridge.								
Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _E	A _N		
1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
May 7	O?		21 35 ca.				12,300	Distance by L-S; 110.7 of arc.
	eP?		21 51 45					
	eP?		21 52 56	4				
	S?		22 03 52	10				
	ig		22 09 56	20				
	eL		22 30 25	48				
	eL		22 30 30	40				
	M		22 45 11	17	*1,500			
	F		0 16 ca.					
8	O		21 <i>postea</i>					N record micro-seismic; times approximate.
	e?		21 32 42	6 & 8				
	L		21 34 12	12				
	L		21 35 00	10				
	L		21 36 54	15				
	F		22 ca.					
12	O?		1 55 34				11,530	103.7 of arc; eL-S gives 11380 km.; 1-55-47 with VL 228 km.
	eP		2 09 48					
	eP		2 09 58					
	IP		2 10 17	4				
	S?		2 21 50	10				
	eL		2 45 42	40				
	M		2 52 22	22		*1,500		
	F		4 21 ca.					
17	eL		20 56 09	10				Possibly only micro; not well shown on E-W.
	F		20 57 41					
20	O		7 <i>postea</i>					P and S too faint for diagnosis; both components damped 1/1 by small magnets. Strong; at great distance. eS? at 7-46-44. L ₁ -eL is 61.3 m.; ca; distance 13500 ca.
	e?		7 30 45					
	e		7 32 35	12				
	e		7 45 57	4				
	e		7 46 44					
	e		7 59 34	8				
	e		8 03 40	12				
	eL		8 16 42	60				
	L		8 19 00	40				
	L		8 21 18	30				
	L		8 22 35	40				
	L		8 27 24	28				
	L		8 27 54	20				
	L		8 31 00	20				
	L		9 19 22	28				
	L		9 38 65	20				
	F		9 45 24					
26	O?		12 28 09				8,900?	Dist. from S ₁ -S; eL suppressed until M sets in. eL should read 13-17 ca. No distinct record on N comp., damped 1/1 by magnet.
	S		12 50 21	8				
	S ₁		12 56 15	12				
	L		13 19 05	16				
	M		13 20 10	18				
	M		10 24 25					
	L		13 29 56	15				
	F		14 ca.					

*Trace amplitude.

TABLE 2.—Instrumental Reports, May, 1920—Continued.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _D	A _N		
MASSACHUSETTS. <i>Harvard University, Cambridge—Continued.</i>								
1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
May 30	O?		23 57 00					P and S ill defined and masked on N record by pulsations of various periods. Dist. 3740 ca. which would put O at 20 $\frac{1}{2}$ 50m.
	eP _N ?		23 58 21					
	eP _{NS} ?		21 02 04					
	e _g		21 02 54					
	eL _N		21 06 25	20				
	eL _S		21 07 26	13				
	M _N		21 07 21	15				
	M _S		21 07 39	15				
	L _g ?		21 10 40	8				
	L _S		to 12 26					
	L _N		21 14 08	8				
	F		21 21 ca					

NEW YORK. <i>Cornell University, Ithaca.</i>								
Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.	Dis-tance.	Remarks.	
			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
1920.								
May 7	L		22 27 30	20				
	F		23 44 --					
13	eS _E		2 26 40	15				
	L		2 48 35	38				
	F		3 39 --					
20	L _S		8 22 10	35				
	F		8 34 --					
26	L _S		13 16 37	20				
	F		13 28 --					
30	e _N		21 04 13	3				
	e _S		21 06 27	8				
	F						Lost in changing sheets after 21:15.	

VERMONT. <i>U. S. Weather Bureau, Northfield.</i>								
Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.	Dis-tance.	Remarks.	
			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
1920.								
May 7	eL		22 31 --					
	F		22 50 --					
13	eL		2 55 --					
	L		2 58 --	20				
	F		3 07 ca					

CANADA. <i>Dominion Observatory, Ottawa.</i>								
Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.	Dis-tance.	Remarks.	
			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
1920.								
May 7	eL		6 35 to 7 20	24 18				
7	e		21 51 36	4				
	eL		22 22 --	40				
	L		22 35 --	28				
	L		22 46 --	18				
	L		23 00 --	15				
	F		23 30 --					
8	e		21 28 to 21 45				Very faint; may not be seismic.	
8	e		23 36 to 23 55				Do.	
26	e		13 11 to 13 30				L waves on RW very small but regular and sinusoidal. Waves on NS very irregular.	
	L _N		13 20 to 14 00					

CANADA. <i>Dominion Meteorological Service, Toronto.</i>								
Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.	Dis-tance.	Remarks.	
			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
1920.								
May 7	e		6 01 30					
	L		6 50 30					
	L		6 53 48					
	eL		7 58 42					
	M		7 08 24		*300			
	F		7 44 42					
7	L		21 33 48					
	M		21 35 00		*100			
	F		21 47 54					
8	L		23 20 54					
	L		23 35 54		*50			

*Trace amplitude.

CANADA. <i>Dominion Meteorological Service, Toronto—Continued.</i>								
Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.	Dis-tance.	Remarks.	
			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
1920.								
May 9	e		8 27 30					
	L		8 31 06		*100			
	F							
10	P		19 11 24					
	S		19 18 18					
	L		19 22 48					
	eL		19 28 54					
	M		19 32 00		*300			
	L		19 49 48					
10	eL		20 03 36					
	M		20 05 36		*400			
	eL		20 16 51					
	M		20 20 00		*500			
	F		20 35 24					
12	S?		2 20 36					
	L or S		2 25 54					
	L		2 44 54					
	IL		2 55 42					
	M		3 09 18		*2,500			
	L _{RWP}		3 55 42					
	M		4 02 06		*400			
14	L		18 31 18					
	F				*50			
19	L		13 39 24					
	L		13 52 30		*100			
29	e		7 31 00					
	S?		7 56 24					
	L		8 02 18					
	L		8 27 42					
	eL		8 37 54					
	M		8 40 00		*500			
	L _{RWP}		9 35 24					
	L		9 38 12					
	F		9 58 00					
21	L		17 36 12					
	L		17 51 36		*200			
22	eL		17 13 06					
	M		17 15 18		*200			
	F		17 20 18					
26	e		12 51 18					
	e		13 03 12					
	eL		13 17 36					
	M		13 21 36		*300			
	F		13 24 06					
30	L		21 04 18					
	L		21 18 06		*100			

Time for first phase doubtful.

May not be seismic.

Thickening. Micros going on.

CANADA. <i>Dominion Meteorological Service, Victoria.</i>								
Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.	Dis-tance.	Remarks.	
			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
1920.								
May 7	P?		5 50 09					
	S		6 05 01					
	L		6 17 18					
	M		6 32 03		*500		7,440	
	F		8 18 47					
7	P		21 53 43				5,230	
	S		22 00 37					
	L		22 10 57					
	M		22 18 49		*300			
	L _{RWP}		23 51 07					
	L		23 56 37					
8	M		0 00 37		*400			
	F		0 47 49					
8	P		21 06 33					
	M		21 11 58		*200			
	F		21 23 16					
8	P		23 20 19					
	M		23 21 48		*100			
	F		23 25 14					
9	P		8 39 32					
	M		8 44 56		*200			
	F		8 51 49					
10	P		19 12 05					
	S		19 20 26					
	L		19 32 14					
	eL		19 41 04					
	M		19 43 33		*900		6,840	
	F		21 13 33					
13	P		2 13 13					
	S		2 19 07					
	L		2 29 56					
	M		2 37 18		*3,000		4,120	
	L _{RWP}		4 09 50					
	F		4 39 01					
14	P		18 23 51					
	M		18 26 20		*200			
	F		18 35 44					
19	Por L		13 23 51					
	M		13 35 17		*100			

*Trace amplitude

TABLE 2.—Instrumental Reports, May, 1920—Continued.

Date.	Char-acter.	Phaso.	Time.	Period T.	Amplitude.			Dis-tance.	Remarks.
					A _B	A _N	μ		
CANADA. Dominion Meteorological Service, Victoria—Continued.									
1920.			H. m. s.	Sec.	μ	μ	Km.		
May 20		P	7 39 09				8,700		May be near Guam.
		S	7 49 04						
		L	8 01 57						
		M	8 12 52		*500				
		F	10 21 13						
22		L	17 42 21						
		M	17 48 48		*500				
		F	17 58 13						
26		P or S.	12 44 45						
		L	12 57 04						
		M	13 02 00		*500				
		F	13 26 55						
27		M.	6 21 14		*50				May be due to light variations.
30		P	20 53 53						
		L	21 02 50						
		M	21 04 48		*100				
		F	?						

* Trace amplitude.

The following stations recorded no earthquakes during May, 1920:

- ALABAMA. *Spring Hill College, Mobile.*
- COLORADO. *Sacred Heart College, Denver.*

Reports for May, 1920, have not been received from the following stations:

- HAWAII. *U. S. C. and G. S. Magnetic Observatory, Honolulu.*
- KANSAS. *University of Kansas, Lawrence.*
- MISSOURI. *St. Louis University, St. Louis.*
- NEW YORK. *Canisius College, Buffalo; Fordham University, New York.*
- CANAL ZONE. *Panama Canal, Balboa Heights.*
- PORTO RICO. *U. S. C. and G. S. Magnetic Observatory, Vieques.*

For the reports of the stations at the University of California, Berkeley, Calif., and at the Lick Observatory, Mount Hamilton, Calif., see *Bulletin of the Seismographic Stations, University of California*. For the report of the University of Santa Clara station, see *Record of the Seismographic Stations, University of Santa Clara*.

SEISMOLOGICAL DISPATCHES.¹

Mexico City, April 20, 1920.

A severe earthquake was felt here at 2:30 o'clock yesterday afternoon. Telegrams from Orizaba and Jalaps stated that shocks were felt in those States and elsewhere in the State of Vera Cruz simultaneously.—*Associated Press*.

¹ Reported by the organization indicated and collected by the Seismological station, Georgetown University, Washington, D. C.

St. Louis, Mo., May 1, 1920.

An earthquake shock was felt in St. Louis this morning. Experts at Washington University stated the seismograph there recorded the shock as 200 miles from St. Louis.—*Associated Press*.

Mount Vernon, Ill., May 1, 1920.

Mount Vernon and the surrounding country was rocked twice this morning by an earthquake or explosion. The first shock, lasting about a quarter of a minute, was felt at 9:15 a. m., and the second about 10:09 a. m.—*Associated Press*.

New York, N. Y., May 4, 1920.

Indications that a volcanic eruption was taking place on the island of Old Providence in the Caribbean Sea were reported here to-day by the United Fruit Company steamer *Calamares*. A wireless message from the ship said that volumes of white smoke were observed ascending from one of its tallest peaks late yesterday afternoon.—*Associated Press*.

TABLE 3.—Late reports, (Instrumental).

Date.	Char-acter.	Phaso.	Time.	Period T.	Amplitude.			Dis-tance.	Remarks.
					A _B	A _N	μ		
HAWAII. U. S. C. and G. S. Magnetic Observatory, Honolulu.									
1920			H. m. s.	Sec.	μ	μ	Km.		
Apr. 2		eP	1 22 12	17					Phases distinct but not consistent.
		eS	1 23 6	17					
		eL	1 31 42						
		eM	1 35 00						
		M	1 38 24	17	*500				
		C	1 55 ..						
		F	2 32 ..	18					
2		P	15 29 00	18					
		L	15 45 24						
		M	15 51 24	17	*300				
		C	15 58 ..	17					
		F	16 18 ..						
6		P	19 11 36	16					
		IS	19 18 36	17					
		L	19 26 54						
		M	19 33 12	17	*700				
		C	19 52 ..	15					
		F	20 31 ..	16					
11		P	23 19 12	17					
		S	23 23 00	15					
		eL	23 28 24						
		M	23 29 12	18	*300				
		C	23 38 ..	18					
		F	23 57 ..						
16		P	22 44 00						
		M	22 55 12	17	*200				
		F	23 14 ..						
19		eP	21 16 36						Comparison with records at other stations indicates that P should come a little earlier.
		IS	21 24 6	17	*400				
		L	21 32 42						
		M	21 36 30	17	*100				
		C	21 42 ..	18					
		F	21 53 ..	18					

* Trace amplitude.

SEISMOLOGICAL REPORTS.

W. J. HUMPHREYS, Professor in Charge.

[Weather Bureau, Washington, D. C., Aug. 3, 1920.]

TABLE I.--Noninstrumental earthquake reports, June, 1920.

Day.	Approximate time, Greenwich civil.	Station.	Approximate latitude.	Approximate longitude.	Intensity Rossi-Forel.	Number of shocks.	Duration.	Sounds.	Remarks.	Observer.
CALIFORNIA.										
1920.	H. m.		° /	° /			Sec.			
June 3	5 55	Kennett.....	40 45	122 56	3	2	5	None.....	Felt by several.....	J. A. Leslie.
10	10 53	Lakeport.....	39 03	121 39	3	1	7	Rumbling.....	Felt by many.....	A. Hyman, M. Callahan.
16	12 15	Salinas.....	36 41	121 36	5	2	3	Faint.....	.....do.....	E. D. Eddy.
		Spreckels.....	36 38	118 15	3	1	3	None.....	Dishes rattled.....	S. P. Gleason.
18	10 08	Los Angeles.....	34 03	118 16	2	1	2	.....do.....	Clocks stopped.....	R. F. Young.
	10 09	Mount Wilson.....	34 13	118 15	3	1	2	.....do.....	Star images oscillated.....	W. P. Hoge.
	10 10	Avalon.....	33 15	116 45	3	2	2	.....do.....	Clocks stopped.....	T. M. Folhamus.
21	7 20	Warner Springs.....	33 15	117 02	3	2	2	.....do.....	Felt by several.....	J. A. Ream.
	20 24	Barstow.....	34 54	118 30	5	1	10	Faint.....	Felt by many.....	E. L. White.
22	2 45	Santa Monica.....	34 02	118 28	7	5	12	Loud rattling.....	Felt by several.....	Nellie Barker.
	2 47	Venice.....	33 58	118 15	8	1	5	Rattling.....	Felt by many; slight damage.....	A. W. Pugh.
		Los Angeles.....	34 03	118 16	3	1	5	None.....	.....do.....	H. B. Hershey.
	2 48	Mount Wilson.....	34 13	118 10	3	2	6	.....do.....	Felt by many.....	W. P. Hoge.
	2 50	Pasadena.....	34 05	120 45	5	1	10	.....do.....	Felt by several.....	M. S. Jones.
28	9 01	San Luis Obispo.....	35 13					.....do.....	Felt by many.....	J. E. Hissong.

Earthquake data as recorded at the United States Weather Bureau office, Los Angeles, Calif., June, 1920.

June 18, 1920.—A light earthquake occurred at 2:08½ a. m., stopping the office clock.

June 21.—A rather sharp earthquake shock occurred at 6:17 p. m., several small shocks occurring after the first one. Some slight damage resulted in older buildings in the different parts of the city. Inglewood and Hyde Park were more seriously damaged; some business

buildings collapsed at these places. Some damage at Venice and other beaches.

June 22.—A slight earthquake occurred at 5 a. m., which was felt at Venice and in Los Angeles. No damage reported. Another light shock occurred at 12:30 p. m. This is said to have caused brick to fall from walls at Inglewood.

June 23.—Light earthquake reported to have occurred at about 4 a. m. and at 5 a. m. by several people. No damage.

June 29.—A slight earthquake felt at 8:08 p. m.

TABLE 2.—Instrumental Reports, June, 1920.

[For significance of symbols and abbreviations, and for a description of stations and instruments, see the REVIEW for January, 1920, pp. 62-63.]

Date.	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.
					A _E	A _N		

ALASKA. U. S. C. & G. S. Magnetic Observatory, Sitka.

1920	June 15	H. m. s.	Sec.	μ	μ	Km.	Remarks.
	P	4 33 24					Reported from Formosa; these times are consistent with that distance; NS not in operation.
	S	4 43 18					
	L	4 59 30		10			
	F	5 31 —					

ARIZONA. U. S. C. & G. S. Magnetic Observatory, Tucson.

1920	June 2	H. m. s.	Sec.	μ	μ	Km.	Remarks.
	eP	22 06 31					Long waves well shown; P and S faint.
	eN	22 06 05					
	L	22 07 00	8				
	L	22 07 25	8				
	M	22 07 29	11	730			
	M	22 08 00	11		500		
	C	22 15 —	6				
	F	22 27 —					
	4	eN	15 29 25				End overlaps beginning of next quake.
		L	15 29 30				
		L	15 30 10				
		M	15 29 50	10			
		M	15 30 40	9	30		
		C	15 32 —	6			
	4	L	15 36 45				Reported from Formosa.
		L	15 37 30				
		M	15 37 20	9	50		
		M	15 38 05	9		50	
		C	15 40 —	6			
	5	eP	4 39 28				Probably local; nothing on NS.
		eS	4 46 27				
		L	5 11 03	30	40		
		M	5 16 00	24			
		C	5 54 —	16			
		F	6 12 —	16			
		F	4 49 —				
	7	eP	9 57 48				Reported from Los Angeles as felt at 2.47; phase recorded as F may be L.
		L	9 59 04				
		M	9 59 30	6	10		
		F	10 02 —				
	18	eP	10 11 29				Micros obscure beginning.
		S	10 12 07				
		S	10 12 01				
		M	10 13 27	7	10	5	
		C	10 13 —				
		F	10 13 —				
		F	10 19 —				
		F	10 16 —				
	22	P	2 51 27				P indistinct.
		F	2 51 24				
		L	2 51 32				
		M	2 52 24	8	40		
		C	2 52 14		80		
		C	2 55 20				
		C	3 01 —				

COLORADO. Sacred Heart College, Denver.

1920	June 2	H. m. s.	Sec.	μ	μ	Km.	Remarks.
	P	22 07 30					Activity on E. W. at intervals during day. Visible waves, especially on N. S.
	S	22 08 —					
	L	22 09 —	10-12				
	L	22 10 —	10-12				
	M	22 12 —	10	*2,000			
	M	22 13 30	10		*2,000		
	C	22 13 —					
	C	22 12 —					
	F	22 16 —					
	F	22 17 —					
	5-6						Indeterminate.
	15	L	13 —				
		F	13 20 —				

*Trace amplitude.

Date.	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.
					A _E	A _N		

DISTRICT OF COLUMBIA. U. S. Weather Bureau, Washington.

1920	June 2	H. m. s.	Sec.	μ	μ	Km.	Remarks.
	P	22 08 55					Phases indistinguishable.
	S?	22 16 20					
	L	22 18 45					
	F	22 38 ca.					
	4	e	15 38 37				
		F	16 ca.				
	5	e	4 40 ca.				
		eL	5 12 —				
		L	5 28 —	24			
		L	5 30 —	20			
		L	5 43 —	16			
		F	6 10 ca.				
	9	e	11 50 10				Phases indistinguishable. Amplitudes very small.
		F	12 45 ca.				
	18	e	10 25 35				Phases indistinguishable.
		F	10 36 ca.				
	21	e	14 15 —				Phases indistinguishable.
		F	14 30 —				
	22	e?	3 03 10				
		S	3 05 15				
		L	3 06 10				
		F	3 15 00				
	26	e?	3 04 15				
		F	3 15 —				

HAWAII. U. S. C. & G. S. Magnetic Observatory, Honolulu.

1920	June 2	H. m. s.	Sec.	μ	μ	Km.	Remarks.
	P	22 17 18	17				Reported from Formosa.
	L	22 23 18	17				
	M	22 27 48	16	*900			
	C	22 33 —	17				
	F	23 43 —	17				
	5	iP	4 33 24	16			
		iS	4 42 24	19			
		eL	4 58 36	17			
		M	5 11 36	17	*1,200		
		C	5 24 —	16			
		F	8 10 —	17			
	9	P	11 42 24	18			Micros obscure beginning.
		iS	11 52 06	16			
		eL	12 07 42	17			
		M	12 17 18	17	*2,600		
		C	12 30 —	17			
		F	13 12 —	17			
	10	P	2 50 06	17			
		L	3 03 30				
		M	3 21 —	18	*200		
		C	3 26 —	18			
		F	3 57 —	17			
	12	P	15 47 42				
		eL	15 52 48				
		M	15 59 —	16	*200		
		C	16 05 —	17			
		F	16 32 —	17			
	15	e	3 20 36				
		L	3 30 06	17			
		M	3 39 36	17	*600		
		C	3 47 —	17			
		F	4 02 —	18			

ILLINOIS. U. S. Weather Bureau, Chicago.

1920	June 2	H. m. s.	Sec.	μ	μ	Km.	Remarks.
	P	22 06 51				2,800	Merged in preceding quake.
	L	22 11 21					
	L	22 13 33					
	M	22 15 27		*3,500			
	F	23 40 ca.					
	4					1,700	
		S	15 36 34				
		L	15 37 35				
	4	P?	15 42 02				
		S?	15 44 25				
		L	16 40 ca.				
		F	16 40 ca.				

*Trace amplitude.

TABLE 2.—Instrumental Reports, June, 1920—Continued.

ILLINOIS. U. S. Weather Bureau, Chicago—Continued.

1920		H. m. s.	Sec.	γ	μ	Km.	
June 5	P.	4 37 30				6,300	
	S.	4 45 20					
	L.	4 54 50					
	L.	5 08 —	30				
	L.	5 22 —	23				
9	L.	5 27 —	18				
	L.	5 45 —	15				
	F.	8 ca					
	P.	11 51 05					
	S?	11 58 00					
18	L?	12 14 00					
	L.	12 22 —	25				
	L.	12 35 —	22				
	L.	12 33 30	18				
	F.	14 +					
21	P?	14 10 —					Sheet changed. Record undeclipherable because of tangling. Phases indistinguishable.
	F.	14 40 ca					
22	P.	2 57 04				1,400	Los Angeles.
	S.	2 59 32					
	L.	3 00 25					
	F.	3 20 ca					
26	P.	3 00 10					
	S.	3 03 50					
	L.	3 20 ca					
	F.	3 20 ca					
30	P.	4 33 13					
	S.	4 40 —					
	L.	4 49 33					
	L.	4 49 —	22				
	L.	4 53 —	15				
F.	5 35 ca						

MARYLAND. U. S. C. & G. S. Magnetic Observatory, Cheltenham.

1920		H. m. s.	Sec.	μ	μ	Km.	
June 2	P.	22 18 56					Phase: ill-defined.
	P.N.	22 18 57					
	M.N.	22 30 39	10	10	20		
	C.N.	22 33 —	9				
	F.N.	22 40 —					
4	P.	10 47 42					
	C.N.	10 46 56					
	M.N.	10 58 23		10	10		
	F.N.	11 04 —					
	F.N.	11 01 —					
5	P.	4 41 17					These phases are called P ₁ to satisfy the distance from Formosa.
	P.N.	4 40 58					
	S?	4 48 10					
	e.	4 50 49					
	L.	5 17 35	40				
	L.N.	5 16 45					
	M.N.	5 38 23	17	50	190		
	C.N.	5 43 —					
	F.N.	5 48 —	16				
	F.N.	6 04 —					
F.N.	6 07 —						
22	e.	3 05 14					Barely perceptible on EW. Reported from Los Angeles, 3,600 km. distant.
	L.N.	3 06 05					
	M.N.	3 06 24	12		10		
	F.N.	3 13 —					

VERMONT. U. S. Weather Bureau, Northfield.

1920		H. m. s.	Sec.	μ	μ	Km.	
June 2	e.	22 20 45					
	F.	22 35 —					
4	e.	15 43 —					
	F.	16 —					
5	e.	4 47 —					
	eL.	5 10 —					
	L.	5 14 —	40				
	L.	5 24 —	20				
	F.	5 29 —	18				
F.	5 50 —						

CANADA. Dominion Observatory, Ottawa.

1920		H. m. s.	Sec.	μ	μ	Km.	
June 2	e?	22 14 48					Irregular waves of small amplitude. May not be seismic.
	eL?	22 19 30					
	F.	22 55 —	6				
4	P?	4 40 ca					A large earthquake; the record was unfortunately spoiled through a fogged sheet.
	S?	4 50 ca					
	L.	5 08 —					

* Trace amplitude.

CANADA. Dominion Observatory, Ottawa—Continued.

1920		H. m. s.	Sec.	μ	μ	Km.	
June 9	e.N.	11 53 09					No evidence of resolution into phases.
	F.	12 25 —	6				
18	e.	10 25 30	4				
	F.	to 37 —	8				
22	e.	3 05 52					
	F.	to 25 —	6				

CANADA. Dominion Meteorological Service, Toronto.

1920		H. m. s.	Sec.	μ	μ	Km.	
June 2	e?	22 01 24					Micros.
	L.	22 17 48					
	L.	22 19 18					
	M.	22 19 54		*1,000			
4	L.	15 31 12					P minute, and ill defined.
	L.	15 37 18		*130			
5	P.	47 36 18				10050?	P minute, and ill defined.
	S.	4 47 18					
	L.	4 57 24					
	L.	5 09 24					
	IL?	5 23 30					
	M.	5 24 54		*3,000			
	M.	5 25 12		*3,000			
9	IL?	5 28 42					No distinct phases.
	IL?	5 35 54					
	L.	5 47 36					
	F.	77 30 43					
	L.	11 56 06		*230			
	L.	12 18 06					
	L.	12 46 18					
9	L.	12 50 24					May not be seismic.
	L.	12 55 36		*400			
	F.	13 21 06					
9	e.	13 44 12					May not be seismic.
	e.	13 57 06		*200			
18	L.	107 27 24		*50			May not be seismic.
	L.	3 04 54					
22	L.	to 23 54		*100			May not be seismic.
	L.	4 56 24					
30	M.	4 58 36		*400			May not be seismic.
	F.	5 09 18					
	IL?	5 30 54		*300			

CANADA. Dominion Meteorological Service, Victoria.

1920		H. m. s.	Sec.	μ	μ	Km.	
June 2	P.	22 10 27					Probably sub-Pacific, about Guam. P minute. S fairly large.
	S.	22 13 24				1710	
	L.	22 16 51					
	M.	22 19 48		*2250			
	F.	22 37 30					
4	P.	15 34 10					Probably sub-Pacific, about Guam. P minute. S fairly large.
	L.	15 39 05					
	M.	15 43 01		*200			
	F.	15 58 16					
5	P.	4 33 13				9800	Probably sub-Pacific, about Guam. P minute. S fairly large.
	S.	4 44 02					
	L.	5 03 14					
	M.	5 23 23		*2750			
	L.	5 32 11					
9	L.	6 02 47					Probably sub-Pacific, about Guam. P minute. S fairly large.
	L.	6 36 05					
9	F.	7 46 00					Probably sub-Pacific, about Guam. P minute. S fairly large.
	P.	4 33 18	2			9360	
7	S.	4 43 46	4				Probably sub-Pacific, about Guam. P minute. S fairly large.
	L.	?					
	M.	?	16				
7	P or S	4 16 17					Probably sub-Pacific, about Guam. P minute. S fairly large.
	L.	4 17 53					
	M.	4 18 42		*100			
	F.	4 24 07					
9	P?	11 52 19				3980	Probably sub-Pacific, about Guam. P minute. S fairly large.
	S.	11 58 05					
	L.	12 05 29					
	M.	12 26 37		*600			
	F.	13 44 11					
18	P.	10 14 23				1740	Reported at Los Angeles at 10.15 a. m.
	L.	10 17 20					
	M.	10 19 18		*300			
	F.	10 26 11					
22	M.	2 59 14		*200			Reported at Los Angeles at 10.15 a. m.
	F.	3 05 11					
30	M.	4 37 57		*100			Reported at Los Angeles at 10.15 a. m.
	F.	4 50 44					

* Trace amplitude.

No earthquakes were recorded at the following stations during the month of June, 1920:

CANAL ZONE. Panama Canal, Balboa Heights.

Reports for June, 1920, have not been received from the following stations:

- ALABAMA. Spring Hill College, Mobile.
- DISTRICT OF COLUMBIA. Georgetown University, Washington.
- KANSAS. University of Kansas, Lawrence.
- MASSACHUSETTS. Harvard University, Cambridge.
- MISSOURI. St. Louis University, St. Louis.
- NEW YORK. Canisius College, Buffalo; Cornell University, Ithaca; Fordham University, New York.
- PORTO RICO. U. S. C. & G. S. Magnetic Observatory, Vieques.

TABLE 3.—Late reports (instrumental).

PORTO RICO. U. S. C. & G. S. Magnetic Observatory, Vieques.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.	
					A _E	A _N			
1920 May 7			H. m. s.	Sec.	μ	μ	Km.		
			eL _E ...	22 37 40	35	30			
			M _E ...	22 38 50					
			C _E ...	22 46 00	20				
20			P _E ...	21 24 33					
			P _N ...	21 24 40					
			F _E ...	21 28 00		10	10		
			F _N ...	21 29 00					

CANAL ZONE. Panama Canal, Balboa Heights.

1920 May 7			P _E ...	17 34 23			172	Direction probably SW.
			S _E ...	17 34 47				
			S _N ...	17 34 50				
			M _E ...	17 34 59		*500		
			M _N ...	17 35 00			*500	
			F _E ...	17 36 30				
8			P _E ...	1 23 42			97ca.	Direction probably SW.
			P _N ...	1 23 48				
			S _E ...	1 23 54				
			S _N ...	1 23 59				
			M _E ...	1 23 55		*1,000		
			M _N ...	1 24 00			*1,500	
10			P _E ...	13 43 48			97ca.	Direction probably SW.
			S _E ...	13 43 59				
			M _E ...	13 44 03		*800		
			M _N ...	13 44 02			*1,000	
			F _E ...	13 46 00				
			F _N ...	13 46 20				

* Trace amplitude.

TABLE 3.—Late reports (instrumental)—Continued.

HAWAII. U. S. C. & G. S. Magnetic Observatory, Honolulu.

1920 May 5			IP...	8 48 54	18			
			L...	8 52 48	17			
			M...	8 54 18	17	*100		
			C...	8 56 42	17			
			F...	9 16 ..	17			
7			IP...	5 52 12	17			
			IS...	6 02 24	18			
			L...	6 19 30	17			
			M...	6 26 36	1	*1,100		
			M ₂ ...	6 30 48	17	*1,100		
7			C...	6 43 42	17			
			F...	8 13 ..	17			
			IP...	21 41 18	19			
			IS...	21 43 30	17			
			L...	21 54 48	17			
9			M...	22 05 00	19	*5,100		
			C...	22 27 18	17			
			F...	25 12 ..	16			
			P...	8 21 54				
			L...	8 24 00	20			
10			M...	8 30 54	20	*200		
			C...	8 39 ..	17			
			F...	8 57 ..				
			IP...	19 01 30	17			
			IS...	19 10 54	17			
13			eL...	19 26 42	20	*1,400		
			M...	19 33 18	20			
			C...	19 45 18	18			
			F...	20 42 ..	17			
			eP...	1 58 24	18			
19			IS...	2 06 42	19			
			L...	2 20 24	17			
			M...	2 28 36	17	*4,100		
			C...	2 38 36	16			
			F...	5 32 ..	17			
20			eP...	3 33 30				
			L...	3 54 00				
			M...	3 58 00	17	*200		
			C...	4 00 ..	17			
			F...	4 18 ..	18			
22			P...	7 35 12	17			
			IS...	7 42 00	17			
			L...	7 49 30	17			
			M...	8 01 48	17	*1,200		
			C...	8 07 18	17			
26			F...	10 38 ..	19			
			L...	17 28 00	16			
			M...	17 37 00	17	*400		
			C...	17 43 00	20			
			F...	18 09 ..	17			
			eP...	12 36 48	16			
			S...	12 38 48	17			
			eL...	12 41 30	19			
			M...	12 47 48	18	*1,400		
			C...	13 12 ..	17			

Actual maximum (*200) at 8:51:18. Times uncertain on account of irregular motion of paper.

L uncertain. End obscured by micro.

* Trace amplitude.

TABLE III.—Data furnished by the Canadian Meteorological Service, July, 1920.

Stations.	Altitude above mean sea level, Jan. 1, 1919.	Pressure.			Temperature of the air.						Precipitation.		
		Station reduced to mean of 24 hours.	Sea level reduced to mean of 24 hours.	Departure from normal.	Mean maximum+mean minimum+2.	Departure from normal.	Mean maximum.	Mean minimum.	Highest.	Lowest.	Total.	Departure from normal.	Total snowfall.
	Feet.	Inches.	Inches.	Inches.	° F.	° F.	° F.	° F.	° F.	° F.	Inches.	Inches.	Inches.
St. Johns, N. F.	125	29.82	29.95	-0.13	66.2	+6.9	74.9	57.5	90	47	3.97	+0.68	00
Sydney, C. B. I.	48	29.93	29.98	+0.05	65.8	+3.5	76.1	55.3	86	48	2.04	-1.61	00
Haliiax, N. S.	88	29.85	29.95	-0.10	64.1	+0.7	74.3	54.0	90	45	4.35	+0.30	00
Yarmouth, N. S.	65	29.88	29.95	-0.07	59.4	-0.1	66.1	52.7	74	46	5.41	+1.79	00
Charlottetown, P. E. I.	38	29.86	29.90	-0.04	68.4	+4.3	76.4	60.3	87	52	2.89	-0.60	00
Chatham, N. B.	28	29.55	29.88	-0.33	66.6	+1.6	77.0	56.1	90	48	4.46	+0.27	00
Father Point, Que.	20	29.50	29.82	-0.32	56.3	-1.3	64.0	48.6	81	43	4.48	+1.44	00
Quebec, Que.	296	29.56	29.87	-0.31	64.5	-1.0	73.6	53.5	85	46	5.26	+1.00	00
Montreal, Que.	187	29.69	29.89	-0.20	67.8	-0.7	76.2	59.5	90	49	3.04	-1.25	00
Stoncliffe, Ont.	489	29.28	29.88	-0.60	67.8	-0.7	76.2	59.5	90	49	3.46	+0.34	00
Ottawa, Ont.	236	29.65	29.91	-0.26	65.8	-3.7	75.5	56.0	88	46	3.84	+0.37	00
Kingston, Ont.	285	29.62	29.92	-0.30	64.2	-4.0	71.5	56.9	79	47	3.18	+0.29	00
Toronto, Ont.	379	29.55	29.94	-0.39	66.4	-1.6	76.7	56.1	87	44	3.63	+0.71	00
Cochrane, Ont.	930	28.60	29.90	-1.30	56.4	-3.1	70.6	42.2	82	29	3.11	+0.31	00
White River, Ont.	1,244	28.60	29.90	-1.30	56.4	-3.1	70.6	42.2	82	29	3.11	+0.31	00
Port Stanley, Ont.	592	29.34	29.98	-0.64	64.1	-3.7	74.6	54.7	83	39	4.79	+0.75	00
Southampton, Ont.	656	29.25	29.98	-0.73	61.2	-3.5	69.8	52.6	81	42	3.18	+1.20	00
Parry Sound, Ont.	688	29.28	29.96	-0.68	63.7	-2.3	74.0	58.4	86	45	4.23	+1.61	00
Port Arthur, Ont.	644	29.25	29.96	-0.71	61.7	-0.3	73.1	50.3	84	39	3.54	+0.06	00
Winnipeg, Man.	760	29.15	29.96	-0.81	66.4	+0.4	79.6	53.3	90	39	0.76	-2.32	00
Minnedosa, Man.	1,690	28.19	29.97	-1.78	65.3	+3.1	79.2	51.4	93	36	2.55	-0.05	00
Le Pas, Man.	860	28.19	29.97	-1.78	65.3	+3.1	79.2	51.4	93	36	2.55	-0.05	00
Qu'Appelle, Sask.	2,115	27.76	29.96	-2.20	68.2	+2.7	80.7	51.7	98	37	3.94	+1.46	00
Medicine Hat, Alb.	2,144	27.68	29.88	-2.20	73.0	+5.2	87.9	58.2	98	46	2.03	-0.06	00
Moose Jaw, Sask.	1,759	27.68	29.88	-2.20	73.0	+5.2	87.9	58.2	98	46	2.03	-0.06	00
Swift Current, Sask.	2,392	27.43	29.99	-2.56	68.0	+1.5	82.7	53.3	97	40	2.16	-0.28	00
Calgary, Alb.	3,428	26.52	30.01	-3.49	65.8	+5.2	81.4	50.2	92	43	4.94	+2.26	00
Banff, Alb.	4,521	25.59	29.98	-4.39	61.7	+5.1	78.6	44.8	88	38	1.88	-1.38	00
Edmonton, Alb.	2,150	27.73	29.97	-2.24	65.1	+4.5	78.7	51.5	92	44	2.33	-0.70	00
Prince Albert, Sask.	1,450	28.43	29.98	-1.55	66.3	+4.4	80.7	51.9	95	41	0.85	-1.20	00
Battleford, Sask.	1,592	28.26	29.97	-1.71	66.3	+1.6	79.2	53.5	94	45	3.98	+1.64	00
Kamloops, B. C.	1,292	28.76	30.02	-1.26	73.4	+4.9	88.4	58.5	97	48	0.35	-1.26	00
Victoria, B. C.	230	29.80	30.05	-0.25	59.8	-0.2	68.0	51.5	91	49	1.00	+0.60	00
Barkerville, B. C.	4,180	25.77	30.03	-4.26	56.2	+1.1	69.5	42.9	82	31	3.56	+0.54	00
Triangle Island, B. C.	680	29.80	30.05	-0.25	59.8	-0.2	68.0	51.5	91	49	1.00	+0.60	00
Prince Rupert, B. C.	170	29.80	30.05	-0.25	59.8	-0.2	68.0	51.5	91	49	1.00	+0.60	00
Hamilton, Ber.	151	30.11	30.27	-0.16	77.0	-1.7	82.8	72.1	85	65	3.53	-0.91	00

SEISMOLOGICAL REPORTS.

W. J. HUMPHREYS, Professor in Charge.

[Weather Bureau, Washington, D. C., Sept. 3, 1920.]

TABLE 1.—Noninstrumental earthquake reports, July, 1920.

Day.	Approximate time, Greenwich civil.	Station.	Approximate latitude.	Approximate longitude.	Intensity of R.S.S.	Number of shocks.	Duration.	Sounds.	Remarks.	Observer.
CALIFORNIA.										
1920.	5 15 35	Whittier	34 00	118 04	3	1	Sec.	None	Felt by several	Associated Press.
	10 5 25	Los Angeles	34 03	118 15	3-4	3?	1-2	do.	do.	P. Hansen.
	16 18 08	Los Angeles	34 03	118 15	6	1	4 ca.	do.	Felt by everyone.	H. B. Hersey.
	21 28	Pasadena	34 65	118 10	3	1	5	do.	Felt by many.	M. S. Jones.
	21 27	Los Angeles	34 03	118 15	6	1	3	do.	Felt by everyone.	H. B. Hersey.
	21 27	Mt. Wilson	34 13	118 16	2	1	1-2	do.	Felt by several.	W. P. Hoge.
	21 30	Los Angeles	34 03	118 15	6	1	3	do.	Felt by everyone.	H. B. Hersey.
		Mt. Wilson	34 13	118 16	3	1	1-2	do.	Felt by several.	W. P. Hoge.
		Pasadena	34 65	118 10	6	1	10	do.	General alarm.	M. S. Jones.
	17 2 14	Los Angeles	34 03	118 15	3	1	1	do.	Felt by several.	R. F. Young.
	23 3 55	McCloud	41 15	122 10	3	1	1	do.	Felt by several.	George Burton.
	4 00	Redding	40 35	122 25	8	1	1	do.	Windows broken, chimneys demolished.	Associated Press.
	14 00	Redding	40 35	122 25	6	1	1	do.	Felt by many.	Do.
	16 00	Redding	40 35	122 25	6	1	1	do.	do.	Do.
	20 00	Redding	40 35	122 25	6	1	1	do.	do.	Do.
	26 12 12	Los Angeles	34 03	118 15	3	2	1-2	Faint	Felt by several.	R. F. Young.
	12 15	Los Angeles	34 03	118 15	4	1	2	Rattling	Awoke light sleepers.	J. M. Bartley.
	27 8 02	Los Angeles	34 03	118 15	3	1	1-2	Faint	Felt by several.	R. F. Young.
	28 19 28	Los Angeles	34 03	118 15	4	1	2	None	do.	H. B. Hersey.
SOUTH DAKOTA.										
	14 23 00	Gelrichs	43 15	103 15	?	1	Few	do.	do.	J. E. Strouse.
		Hot Springs	43 30	103 25	?	1	2	Rumbling	No damage.	Allen Baker.
LATE REPORTS.										
Apr. 14	11 45	Crater Lake, Oreg.	42 50	122 00	5	3	Short	do.	Also felt at Fort Klamath.	H. F. Brown.
May 18	18 00	Santa Monica, Calif.	34 02	118 30	3	1	1	None	Felt by several.	N. Barker-Bates.
June 5	14 01	Summerville, S. C.	33 05	80 15	1	1	1	Faint	do.	Mrs. E. G. Robertson.

TABLE 2.—Instrumental Reports, July, 1920.

[For significance of symbols and abbreviations, and for a description of stations and instruments, see the REVIEW for January, 1920, pp. 62-63.]

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.	Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.	
					A _x	A _N								A _x	A _N			
ALASKA. U. S. C. & G. S. Magnetic Observatory, Sitka.									HAWAII. U. S. C. & G. S. Magnetic Observatory, Honolulu—Continued.									
1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>		1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>		
July 7...		P _N	18 42 49					Instrument in poor adjustment; E not in operation.	July 2		P	21 49 12	17					
		L _N	18 44 17								S	21 59 36	17					
		M _N	18 44 26	10		460					eL	22 16 00	17					
		C _N	18 45 20								M	22 25 24	17		*800			
		F _N	18 45 25								C	22 30	17					
											F	23 19	17					
ARIZONA. U. S. C. & G. S. Magnetic Observatory, Tucson.									* Trace amplitude.									
1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>		ILLINOIS. U. S. Weather Bureau, Chicago.									
July 7...		L _E	18 59 10						1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>		
		e _N	19 00 25	13	10	10			July 2		P	18 59 42						
		M _E	19 01 10								S?	19 09 18						
		C _E	19 04								eL	19 30 40						
		F	19 12								L	19 36 30	23					
CALIFORNIA. Theosophical University, Point Loma.									L not discernible.									
1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>		July 2		P	21 58 20				9,000		
July 1					150	250		Tremors during 24 h. preceding 13 h. that date.			S	22 08 30						
2					200	250						eL	22 31 30					
3					200	300						L	22 44 30	20				
4					100	100						L	22 55	16				
5					50	50						F	0 20					
6					150	150												
8					200	200												
10					200	400												
11					100	100												
13					100	200												
14					200	200												
15					100	150												
16					100	250												
17			18 00 ca		200	200												
18					150	150			Tremors as above.	July 2		P	21 58 20				9,000	
19					200	200							S	22 08 30				
20					200	200						eL	22 31 30					
21					150	300						L	22 44 30	20				
25					100	100						L	22 55	16				
27					100	100						F	0 20					
28					250	400												
29					300	300												
					200	250												
DISTRICT OF COLUMBIA. U. S. Weather Bureau, Washington.										* Trace amplitude.								
1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>		HAWAII. U. S. C. & G. S. Magnetic Observatory, Honolulu.									
July 2		P?	3 21 08					Amplitudes small.	1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>		
		S	3 24 15							July 2		P	18 50 30	18				
		F	3 35 ca									S	18 58 18	17				
5								Feeble quake about 10:12; record uncertain.			eL	19 03 54	17					
7		P	18 49 40						L not found.			S?	19 07 00	17				
		S	18 56 20									M	19 15 36	16	*1,500			
		M	19 05 25		*16,500	*16,500						C	19 30	17				
		F	19 50 ca									F	20 26	17				
7		e	23 33 30															
8		e	0 59 30															
16		P	17 20 36															
		S?	17 26 30															
		L	17 32 20	20														
		F	20 45 ca															
26		P	5 23 57				7,000											
		S	5 33 15															
		F	5 50 ca															
* Trace amplitude.									* Trace amplitude.									
1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>		* Trace amplitude.									
July 2		P	18 50 30					Very considerable increase in amplitude.	1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>		
		S	18 58 18							July 2		P	14 47 12					
		eL	19 07 00									S	1 55 30				8,800	
		M	19 15 36									F	3 ca					
		C	19 30															
		F	20 26															

TABLE 2.—Instrumental Reports, July, 1920—Continued.

ILLINOIS. U. S. Weather Bureau, Chicago—Continued.							CANADA. Dominion Observatory, Ottawa.									
1920.		H. m. s.	Sec.	μ	μ	Km.	1920.		H. m. s.	Sec.	μ	μ	Km.			
July 16	P.	17 21 57				3,400	May 30	eN.						Lost in micros. Quake omitted from May report as it appeared to be local.		
	S.	17 27 05						eL?	21 05							
	L.	17 35	16					M.	21 06 20							
	F.	18 30 ca						F.	21 07 50							
20	e.	1 08 30					July 2	e.						Lost in small micros at about 19h. From deformation instrument only; 13 mm.—1 h.		
	F.	1 40 ca						PR?	19 11 ca.							
20	PP?	5 31 54					eS?	19 16 ca.					May not be seismic.			
	SP?	5 40 15					eL	19 35	50							
	L.	5 48	18				L.	19 47	20							
	F.	6 40 ca					L.	19 56	18							
25	P?	13 28 20					L.	20 10	15				Very feeble.			
	F.	14 ca					F.	20 30								
26	P.	5 24 20				8,300	2	e.	21 55 54					May not be seismic.		
	S.	5 33 55						eL.	21 59 48							
	L.	5 50 20						F.	22 40							
	F.	6 40 ca														
28	e.	0 55					7	O?	18 41 34			4,160	Irregular.			
	F.	1 30 ca						P?	18 49 04							
MARYLAND. U. S. C. & G. S. Magnetic Observatory, Cheltenham.							CANADA. Dominion Meteorological Service, Toronto.									
1920		H. m. s.	Sec.	μ	μ	Km.	1920.		H. m. s.	Sec.	μ	μ	Km.			
July 7	eN.	18 56 24					July 2	L?	19 38 42					P, S, and F masked by micros. Thickening.		
	eS.	19 00 00						eL.	19 43 36							
	eS.	19 01 17	3					M.	19 51 54		*1,300					
	L.	19 04 05						iL.	20 04 12							
	eL.	19 04 35						2	L.	21 42 12					Direction probably SW.	
	M.	19 05 35		220					M.	21 52 06		*200				
	M.	19 05 40		13	200			F.	22 07 48							
	C.	19 10						3	L.	16 52 30					Direction probably NW.	
	C.	19 09								to 58 42		*200				
	F.	19 30						4	L?	07 52 36					Do.	
	F.	19 27							L.	to 57 36		*200				
8	e.	1 02 12		10			16						Marked oscillation of *400 between 15h. 26m. 42s. and 15h. 30m.; may be local.			
	e.	1 02 07			20											
	F.	1 09														
	F.	1 11														
CANAL ZONE. Panama Canal, Balboa Heights.							CANADA. Dominion Meteorological Service, Toronto.									
1920.		H. m. s.	Sec.	μ	μ	Km.	1920.		H. m. s.	Sec.	μ	μ	Km.			
July 1	P.	15 18 28				249	July 2	L?	19 38 42					P, S, and F masked by micros. Thickening.		
	P.	15 18 30						eL.	19 43 36							
	S.	15 18 55						M.	19 51 54		*1,300					
	S.	15 18 57						iL.	20 04 12							
	M.	15 18 59		*300				2	L.	21 42 12					Direction probably SW.	
	M.	15 19 01			*100				M.	21 52 06		*200				
	F.	15 21 00						F.	22 07 48							
	F.	15 20 45						3	L.	16 52 30					Direction probably NW.	
										to 58 42		*200				
	16	P.	17 15 42					483	4	L?	07 52 36					Do.
		P.	17 15 44							L.	to 57 36		*200			
S.		17 16 34														
S.		17 16 36														
L.		17 16 50														
L.		17 16 51														
M.		17 17 11		*5,000												
M.		17 17 23			*8,000											
F.		17 27 10														
F.		17 32 30														
19		P.	15 04 46				407	6							Marked oscillation of *400 between 15h. 26m. 42s. and 15h. 30m.; may be local.	
	P.	15 04 10														
	L.	15 05 12														
	L.	15 05 12														
	M.	15 05 06														
	M.	15 05 14		*800												
	M.	15 05 12			*800											
	F.	15 08 00														
	F.	15 10 00														
	*Trace amplitude.								CANADA. Dominion Meteorological Service, Toronto.							
	VERMONT. U. S. Weather Bureau, Northfield.								CANADA. Dominion Meteorological Service, Toronto.							
1920.		H. m. s.	Sec.	μ	μ	Km.	1920.		H. m. s.	Sec.	μ	μ	Km.			
July 2	eL.	19 43					July 2	L?	19 38 42					P, S, and F masked by micros. Thickening.		
	L.	19 47	20					eL.	19 43 36							
	F.	20 00 ca						M.	19 51 54		*1,300					
7	P.	18 47 55					2	iL.	20 04 12							
	M.	19 03 38						L.	21 42 12							
	F.	19 30 ca						M.	21 52 06		*200					
*Trace amplitude.							CANADA. Dominion Meteorological Service, Toronto.									
*Trace amplitude.							CANADA. Dominion Meteorological Service, Toronto.									

TABLE 2.—Instrumental Reports, July, 1920—Continued.

CANADA. Dominion Meteorological Service, Victoria.

1920.		H. m. s.	Sec.	μ	μ	Km.	
July 2	P	19 04 04				4,120	
	S	19 09 58					
	L	19 21 46					
	M	19 27 40		*4,000			
	M.	1927 00					VERTI-CAL. 25 5
2	P	21 58 37					
	M	22 35 03		*400			
	F	22 31 45					
3	P	16 51 47					
	L	16 55 43					
	M	16 58 40		*200			
4	P	17 10 29					
	P	1702 38					
	M	1 07 33		*200			
6	F	1 15 25					
	P	3224 21					
	M	3 26 19		*100			
6	M	3 44 00		*100			
	F	3 37 30					
	P	18 48 02				820	
7	L	18 49 31					
	M	18 50 29		*1,750			
	F	19 13 08					
	P	18 46 39				1,320	Probably off north coast of California.
7	S	18 48 56					
	L	18 52 09					
	M	18 55 15			14		
8	M	2046 34		*100			
	P	2 54 26					
	M	3 00 50		*200			
16	F	3 05 45					
	P	17 37 33					
	M	17 50 01		*200			
20	F	18 06 05					
	P	1 09 36					
	L	1 12 13					
	M	1 13 12		*200			
26	F	1 20 04					
	P?	5 36 04					
	L?	5 36 43					
7	M	6 02 38		*200			
	F	6 12 58					

* Trace amplitude.

No earthquakes were recorded at the following stations during July, 1920:

COLORADO. Sacred Heart College, Denver.

Reports for July, 1920, have not been received from the following stations:

- ALABAMA. Spring Hill College, Mobile.
- DISTRICT OF COLUMBIA. Georgetown University, Washington.
- KANSAS. University of Kansas, Lawrence.
- MASSACHUSETTS. Harvard College, Cambridge.
- MISSOURI. St. Louis University, St. Louis.
- NEW YORK. Canisius College, Buffalo; Cornell University, Ithaca; Fordham University, New York.
- PORTO RICO. U. S. C. & G. S. Magnetic Observatory, Vieques.

TABLE 3.—Late Reports (Instrumental).

CALIFORNIA. Theological University, Point Loma.

1920.		H. m. s.	Sec.	μ	μ	Km.	
April 3				400	400		Tremors during 24 hrs. preceding 15h. this date.
	4			250	250		Do.
5				250	250		Do.
6				200	200		Do.
7				200	250		Do.
8				100	100		Do.
13		4 43 ca		400	500		Light shock; int. II, R-F.
19				200	200		Tremors as above.
21				300	400		Do.

TABLE 3.—Late Reports (Instrumental)—Continued.

CALIFORNIA. Theological University, Point Loma—Continued.

1920.		H. m. s.	Sec.	μ	μ	Km.		
May	7			100	100		Tremors as above.	
	12			100	100		Do.	
	13			100	100		Do.	
	14			50	50		Do.	
	15			100	150		Do.	
	17			200	200		Do.	
	19			100	100		Do.	
	20			100	100		Do.	
	21		13 50		250	250		Light shock.
			14 20					Do.
	25				50	50		Tremors as above.
	26				100	150		Do.
	28				100	100		Do.
29				30	50		Do.	
30				150	150		Do.	
31				100	100		Do.	
June	6			50	50		Do.	
	7			50	50		Do.	
	8			100	100		Do.	
	9			100	100		Do.	
	10			200	300		Do.	
	13			50	100		Do.	
	16			100	50		Do.	
	17			100	100		Do.	
	18			100	150		Do.	
	19			100	150		Do.	
	20			50	50		Do.	
	21			100	100		Do.	
22		2 67		150	350		Light shock.	
		15 00		150	150		Tremors.	
23				200	300		Tremors as above.	
26				200	450		Do.	
26				100	100		Do.	
28				100	100		Do.	
29				250	350		Do.	
30				100	200		Do.	

DISTRICT OF COLUMBIA. Georgetown University, Washington.

1920.		H. m. s.	Sec.	μ	μ	Km.	
June 2	eP ₁	22 18 46					
	eP ₂	22 18 46					
	S ₁	22 22 36					
	S ₂	22 22 36					
	eL ₁	22 23 30					
	eL ₂	22 23 36					
	L ₁	22 24 42	8				
	L ₂	22 24 24	8				
	F	22 51					
	eP ₁	4 40 48					
	eP ₂	4 40 48					
S ₁	4 48 10						
S ₂	4 48 13						
eL ₁	4 57 18						
L ₁	5 18 21						
L ₂	5 28 27						
M ₁	5 38 16	16	*500				
M ₂	5 37 16	16		*1,200			
F	6 30						
9	e ₁	11 53					Heavy micros.
	e ₂	11 53					Difficult.
	F	12 20					
15	eP ₁	10 25 43					
	eP ₂	10 25 49					
	S ₁	10 28 49					
	eL ₁	10 28 42	9				
	F	10 45					
22	e ₁	3 05					
	e ₂	3 05					
	S ₁	3 10 44					
	F	3 18					

* Trace amplitude.

MASSACHUSETTS. Harvard University, Cambridge.

1920.		H. m. s.	Sec.	μ	μ	Km.	
June 2	O?	22 12 35				2733?	Distance may be greater and 0 earlier by one or more minutes.
	e ₁	22 21 38	4				Phases on both components indistinct before 22h 24m ca. N record distorted by local disturbances and micros.
	S ₁	22 22 29	6				F uncertain, in micros.
	L ₁	22 23 51	12				
	eL ₁	22 24 34	10				
	M ₁	22 25 23	11				
	M ₂	22 26 42	8				
	eP ₁	22 28 43	7 & 10				
	F ₁	23 12 ca					

TABLE 3.—Late Reports (Instrumental)—Continued.

MASSACHUSETTS. Harvard University, Cambridge—Continued.							MASSACHUSETTS. Harvard University, Cambridge—Continued.											
1920.		H. m. s.	Sec.	μ	μ	Km.		1920.		H. m. s.	Sec.	μ	μ	Km.				
June 4	O	15 20ca					Earlier phases not distinguishable from micros before and after this record. Press dispatches mention two quakes felt at Ferrara, Italy, on June 5.	June 18	M _N	10 29 20	11				A 625 _μ trace. Perceptible in next quake.			
	eL _N ?	15 45 51	12															
	M _S	15 48 52	10															
	F?	15 55 06	10															
5	O	4 21 26				11,560	104.04° of arc: eL-0 gives V ₁ 228 kms. sec.	18	O?	10 36 31				675?	Confused with last record on E, and some with a t masked by micros. No reports; may be part of last record.			
	eF _N	4 39 08																
	iF _N	4 40 55																
	iF _N	4 40 51	6															
	S _N	4 56 36	10															
	S _N	4 51 45	13															
	eL _N ?	4 56 22																
	eL _N	4 12 08	54															
	eL _N	4 12 42	54															
	L _N	4 13 32	50															
	L _N	4 15 00	40															
	L _N	4 19 00	30															
	L _N	4 20 00	20															
M _N	4 27 08	18	107?				E damped 1.5/1 only. Chief maximum.	21	O?	14 06 23				3,080?	Fore phases masked by micros. No M.			
M _N	5 31 00	18	170?															
C _N	5 54 00																	
F	6 50 ca																	
9	O	11 20ca				13,900+	E record changed from 12h 14m to 12h 30m; N record has hiatus between 12h 4m and 12h 16m. eL-e, 44m 25s: 1s 12:11:21 8 secs. L waves very flat. S well marked for flat L. After 13h 35m: Lost in micros and artificial motion.		22	O?	1 45 ca					3,860?	O from press dispatches, giving time of a destructive shock at Inglewood, about 10 miles SW. from Los Angeles, at 6 ^h 45 ^m , 6 ^h 47 ^m , June 21, 12 th mer. W. Distance from station to courthouse in Los Angeles is 2,850 kms. Press reports 21 buildings destroyed, several persons slightly injured. In Los Angeles plate glass windows shattered. Shock causing damage followed by two tremors few minutes later. At 10 ^h 40m p. m. a fourth tremor felt at Inglewood and SW part of Los Angeles; slight shock 4 a. m. June 22. Other press notices give time 5 ^h a. m. 13 th mer. W. Harvard record after 2:07:58, from time given for O, would appear to be C vibrations.	
	e _N	11 20 15	6															
	e _N	11 20 27	6															
	e _N	11 53 21	10															
	e _N	11 53 24	12															
	eL _N	11 54 20	12															
	eL _N	12 34 40	60															
	eL _N	12 34 43	40															
	L _N	12 35 24	60															
	L _N	12 36 08	60															
	L _N	12 39 48	30															
	L _N	12 55 34	20															
	L _N	13 08 00	20															
C _N	13 11 09	15																
F _N																		
12	O	20 20ca					Not recognizable on E.	16	e _N ?	20 12 56					Record of doubtful origin; micros only on N.			
	eL _N ?	20 56 26	28															
	L	21 01 21	14															
	L	21 03 17	12															
16	e _N ?	20 12 56					Lost in winding drums.	18	e _N	20 14 54	8				Apparently seismic and not distant.			
	iF _N	20 17 33	8															
	L _N	20 25 04	15															
	F?	20 28 ca	8															
18	O	9 20ca					Apparently seismic and not distant.	18	O	10 22 27				1,450	E masked by micros; distance from epicenter and O from eL _N and S _N -F _N .			
	F _N	9 03 54																
	S _N	9 05 30	6															
	L _N	9 05 42	10															
	L _N	9 05 47	10															
	L _N	9 11 13	15															
L _N	9 13 12	10																
F?	9 15																	
18	O	9 20ca					Apparently seismic and not distant.	June 5	e _N	4 42 57					Probably P ₁ reported from Formosa.			
	S _N	9 45 58	6															
	L?	9 47 29	8															
18	O	10 22 27				1,450	E masked by micros; distance from epicenter and O from eL _N and S _N -F _N .	June 5	eL _N	5 26 19	20							
	eF _N	10 25 42	3															
	eF _N	10 25 49	3															
	S _N	10 28 25	6															
	eL _N	10 29 00	13															
	eL _N ?	10 29 01																

* Possibly of different origin.

Porto Rico. U. S. C. & G. S. Magnetic Observatory, Vieques.

SEISMOLOGICAL REPORTS.

W. J. HUMPHREYS, Professor in Charge.

[Weather Bureau, Washington, D. C., Oct. 3, 1920.]

TABLE 1.—Noninstrumental earthquake reports, August, 1920.

Day.	Approximate time, Greenwich civil.	Station.	Approximate latitude.	Approximate longitude.	Intensity Ross-Forl.	Number of shocks.	Duration.	Sounds.	Remarks.	Observer.
CALIFORNIA.										
1920.	H. m.	Salinas.....	36 36	121 40	3	1	Sec. 5	None.....	Felt by many.....	Dr. E. D. Eddy. P. Hansen.
Aug. 18	7 20	Los Angeles.....	34 03	118 15	4	2-3		do.....	Felt by several.....	
MONTANA.										
16	18 05	Helena.....	46 40	112 00	3	1	2 ca.	do.....	do.....	N. T. Lathrop.
SOUTH CAROLINA.										
1	11 53	Summerville.....	33 04	80 15	2	1			do.....	E. P. Lawton.
UTAH.										
18	8 20	Beaver.....	38 12	112 45	3	1	5-6	Rumbling.....	Traveled from SW. to NE.....	C. T. Baldwin.

TABLE 2.—Instrumental reports, August, 1920.

[For significance of symbols and abbreviations, and for a description of stations and instruments, see the REVIEW for January, 1920, pp. 62-63.]

Date.	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.	
					A _W	A _N			
ALASKA. U. S. C. & G. S. Magnetic Observatory, Sitka.									
1920.			H. m. s.	Sec.	μ	μ	Km.		
Aug. 26	es.....		23 08 16			20		E not in operation. No distinct M.	
	MN.....								
	FN.....		23 19 —						
ARIZONA. U. S. C. & G. S. Magnetic Observatory, Tucson.									
1920.			H. m. s.	Sec.	μ	μ	Km.		
Aug. 3	ePe.....		20 09 08					Times uncertain, due to failure of marking apparatus. Preliminary tremors faint in both components.	
	ePn.....		20 09 44						
	eSn.....		20 17 29						
	eSs.....		20 19 01						
	Le.....		20 25 29	32	10				
	Me.....		20 30 45	20	10				
	Ca.....		20 41 —	16					
	Fe.....		21 08 —	13					
	Fs.....		20 39 —						
15	ePe.....		8 29 27						Not apparent on N. Preliminary tremors faint.
	ePn.....		8 40 13						
	eSn.....		8 58 20						
	eSs.....		9 02 45	21	10				
	Le.....		9 23 —	16					
	Me.....		9 28 —	16					
20	Le.....		16 54 07					Record on N barely perceptible.	
	Ls.....		16 55 04						
	Ms.....		17 00 52	14	10				
	Ca.....		17 02 —						
	Fe.....		17 14 —						
	Fs.....		17 01 —						
26	ePe.....		23 08 25					Preliminary tremors faint on both components. Nothing else on N.	
	ePn.....		23 08 24						
	eLe.....		23 28 50	20					
	Me.....		23 27 25	17	10				
	Ca.....		23 32 —	15					
	Fe.....		23 58 —						
	Fs.....		23 12 —						
29	Pn.....		12 50 18						
	Le.....		12 53 55						
	Ls.....		12 55 06						
	Me.....		12 55 57	8	20				
	Ms.....		12 56 52	7	10				
	Ca.....		13 00 —						
	Fe.....		12 58 —						
	Fs.....		13 05 —						
	Fn.....		13 03 —						
	Fs.....		13 03 —						
CALIFORNIA. Theosophical University, Point Loma.									
1920.			H. m. s.	Sec.	μ	μ	Km.		
Aug. 1					200	300		Tremors during 24h. preceding 15h. on dates given.	
2					200	200			
3					200	300			
4					50	100			
8					100	100			
15					100	100			
18					200	300			
21					100	100			
23					100	100			
25					200	200			
28					100	100			
29					50	50			
30					100	100			
31					100	100			
DISTRICT OF COLUMBIA. U. S. Weather Bureau, Washington.									
1920.			H. m. s.	Sec.	μ	μ	Km.		
July 2	eL.....		19 39 30	30				Quake on Aug. 3 inserted in July report by mistake, instead of this quake.	
	L.....		19 45 —	20					
	F.....		20 15 ca.						
2	P.....		21 56 27					Amplitudes small.	
	S.....		21 59 15						
	F.....		22 20 ca.						
Aug. 3	Pp.....		3 21 08						
	S.....		3 24 15						
	F.....		3 35 ca.						
3	P.....		20 08 08				7,400		
	S.....		20 16 58						
	Ln.....		20 31 35						
	Ls.....		20 29 00						
	L.....		20 36 —	20					
	L.....		20 45 —	16					
	F.....		21 30 ca.						
12	P.....		6 27 12				3,500		
	S.....		6 32 30						
	L.....		6 36 10	18					
	F.....		6 45 ca.						
13	P.....		2 12 46				5,000		
	S.....		2 20 46						
	eL.....		2 33 30						
	F.....		2 40 ca.						

TABLE 2.—Instrumental reports, August, 1920—Continued.

DISTRICT OF COLUMBIA. U. S. Weather Bureau, Washington—Continued.							ILLINOIS. U. S. Weather Bureau, Chicago.							
1920.		H. m. s.	Sec.	μ	μ	Km.	1920.		H. m. s.	Sec.	μ	μ	Km.	
1920. Aug. 15	P	8 36 ca.					Aug. 2	e	6 20 00					
	S	8 46 ca.						L	6 35 —	18				
	eL	9 10 —						F	7 05 ca.					
	L	9 18 —	20					3	eP	3 21 22				
	L	9 24 —	16						PR1	3 27 07				
F	9 50 —					S?	3 31 52							
20	P	16 27 25				8,500	eL		3 52 40					
	S	16 37 03					L		4 10 —	20				
	L	16 52 —	20				F	5 20 ca.						
	L	16 52 —	20				3	P	20 08 00			7,700		
	F	17 30 —						S	20 17 05					
26	P	23 10 14				6,800		L	20 20 —					
	S	23 18 30						L	20 33 —	30				
	eL	23 29 52						L	20 40 —	20				
	F	0 15 —					F	24 ca.						
	F	0 15 —						P	6 27 55			4,300		
27	P	23 10 14				6,800	S	6 34 00						
	S	23 18 30					L	6 39 12						
	eL	23 29 52					L	6 41 —	20					
	F	0 15 —					F	7 20 ca.						
	F	0 15 —						P	21 23 —				May not be seismic.	
HAWAII. U. S. C. & G. S. Magnetic Observatory, Honolulu.														
1920.		H. m. s.	Sec.	μ	μ	Km.	1920.		H. m. s.	Sec.	μ	μ	Km.	
1920. Aug. 3	S	20 22 36	17				Aug. 2	e	21 23 —					
	e	20 39 48						L	21 38 —					
	M	20 50 18	17	*700				F	23 ca.					
	C	21 03 —	17					13	P	2 12 41			6,900	
	F	22 45 —	17						S	2 21 04				
15	iP	8 25 18	17				eL		2 35 —					
	iS	8 32 06	17				L		2 43 —	18				
	eL	8 39 00	19				F		4 ca.					
	M	8 49 00	17	*3,000			15	e	0 50 —					
	C	8 54 —	17					L	0 57 —	16				
F	9 53 —	17				F		1 30 ca.						
17	e	2 54 00						P?	8 33 58					
	M	3 02 30	18	*200				S	8 44 ca.					
	F	3 08 —					L	9 10 —	26					
	20	e	17 48 —					L	9 18 —	18				
		F	20 10 —					F	11 10 ca.					
25		P	22 04 30	17				P	16 26 50			8,900		
		S	22 12 54	17				S	16 36 56					
		L	22 22 00	30				L	16 54 15					
	M	22 31 42	17	*800			L	17 01 —	24					
	C	22 37 —	17				L	18 —	18					
26	eP	23 07 48					F	20 20 ca.						
	S	23 12 00	17				26	P	23 08 10			5,800		
	eL	23 16 00	17					S	23 15 33					
	M	23 20 48	17	*1,100				L	23 24 15					
	C	23 29 —	17					L	23 32 —	22				
F	24 45 —	17				F		1 30 ca.	16					
27	eP	3 48 18					27	eL	13 54 30				May not be seismic.	
	eL	4 05 00	17					L	14 01 45	18				
	M	4 09 48	17	*300				F	14 30 ca.					
	C	4 16 —	17					29	eL	11 42 30				Nothing on NS.
	F	4 25 —	17						L	11 46 30	18			
29	P	11 05 18	17				F		12 10 ca.					
	L	11 12 18	30				29		e	13 00 00				Phases indistinguishable F lost in changing sheets.
	M	11 20 48	19	*500					F					
	C	11 24 —	18											
	F	11 30 —	18											
F	11 30 —	18												

*Trace amplitude.

TABLE 2.—Instrumental reports, August, 1920—Continued.

MARYLAND. U. S. C. & G. S. Magnetic Observatory, Cheltenham.								
1920.		H. m. s.	Sec.	μ	μ	Km.		
Aug. 3	eP ₈	20 08 10				P tremors only on E.		
	eP ₈	20 08 05						
	eS ₈	20 16 59						
	SN	20 16 49						
	LN	20 31 33	30					
	MN	20 38 07	18		20			
	CN	20 47 —						
	FN	20 25 —						
	FN	21 03 —	16					
	20	ePN	16 27 29	3				No distinct M. Not apparent on E.
SN		16 37 16						
eLN		17 03 58						
MN		17 21 —			10			
FN		17 21 —						
26	eP ₈	23 10 15				Preliminary tremors only on E.		
	ePN	23 10 17						
	eS ₈	23 18 38						
	MN	23 31 45	12		10			
	LN	23 31 00						
	CN	23 41 —						
	FN	23 16 —						
	FN	24 01 —						
PORTO RICO. U. S. C. & G. S. Magnetic Observatory, Vieques.								
1920.		H. m. s.	Sec.	μ	μ	Km.		
Aug. 3	PRIN	20 07 12	12			This interpretation adopted after comparison with Cheltenham record. SRI prominent in both components.		
	S ₈	20 12 13						
	eS ₈	20 12 06						
	SRI ₈	20 15 33						
	SRI ₈	20 15 50						
	LP	20 20 17	32					
	eLN	20 21 47	14					
	M ₈	20 22 18	20	250				
	MN	20 26 25	16					
	C ₈	20 27 —	13		30			
	CN	20 29 —	16					
	FN	20 45 —	13					
	FN	20 36 —	9					
	7	P ₈	2 41 41					Apparently slight close shock. No distinct M.
		FN	2 41 21					
M ₈		2 45 —			15			
FN		2 45 —						
FN		2 47 —						
20	S ₈	16 33 09				First appearance seems to be S from comparison with Cheltenham. L ₈ difficult to place.		
	eL ₈	16 42 00						
	eS ₈	16 52 06						
	M ₈	16 46 50	26	20				
	MN	16 52 —	18		10			
	C ₈	16 52 —						
	FN	17 10 —						
	FN	16 56 —						
CANAL ZONE. Panama Canal, Balboa Heights.								
1920.		H. m. s.	Sec.	μ	μ	Km.		
Aug. 3	FN	20 04 38				Dist. about 4,000 km., probably NW.		
	S ₈	20 10 36						
	SN	20 10 30						
	M ₈	20 23 02		*500				
	MN	20 23 44			*1,000			
	FN	21 05 00						
	FN	21 08 00						
VERMONT. U. S. Weather Bureau, Northfield.								
1920.		H. m. s.	Sec.	μ	μ	Km.		
Aug. 3	L	3 25 04	18			Other phases lost in unsteadiness due to loose joint.		
	L	20 36 30						
	F	20 50 ca						
CANADA. Dominion Observatory, Ottawa.								
1920.		H. m. s.	Sec.	μ	μ	Km.		
Aug. 3	eP	3 25 04				Small disturbance, resembling micros.		
	F	4 40 ca						
	3	O	19 57 29				3,140	
		PN	20 05 48					
		SN	20 18 15					
		eL	20 31 30	49				
		L	20 40 —	21				
	13	L	20 51 —	15				
		F	21 30 —					
		IN	2 13 30					
		IN	2 14 06					
	15	IG	2 16 27					
IG		2 22 08						
I		2 22 50						
I		2 24 00						
F		3 50 —						
O		8 22 08			10,000			
20	eP	8 35 10				Phases do not agree very well in giving dist.		
	S ₈	8 46 08						
	SRI ₈	8 52 42						
	OL	9 07 —	33					
	L ₈	9 26 —	18					
	L ₈	9 29 —	17					
	L ₈	9 39 —	16					
	L ₈	10 00 —	15					
	LRI ₈	10 31 —	20					
	F	10 40 —						
21	O ₈	16 15 43			(9,140)			
	eP ₈	16 22 30						
	IP ₈	16 28 03						
	IS ₈	16 38 21						
	OP	16 43 20						
	OL ₈	16 32 30	40					
	L	17 09 —	18					
	L	17 17 to	13					
	L	17 25 —						
	L ₈	17 36 —	12					
26	L ₈	18 09 —	13					
	L ₈	18 20 —	13					
	F	18 30 —						
	C ₈	21 26 26						
	L	21 37 —	11					
27	F	21 51 —						
	O	23 00 04			6,200			
	IP	23 09 46						
	PRIN	23 12 13						
	eS	23 17 33						
29	eL ₈	23 27 39						
	L	23 31 —	24					
	L ₈	23 44 —	18					
	L ₈	0 05 —	13					
	F	0 25 —	12					
29	eL ₈	11 50 23 to 12 05 —	21					

*Trace amplitude.

No earthquakes were recorded during August, 1920, at the following stations:

COLOKADO. *Sacred Heart College*, Denver.

Reports for August, 1920, have not been received from the following stations:

- ALABAMA. *Spring Hill College*, Mobile.
- DISTRICT OF COLUMBIA. *Georgetown University*, Washington.
- MASSACHUSETTS. *Harvard University*, Cambridge.
- MISSOURI. *St. Louis University*, St. Louis.
- NEW YORK. *Canisius College*, Buffalo; *Cornell University*, Ithaca; *Fordham University*, New York.
- CANADA. *Dominion Meteorological Service*, Victoria and Toronto.

SEISMOLOGICAL DISPATCHES¹

Kingston, Jamaica, July 2, 1920:

Kingston and St. Andrew were shaken by an earthquake at 12:20 last night. No damage is reported.—Associated Press.

Victoria, B. C., July 7, 1920:

A well-defined record on the Gonzales Observatory seismograph here to-day indicated an earthquake about 550 miles south of Victoria. The disturbance began at 10:45 a. m. and continued 20 minutes.—Associated Press.

Los Angeles, Calif., July 16, 1920:

A severe earthquake at 10:10 o'clock this morning apparently centered in Los Angeles city, caused slight damage to some of the older buildings, broke a number of plate-glass windows, and frightened the citizens generally. No extensive damage was reported.—Associated Press.

Luray, Va., July 25, 1920:

Following an earthquake, this county, at a late hour yesterday evening, was visited by one of the most severe electrical storms ever known. A short time before the storm struck the county the second most severe earthquake ever known here was experienced. In Luray it was particularly severe, rattling windows and doors.—International News Service.

Santiago, Chile, July 26, 1920:

This city was rocked by a strong earthquake at 12:30 o'clock this morning, but little damage has been reported. It was felt throughout the central zone of the country from Serena to Concepcion. The duration of the shock is estimated here at from 4 to 6 seconds.

Advices from Argentina say an earthquake occurred at Mendoza last night, lasting nearly 2 minutes.

Other estimates of the duration of the shock here vary, some reaching 25 seconds. An investigation revealed small damage to cornices and plaster walls of some buildings.

Dispatches from Valparaiso say that the earthquake produced considerable alarm there.

This morning's quake was the most intense since 1906. It appears to have been stronger at Valparaiso than at Santiago.—Associated Press.

Los Angeles, Calif., July 26, 1920.

A sharp earthquake shock awoke Los Angeles at 4:12 this morning. A few chimneys were knocked down, dishes broken, and windows rattled.—Associated Press.

Mexico City, August 19:

The volcano of Popocatepetl is showing signs of activity, luminous smoke being visible above its crater and ashes falling on the neighboring town of Ayotzingo, in the State of Mexico.—Associated Press.

¹ Collected by seismological station, Georgetown University, Washington, D. C.

Santiago, Chile, August 21:

A series of violent earthquakes visited the southern region of Chile Friday, causing considerable alarm, but so far as has been ascertained little property damage. The shocks were most intense in the Provinces of Malleco and Cautin, and lasted for about a minute. Twenty shocks were reported on the sparsely populated island of Mocha, off the Province of Malleco between 11 a. m. and 4 p. m. Friday, and lighthouses on the island were damaged. No fatalities have been reported.—Associated Press.

San Salvador, Republic of Salvador, August 27:

The volcano San Miguel is throwing out sand and ashes. No damages have been reported.—Associated Press.

London, August 29:

The island of Malta suffered an earthquake shock of considerable force at 2.45 o'clock this morning, says a Central News dispatch from Rome, quoting advices from Syracuse, Sicily. Numerous buildings in Floriana and the surrounding district were seriously damaged and the population was in a panic, the dispatch says.—Associated Press.

TABLE 3.—Late reports (instrumental).

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _z	A _N		
DISTRICT OF COLUMBIA. <i>Georgetown University, Washington.</i>								
1920			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
July 2	eL _N		19 39 30					Heavy micros.
	L _N		19 43 31	23				
	L _S		19 45 15	23				
	F		19 57 —					
2	e _S		21 30 25					Very heavy micros; doubtful.
	e _S		21 30 25					
	S ₇		21 39 25					
	I _N		21 57 20					
	F		22 25 —					
7	eP _N		18 49 40					Micros.
	eP _N		18 49 40					
	S ₇		18 56 30					
	S ₇		18 56 29					
	eL _S		19 04 12	7				
	eL _S		19 04 24	7				
	M _S		19 05 20	6	*10,500			
	M _S		19 05 25	6	*5,700			
	F		19 50 —					
7	e		20 02 —					Micros.
	F		20 11 —					
26	e		5 23 58					Very heavy micros.
	S ₇		5 33 17					
	F		6 ca. —					
*Trace amplitude.								
PORO RICO. <i>U. S. C. & G. S. Magnetic Observatory, Vieques.</i>								
1920			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
July 7	eP _N		0 44 44					
	eP _N		0 44 54					
	I _N		0 45 20					
	M _S		0 45 45		25			
	M _S		0 45 40			25		
	F _N		0 50 —					
	F _N		0 49 —					

SEISMOLOGY.

W. J. HUMPHREYS, Professor in Charge.

[Dated: Weather Bureau, Washington, D. C., Nov. 3, 1920.]

TABLE I.—Noninstrumental earthquake reports, September, 1920.

Day.	Approximate time, Greenwich civil.	Station.	Approximate latitude.	Approximate longitude.	Intensity Rossi-Forel.	Number of shocks.	Duration.	Sounds.	Remarks.	Observer.
CALIFORNIA.										
1919.	<i>H. m.</i>		<i>° ' "</i>	<i>° ' "</i>			<i>Sec.</i>			
Sept. 3	4 30	Los Angeles.....	34 03	118 15	2	3	3	None.....	Felt by one.....	P. Hansen.
9	16 44	Palo Alto.....	37 30	122 06	3	2	2½	.....do.....	Moved desk slightly.....	W. H. Shockley.
	16 49	San Jose.....	37 15	121 53	5	1	10	.....do.....	Felt by many.....	M. Connell.
	16 50	Centerville.....	37 30	122 00	2	1	10	Rumbling.....	Felt by several.....	M. L. Mowry.
15	16 57	San Francisco.....	37 48	122 26	2	1	3	None.....	Felt by one.....	M. W. Allen.
17	12 50	Los Angeles.....	34 03	118 15	2	1	Few.	.....do.....	.....do.....	P. Hansen.
17	6 20	Lakeport.....	39 03	122 56	3	1	5	.....do.....	Felt by many; window shook.....	J. Overholser.
18	11 45	Los Angeles.....	34 03	118 15	3	1	3	.....do.....	Felt by several.....	P. Hansen.
UTAH.										
18	21 05	Brigham.....	41 30	112 00	5	1		Rumbling.....	5-6 waves; spilled water from bucket.....	J. N. Anderson.
18	21 10	Salt Lake City.....	40 45	111 50	3	1	Few.	None.....	Felt by many.....	P. J. O'Gara.
19	13 50	Brigham.....	41 30	112 00	5	1		Ramble.....	.....do.....	J. N. Anderson.

TABLE 2.—Instrumental seismological reports, September, 1920.

Time used: Mean Greenwich, midnight to midnight. Nomenclature: International.

[For significance of symbols see REVIEW for January, 1920, pp. 62-63.]

Date.	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.	Date.	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.
					A _m	A _s								A _m	A _s		
CALIFORNIA. Theosophical University, Point Loma.																	
1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>		1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Sept. 1					100	100		Tremors.	Sept. 7	eL _m		6 32	18				
5					150	250				F		6 37					
8					100	200			8	eP		2 04					
11					200	300				PR ₁		2 07 20					
13					100	100				S		2 12 56					
15					150	300				L		2 07 31					
17					100	200				L		2 07 42	16				
20					100	100				F		3 15					
21					200	300			9								Slight disturbance (L?) between 190 and 200, ca.
COLORADO. Sacred Heart College, Denver.																	
1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>		20	P?		14 54 53				8,800	
Sept. 9								Activity on both components during day.		S		15 04 50					
10								Visible activity at intervals during day.		eL		15 23 30					
17								Visible activity at intervals during day.		L		15 37	24				
20		P ₁	15 02					P not visible on NS.		L		15 45	18				
		S ₁	15 12					Numerous sets of waves with intervals of calm between.		L		16 06	18				
		L ₁	15 23	18	*1,100			Heavy machinery in motion near by.		L		16 23	18				
		L ₂	15 24	18	*1,120					L		16 41	24				
		M ₁	15 31	17-18	*1,100					L		16 46	20				
		M ₂	15 31	17-18	*1,120					F		17 30	ca				
		C ₁	17 02														
		C ₂	17 02							21	P	17 54 48				9,400	Very feeble.
		F	17 08							L		18 44 30					
24								Visible activity at intervals during day.		F		18 50	ca				
										24	P	22 01 40				4,200	
										S		22 07 36					
										L		22 13 00					
										F		22 35					
										27	e	5 41 20					
										L?		5 42 40					
										F		5 55					

*Trace amplitude.

TABLE 2.—Instrumental seismological reports, September, 1920—Continued.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.
					A _m	A _s		
ILLINOIS. U. S. Weather Bureau, Chicago.								
1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Sept. 1		P	2 54 18				5,700	
		S	3 01 40					
		F	3 25 ca					
3		L _B	4 10 ca	15				
		L _S	4 16 ..	10				
		F	4 30 ca					
4		P?	14 30 04				9,700?	
		S?	14 40 50					
		L	14 59 45	24				
		L	15 17 ..	10				
		F	17 10 ca					
7		P	6 15 30				4,700	
		S	6 22 00					
		L	6 27 50	14				
		L	6 36 ..	12				
		F	7 30 ca					
		P	1 59 47				9,000	
		PR ₁	2 03 31					
		PR ₂	2 05 31					
		S	2 10 00					
		SR ₁	2 18 50					
		L?	2 26 35					
		L	2 41 ..	20				
		L	2 48 ..	16				
		F	4 50 ca					
9		P	19 24 54				5,300	
		S	19 31 55					
		L	19 38 ..	30				
		L	19 44 ..	22				
		L	20	18				
		F	22 10 ca					
10		eL	22 56 40	20				
		L	23 10 ..	16				
		F	23 30 ca					
17		P	23 58 07				3,600	
18		S	0 04 00					
		L	0 09 03	25				
		F	0 40 ca					
20		P	14 53 48				9,500	
		PR ₁	14 58 30					
		S	15 04 20					
		L?	15 22 40					
		M	15 41 45		*38,000			
		F	20 ca ..					
21		P	3 03 30				9,800	
		S	3 14 23					
		eL	3 33 ..	22				
		F	4 20 ca					
21		eL	5 57 15					
		F	6 20 ca					
21		P?	17 53 23				9,500	
		S	18 04 00					
		eL	18 24 30					
		L	18 27 30	18				
		F	20 ca ..					
23		P	5 43 22				9,200	
		S	5 53 42					
		L	6 11 15	22				
		L	6 28 ..	16				
		F	6 50 ca					
24		P	22 01 50				4,300	
		S	22 07 55					
		SR ₁	22 10 24					
		L _S	22 13 00					
		F	23 50 ca					
27		P	5 31 19				2,700	
		S	5 35 40					
		L	5 37 40					
		M	5 39 45		*6,000	*5,500		
		F	6 40 ca					
NEW YORK. Cornell University, Ithaca.								
1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Sept. 8		e	2 12 20	9				
		e	2 20 09	12				
		F	2 43 ..					
20		eP?	15 06 24	3				
		eS	15 18 20	10				
		c	15 21 30	16				
		L	15 33 20	22				
		F	17 01 ..					
24		P _S	22 02 10	3				
		eS _S	22 07 54	4				
		L _S	22 10 47	12				
		L	22 12 50	22				
		F	22 22 ..					
27		e	5 42 12		5			
		L	5 43 14		11			
		F	5 54 ..					
CANAL ZONE. Panama Canal, Balboa Heights.								
1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Sept. 3		P _S	16 20 20				257	Direction prob. SW.
		P _N	16 20 23					
		S _S	16 20 48					
		S _N	16 20 51					
		M _S	16 20 52		*800			
		M _N	16 21 00			*400		
		F _S	16 23 35					
		F _N	16 23 00					
20								Slight tremors from distant quake between 14:30 and 17h; distance and direction unknown.
24		P _S	21 55 47				579	Direction prob. NW; distinctly felt at Ponomo, R. F.
		P _N	21 55 44					
		S _S	21 56 50					
		S _N	21 56 46					
		L _S	21 57 20					
		L _N	21 57 34					
		M _S	21 57 46		*44,000			
		M _N	21 58 38			*44,000		
		F _S	22 19 00					
		F _N	22 19 40					
VERMONT. U. S. Weather Bureau, Northfield.								
1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Sept. 20		P?	15 01 ..					
		eL	15 32 ..	40				
		L	15 40 ..	24				
		L	15 45 ..	18				
		F	17 ca ..					
27		e	5 44 ..					
		F	5 50 ..					
* Trace amplitude.								

* Trace amplitude.

TABLE 2.—Instrumental seismological reports, September, 1920—Continued.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.	Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.	
					A _B	A _N								A _B	A _N			
CANADA. Dominion Observatory, Ottawa.																		
1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>		1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>		
Sept. 4			(14 17 16)				(8780)		Sept. 1			37 04 00						Doubtful as to being seismic.
	O		14 29 17						4	P		15 12 54						
	S ₂		14 39 15							i		15 16 30						
	eL		14 57							S ₂		15 19 42						
	L		15 07	21						L		15 27 30						
	L _a		15 20	19						M		15 29 30		*300				
	L _b		15 30	17						F		16 00 42						
	L _c		15 40	16					7	eL		6 31 18						
	L _d		15 45	16						M		6 33 24		*200				
	LR1 _a		16 34 30							F		6 41 06						
	F		16 40															
	O		5 55 44				6450	Italian quake; epicentre in northern Italy.	8	S		2 12 06						Faint trace. Italian quake.
	P		6 05 41							L		2 14 54						
	S _a		6 13 41							M		27 15 54		*500?				
	eL		6 23 12							L ₇		2 52 00						
	L _a		6 30	17						eL		2 53 06						
	L _b		6 42	13						M		2 57 48						
	F		7 10							F		47 09 48		*800				
	O?		1 49 ca				10,000	Distance obtained by approx. agreement in PR1 _a , S _a , eL and LR1 _a ; O obtained by subtracting I _a at 10000 from S ₂ at 2-13 ca.	9	i		19 07 12		*300				Preceded by small micros. Difficult seismogram to read.
	PR1 _a ?		2 05 25							P?		19 15 12						
	S _a		2 10 51							S		19 55 06						
	i _a		2 12 00							e?		19 27 54						
	S ₂ ?		2 33 58							L		19 54 54						
	eL ₁₀		2 33 58	40						iL		19 58 48						
	L		2 35	40						L		20 08 12						
	L _a		2 39	22						L ₁₀		20 16 12						
	L _b		2 48	18						M		20 16 36		*500				
	L _c		2 53	16						L		21 05 30						
	L _d		3 08	16						L		21 24 30						
	L _e		3 12	14						F		21 32 36						
	L _f		3 20	14					18	i		0 01 36						
	L _g		3 28	13						eL		0 07 42						
	LR1 _a		4 00	20						M		0 11 48		*800				
	F		4 20							F		0 18 00						
	ePR1?		19 15 31						20	P?		14 57 42						
	e		19 28 23							i?		14 59 18						
	e		19 32 47							i		15 06 54						
	eL?		19 43 48							iS		15 08 30						
	L _a		19 46	35						L		15 15 18						
	L _b		19 55	25						L		15 40 18						
	L _c		20 00	23						L		15 40 54						
	L _d		20 05	20						M?		15 49 48		*23000?				
	L _e		20 16	20						eL		16 55 54						
	L _f		20 28	17						F		18 32 36						
	L _g		20 35	15														
	LR1 _a		21 00	23					21	eL		3 38 54		*300				Micros 3:28:18 to 3:25:06.
	F		21 15							M		3 46 24						
	ep		0 02 10					NS component masked by micros.		F		3 51 12						
	eL ₁₀		0 05 38	19					24	S		22 08 42						
	F		0 22							eL		22 12 24						
	O		14 45 12				9,660			M		22 15 36						
	Pv		14 57 57							F		22 17 24		*2000				
	i _a		15 04 55									23 08 24						
	i _b		15 06 27															
	S ₂		15 08 40						24	L		23 46 36		*200				
	eL ₁₀		15 29 48	50						F		23 49 54						
	L		15 40	27														
	M _a		15 45	20	1,000	90		Av. 600 μ .										
	L		15 55	17														
	L _a		16 06	17														
	L _b		16 21	15														
	L _c		16 45	24?														
	L _d		16 56	17														
	LR1 _a		16 58 48	16														
	F		18 00 00						21	eL _a		3 35 to	24 to					NS component completely obscured by micros.
	eL _b		3 43	18						L _a		3 43	18					
	L _b		3 53	16						F		4 10						
	F		4 10						21	e		18 04 24						
	O		21 54 54				4,340			eL ₁₀		18 19						
	P _N		22 02 37							L _a		18 25 30						
	PR1 _a		22 04 07							L _b		18 30	15					
	S _a		22 08 43							L _c		18 40	15					
	eL ₁₀		22 11 16							F		19 ca.						
	L		22 13 30	22					24	O		21 54 54						
	L _a		22 28	10						P _N		22 02 37						
	F		23 15							PR1 _a		22 04 07						
	O?		5 24 34				4,220			S _a		22 08 43						
	P _N ?		5 32 08							eL ₁₀		22 11 16						
	S _a		5 38 08							L		22 13 30	22					
	eL		5 45 38	20						L _a		22 28	10					
	L		5 54	8						F		23 15						
	L _a		6 03	9														
	F		6 30															
	e		0 31 54						28	e		0 31 54						
	F		0 56 00							F		0 56 00						

CANADA. Dominion Meteorological Service, Toronto.

*Trace amplitude.

TABLE 2.—Instrumental seismological reports, September, 1920—Contd.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _E	A _N		
CANADA. Dominion Meteorological Service, Victoria.								
1920. Sept. 1		P	11. m. s.	Sec.	μ	μ	Km.	
		M	3 03 13					
		F	3 08 37		*200			
		F	3 17 28					
4		P	14 58 02					
		M	15 32 58		*200			
		F	16 22 38					
7		P?	6 28 14					
		L	6 35 07					
		M	6 39 45		*300			
		F	6 49 22					
8		S	1* 58 47					
		L	2 08 38					
		eL	2 15 09					
		M	2 17 58		*500			
		F	3 16 00					
9		P	19 09 11				8570	
		S	19 19 01					
		L	19 31 48					
		M	19 37 13		*500			
		V	21 42 08					
18		M	0 27 09		*200			
20		P	14 51 26				2390	Alaska.
		S	14 55 22					
		L	15 02 16					
		M ₁	15 23 54		*5500			
		M ₂	15 31 07		*5500			
		eL	16 54 30					
		eL	17 06 24					
		M	17 13 12		*2000			
		F	18 44 33					
VERTICAL.								
		P	14 51 39		9		2620	
		S	14 55 45		7			
		L	15 02 30					
		M	15 19 31		39		10	
24		L	5 49 46					
		M	5 53 42		*100			
24		P	22 12 29					
		L	22 22 19					
		M	22 29 32		*500			
		F	22 46 24					
27		P?	5 35 16				1400	Real P may not be recorded. Alaska.
		L	5 37 45					
		M	5 41 10		*500			
		F	5 50 30					

*Trace amplitude.

Reports for September, 1920, have not been received from the following stations:

- ALABAMA. *Spring Hill College, Mobile.*
- ALASKA. *U. S. C. & G. S. Magnetic Observatory, Sitka.*
- ARIZONA. *U. S. C. & G. S. Magnetic Observatory, Tucson.*
- DISTRICT OF COLUMBIA. *Georgetown University, Washington.*
- HAWAII. *U. S. C. & G. S. Magnetic Observatory, Honolulu.*
- KANSAS. *University of Kansas, Lawrence.*
- MARYLAND. *U. S. C. & G. S. Magnetic Observatory, Cheltenham.*
- MASSACHUSETTS. *Harvard University, Cambridge.*
- MISSOURI. *St. Louis University, St. Louis.*
- NEW YORK. *Canisius College, Buffalo; Fordham University, New York.*
- PORTO RICO. *U. S. C. & G. S. Magnetic Observatory, Vieques.*

SEISMOLOGICAL DISPATCHES.¹

Los Angeles, September 3.

A light earthquake shock was felt in outlying parts of the city early to-day. No damage was reported.—*Associated Press.*

¹ Collected by seismological station, Georgetown University, Washington, D. C.

London, September 7.

The town of Fivizzano, 34 miles northwest of Lucca, has been completely demolished by an earthquake, according to a Spezia dispatch to the Exchange Telegraph. The dispatch adds that Solero and Monte were badly wrecked.—*Associated Press.*

Rome, September 7.

The earthquake in northern Italy was of a violent nature. Villa Collemantina is reported to have been destroyed. Castiglione, Pieve Fosciano, Vaglia, Camporgiano, San Donnino, Piazza Alserchio, Poggio, Castegnola, Fosciendora, and Canigiano have been badly damaged.—*Associated Press.*

Pisa, Italy, September 7.

The earthquake shock here was preceded by deep rumblings and followed by vertical and horizontal earth tremors which lasted for 13 seconds. The hands of the clock in the tower stopped at 7.55 o'clock this morning.—*Associated Press.*

Rome, September 9.

Another violent earthquake occurred in the Emilia district at 2.35 o'clock this morning, causing loss of lives and important damage. The communities suffering the most were Reggio, Ospedaletti, Bussana, Toano, and Cavola. This morning's shock was more violent than that of Tuesday. The Epoca estimates that the dead in the earthquake of Tuesday exceed 500 and the homeless more than 20,000.—*Associated Press.*

Riverside, Calif., September 10.

An earthquake shock was felt here this morning about 5.16. It was of sufficient violence to awaken sleepers and many persons fled into the open until the tremors subsided. No damage was reported.—*Associated Press.*

Rome, September 10.

Earthquake shocks continue, causing more victims among the rescuers owing to falling masonry. To-day there were shocks as far south as Cassino, near Naples. Apparently there was no serious damage nor victims, but the shocks produced great panic among the population, which recalled its experiences in the earthquake of 1915. A volcanic crater has suddenly opened at the top of Pizzo d'Ucello, a mountain 5,845 feet high about 9 miles northeast of Spezia. It is located on what appears to be the northeast corner of the district shaken by Tuesday morning's earthquake, which resulted in the loss of hundreds of lives in the region just north of Florence. A telegram from Spezia states the crater is emitting smoke and sulphuric fumes and that scientists there attribute the volcanic outbreak to the earthquake.—*Associated Press.*

Geneva, Switzerland, September 10.

A severe earthquake shook the southern slopes of the Swiss and Italian Alps yesterday from Monterosa to Bernina Pass, causing avalanches. The shock was accompanied by heavy snowfalls, and several Alpine villages are isolated. Four persons are reported to have been killed and many injured. Slighter shocks also were reported in the Swiss Alps around Zermatt and Ponterosina, but there were no casualties.—*Associated Press.*

Rome, September 10.

Minor earthquake shocks which have been felt since Tuesday morning in the devastated zone north of Florence indicate the disturbance is subsiding, according to Father Alfani, director of the observatory here. He

said that small shocks succeeding each other rather frequently show the seismic phenomena are wearing out. "The shocks in the present case," he declared, "are to be considered as good omens as indicating that no serious recurrence of the earthquake may be expected."—*Associated Press.*

Berlin, September 10.

The seismographic station at Jenö suggests as the possible cause of the Italian earthquake a sinking of the earth along the mountains bordering the Gulf of Genoa. Experts there say it indicates a massive caving zone in the earth's crust.—*Associated Press.*

Comrie, County of Perth, Scotland, September 13.

An earthquake shock was experienced here this morning. The inhabitants were awakened when their beds and furniture were shaken by the shock. A dull rumbling sound accompanied the shock.—*Associated Press.*

Rome, September 15.

Scientists say they do not believe that a new volcano was created on Mount Pisanino, near Spezia, during the earthquakes which began September 7 and continued until September 9 causing the loss of 500 lives. Tongues of flame and smoke or dust were seen to be emitted from what is popularly supposed to have been a new crater opened near the mountain top. Frank A. Perrett, the American volcanologist for the Carnegie Institution who occupies a station at Mount Vesuvius to observe its operations, has expressed to the *Associated Press* the opinion that no new volcano has been formed but that the earthquakes caused displacements of subterranean strata causing a fissure in the earth's crust and that gas escaping therefrom was mistaken by onlookers as the opening of a new crater.—*Associated Press.*

Vienna, September 23.

Slow moving landslides covering considerable territory are doing considerable damage in the Sandling Alps of upper Austria. The entire mountain surface apparently is settling into the Leisling Valley. Many huts have been destroyed, and hamlets, forests and fields are moving bodily, accompanied by tremendous noises.—*Associated Press.*

London, September 27.

A violent earthquake is reported to have occurred at Giarre, Sicily, according to a Rome dispatch to the Exchange Telegraph Co. Giarre lies at the base of Mount Etna. The quake lasted 10 seconds. One village was destroyed and many persons were injured.—*Associated Press.*

Madrid, September 28.

Widespread alarm was caused in the vicinity of Crihucla, about 35 miles north of Cartagena, when a sharp earth shock occurred at 10.45 o'clock Sunday night, according to advices received here. Many families passed the night in the fields, fearing a repetition.—*Associated Press.*

Catania, Sicily, September 29.

Relief measures for the victims of the earthquake near here on Sunday are being expedited, and many

persons injured during the disaster have been rescued from the ruins. The shock was most violent at Giarre, and the village of Codadivolpe, nearby, was demolished. The damage throughout the district was enormous.—*Associated Press.*

LATE REPORTS.

TABLE 2—Instrumental reports.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _z	A _N		
DISTRICT OF COLUMBIA. <i>Georgetown University, Washington.</i>								
1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Aug. 3		eP	3 24 —					
		eS	3 24 —					
		F	3 35 —					
3		eP _N	20 08 11					
		S _N	20 17 11					
		eL	20 28 12					
		L	20 31 37	26				
		F	31 20 —					
13		eP	8 37 10					Heavy micros.
		L	9 25 11	18				
		L	9 25 10	17				
		F	10 30 —					
20		eL _N	16 56 12	24				Sheets taken off at 16h 21m, put on at 16h 29m, quake then in progress.
		eL _N ?	16 56 00	24				
		L	17 02 —	11				
		L	17 01 16	16				
		F	18 — —					
26		iP _N	23 10 13					
		iP _N	23 10 14					
		S _N	23 18 31					
		eL	23 30 —					
		L	23 33 —	9				
		L	23 34 11	20				
		F	0 30 —					
27								
NEW YORK. <i>Cornell University, Ithaca.</i>								
1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
June 2		eP	22 13 30	4				Irregular, short period waves.
		L	22 18 14	21				
		F	22 36 —					
4		e	15 41 —					
		F	16 02 —					
5		P	4 39 25	4				
		L	5 12 20	35				
		F	6 20 —					
18		e	10 25 30	4				
		F	10 34 30					
22		e	3 05 30	10				
		F	3 13 —					
July 2		L	19 40 —	24				
		F	19 58 —					
7								Quake after 18 hr.; seismograph out of order.
8		e	1 00 09	3				
		L	1 03 02	7				
		F	1 07 —					
Aug. 3								Time marker not recording; beginning 20 hr. ca., L-S 12 min. ca.
13		c	2 13 —	4				
		F	2 24 —					
15		eL	9 09 —	28				
		F	9 16 —					
20		eP	16 27 10	4				
		S	16 37 12	6				
		L	16 51 38	38				
		F	18 08 —					

TABLE 2.—Instrumental reports—Continued.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _E	A _N		
CANADA. Dominion Meteorological Service, Toronto.								
1920.			<i>H. m. s.</i>	<i>Sec.</i>	<i>μ</i>	<i>μ</i>	<i>Km.</i>	
Aug. 3	L?		3 23 48		*200			Micros going on.
3	P?		20 06 36					P preceded by minute micros.
	IP?		20 11 24					
	IS		20 19 12					
	eL		20 33 18					
	eL		20 42 30					
	M		20 47 30		*1400			
	eL		20 55 36					
	eL		21 11 12					Micros.
	F							
11	eL		20 13 24					Micros going on.
	eL		20 14 24					
	M		20 15 36		*800			Micros.
	F							
12	eL		6 39 30					
	M		6 42 06		*200			
	F		6 45 44					Gradual thicken- ing.
13	P?		2 12 18					
	L		2 22 00					
	M		2 23 18		*200			
	F		2 32 30					
15	S		8 46 54					
	M		8 49 42		*700			
	L		9 02 42					
	eL		9 21 12					
	eL		9 28 48					
	F		10 45 30					
20	L		17 02 24					Light turned down 16.38 to change paper.
	eL		17 08 36					
	M		17 10 18		*700			
	eL		17 21 24					
	F		17 38 48					
26	L		22 53 48		*200			May not be seis- mic.
	F		22 56 48					
26	P		23 09 06					
	I		23 12 42					
	S		23 17 24					
	eL		23 32 48					
	M		23 39 48		*800			
	F		1 21 12					
29	eL		11 53 48					
	M		11 57 18		*200			
	F		12 01 12					

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _E	A _N		
CANADA. Dominion Meteorological Service, Victoria.								
1920.			<i>H. m. s.</i>	<i>Sec.</i>	<i>μ</i>	<i>μ</i>	<i>Km.</i>	
Aug. 3	P		3 13 42					
	S		3 26 34					
	L		3 41 19					
	M		3 53 05		*100		6300?	
	F		4 30 30					
3	P?		20 20 42				3620?	Probably from Aleutian Islands. Fine marks in- distinct.
	S?		20 26 07					
	L		20 34 28					
	M		20 41 21		*1500			
	F		22 44 18					
11	P		20 38 51					
	L		20 41 46					
	M		20 44 42		*200			
	F		20 51 33					
12	P		6 51 35					
	M		6 58 28		*200			
	F		7 09 48					
15	P		8 28 05					
	L		8 38 54					
	M		8 45 47		*600			
	F		10 57 36					
17	M		3 17 14		*50			
20	P		16 39 08					
	S		16 47 30					
	L		16 58 19					
	M		17 06 41		*600		6860	
	F		18 58 48					
	M		22 44 39		*200			
25	P		23 01 09					
	S		23 06 04					
	L		23 10 30					
	M		23 15 25		*1000			
	F		0 08 32					

* Trace amplitude.

* Trace amplitude.

SEISMOLOGY.

W. J. HUMPHREYS, Professor in Charge.

[Dated: Weather Bureau, Washington, D. C., Dec. 3, 1920.]

TABLE 1.—Noninstrumental earthquake reports, October, 1920.

Table with 11 columns: Day, Approximate time, Greenwich civil, Station, Approximate latitude, Approximate longitude, Intensity Rossi-Forel, Number of shocks, Duration, Sounds, Remarks, Observer. Includes data for California and Missouri stations.

TABLE 2.—Instrumental seismological reports, October, 1920.

Time used: Mean Greenwich, midnight to midnight. Nomenclature: International.

[For significance of symbols see REVIEW for January, 1920, pp. 62-63.]

Table for Alabama: Spring Hill College, Mobile. Columns: Date, Character, Phase, Time, Period T, Amplitude (A_E, A_N), Distance, Remarks.

Table for California: Theosophical University, Point Loma. Columns: Date, H. m. s., Sec., mu, Km, Remarks.

Table for Colorado: Sacred Heart College, Denver. Columns: Date, H. m. s., Sec., mu, Km, Remarks.

Table for District of Columbia: Georgetown University, Washington. Columns: Date, Character, Phase, Time, Period T, Amplitude (A_E, A_N), Distance, Remarks.

Table for District of Columbia: U. S. Weather Bureau, Washington. Columns: Date, H. m. s., Sec., mu, Km.

* Trace amplitude.

TABLE 2.—Instrumental seismological reports, October, 1920—Continued.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _W	A _N		
DISTRICT OF COLUMBIA. U. S. Weather Bureau, Washington—Con.								
1920. Oct. 3			H. m. s.	Sec.	μ	μ	Km.	Clock stopped; rec-ord lost.
7	P. S. L. F.		21 03 06 21 10 26 21 18 20 21 40 ..				5,700	
8	P. S. M. F.		16 56 24 17 01 32 17 07 25 17 30 ca		*2,000	*2,000	3,400	
18	P. S. L. F.		8 24 09 8 34 24 8 52 14 8 40 ca				9,100	
18	e. F.		12 33 20 12 40 50					
18	e. S? F.		13 57 .. 14 14 .. 14 40 ..					
20	eL. F.		12 09 .. 12 25 ..					
22	P. S. L. F.		12 20 05 12 28 20 12 39 20 13 00 00				6,700	
27	P. S. F.		11 48 44 11 52 44 11 56 44				2,400	
27	P. S. F.		11 57 24 11 01 12 12 15 ..					
28	P. S? e. F.		7 31 47 7 40 45 8 00 00 8 20 ..					
28	iP. S. eL. F.		12 59-59 13 05 48 13 23 .. 13 40 ..					

ILLINOIS. U. S. Weather Bureau, Chicago.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _W	A _N		
ILLINOIS. U. S. Weather Bureau, Chicago.								
1920. Oct. 1			H. m. s.	Sec.	μ	μ	Km.	Clock stopped; rec-ord lost.
7	P. S. eL. F.		18 55 34 19 00 19 19 06 06 20 20 ca				3,000	
3	e. cL. F.		5 42 30 5 46 .. 6 30 ca		16			
5	e. cL. F.		19 17 25 19 20 .. 19 40 ca					
7	P. S. L. M. F.		21 03 54 21 11 12 21 17 49 21 21 25 22 20 ca		25	*4,000	*4,000	
8	P. S? L? L? F.		16 56 18 17 01 18 17 04 20 17 06 00 18 ca					
12	eL. L. F.		7 46 .. 7 50 .. 8 00 .. 8 20 ca		22 16			
18	P. PR1. S. L. F.		8 23 38 8 26 39 8 33 29 8 49 45 9 02 .. 11 ca				8,600	
18	e. S? F.		12 16 06 12 24 22 12 50 ..					
18	e. F.		13 03 10 14 20 ca					

* Trace amplitude.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _W	A _N		
ILLINOIS. U. S. Weather Bureau, Chicago—Continued.								
1920. Oct. 20			H. m. s.	Sec.	μ	μ	Km.	Clock stopped; rec-ord lost.
22	L. L. F.		10 54 21 11 06 30 11 40 ca		16			
22	P. S. L. L. F.		12 20 26 12 29 10 12 42 .. 12 52 .. 14 30 ca			30 16	7,300	
24	eL. L. F.		2 36 15 2 38 30 3 10 ..		18			
27	S? L? F.		11 55 25 11 58 25 13 00 00					
28	P. S. L. L. F.		7 33 50 7 41 55 7 52 16 7 58 .. 8 03 .. 11 ca			25 22 16	6,500	
28	P. S. L. L. F.		13 01 18 13 10 45 13 25 33 14 00 00 14 09 .. 15 20 ca			30 18 14	8,100	

NEW YORK. Cornell University, Ithaca.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _W	A _N		
NEW YORK. Cornell University, Ithaca.								
1920. Oct. 7			H. m. s.	Sec.	μ	μ	Km.	Irregular, short period waves.
8	eP. eS. L. F.		21 04 01 21 11 18 21 18 10 21 33 ..		3 4 27			
8	e. e. F.		16 57 30 17 01 22 17 18 ..		4 5			
18	P. PR. S. eL. F.		8 24 05 8 27 19 8 34 15 8 51 56 9 21 ..		4 4 5 30			
18	e. F.		12 33 36 12 41 ..		9			
18	e. e. e. F.		13 07 30 13 12 35 13 21 04 13 37 ..		4 10 11			
22	P. S. eL. F.		12 20 33 12 29 05 12 41 15 13 14 ..		4 6 14			
28	eL. F.		8 00 30 8 13 ..		18			
28	P. PR. eS. F.		13 01 22 13 03 50 13 25 30 13 45 ..		5 4 18			

VERMONT. U. S. Weather Bureau, Northfield.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _W	A _N		
VERMONT. U. S. Weather Bureau, Northfield.								
1920. Oct. 8			H. m. s.	Sec.	μ	μ	Km.	Clock stopped; rec-ord lost.
18	e. F.		17 06 .. 17 15 ..					
18	P. S. L? F.		8 24 .. 8 34 10 8 50 .. 9 15 ca				9,000	
18	e. F.		13 14 .. 13 30 ..					
22								
28	e. F.		13 01 50 13 15 ..					

* Trace amplitude.

TABLE 2.—Instrumental seismological reports, October, 1920—Continued.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _E	A _N		
CANAL ZONE. Panama Canal, Balboa Heights.								
1920.								
Oct. 7	P		H. m. s.	Sec.	μ	μ	Km.	Epicenter prob-ably in Mexico.
	S _E		20 59 06				2,494	
	S _N		21 03 04					
	S _N		21 03 10					
	M _N		21 03 42		*1,500	*900		
	F _N		21 04 12					
	F _N		21 17 00					
	F _N		21 16 15					
22	P _N		12 16 26				3,460	Distance from Washington, 6,920 km. Direc-tion unknown.
	P _N		12 18 25					
	S _N		12 21 35					
	S _N		12 21 48					
	M _N		12 22 20		*500			
	M _N		12 21 53			*1,500		
	F _N		12 35 00					
	F _N		12 47 00					
28	P _N		12 57 20					Very slight on EW; dist. 4,311 km. ca., dir. S.; timer not rec. on EW.
	S _N		12 59 20					
	M _N		12 59 20			*500		

CANADA. Dominion Observatory, Ottawa.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _E	A _N		
CANADA. Dominion Observatory, Ottawa.								
1920.								
Oct. 1	e.		H. m. s.	Sec.	μ	μ	Km.	Micros interfere with registration of preliminary phases.
	eL?		19 02 25					
	F		19 11 54					
	F		20 00 ..					
5	e.		19 22 30					Micros.
	eL?		19 23 ..					
	L		19 24 18					
	L		to 30 ..	10				
	F		19 50 ..					
	F		19 50 ..					
7	O		20 55 18				5,700	Irregular waves in L phase.
	P		21 04 31					
	S		21 11 51					
	i _g		21 12 33					
	i _g		21 14 11					
	eL _N		21 19 16					
	L		21 22 ..	28				
	L		21 30 ..	22				
	L		21 40 ..	16				
	F		22 ca ..					
	F		22 ca ..					
8	O?		16 50 28				(3,600)		Irregular waves in L phase.
	P		16 57 16					
	S _N		17 02 40					
	eL		17 06 25					
	F		17 50 ca					
	F		17 50 ca					
18	O		8 11 49				8,780	LR1 recorded sharply on de-formation instru-ment, 10:30.
	iP _v		8 23 30					
	iS _v		8 33 49					
	eL _v		8 52 24					
	L _v		8 55 ..	28				
	F _v		9 ca ..					
HALIFAX.								
	O		8 11 52				9,100	Halifax and Ottawa together indicated epicenter in Kurile Ids.
	eP _N		8 24 10					
	iS _N		8 34 26					
	eL		8 52 56					
20	e _g		10 54 30					Irregular.
	eL _N		11 03 30	24				
	F		11 20 ..					
22	O		12 09 51				7,390	Irregular.
	iP _{NV}		12 20 46					
	iS		12 25 30					
	iS _{NV}		12 29 55					
	i _g		12 30 20					
	eL		12 31 22					
	eL		12 37 30					
	L		13 00 ..	18				
	F		13 18 ..					
	F		13 18 ..					
	F		13 18 ..					
24	eL _N		2 42 40					
	F		2 50 ca					
28	e _g		(7 43 00)					
	eL _N		7 53 08					
	L		7 56 48	20				
	L		8 02 45	16				
	L		8 19 00	12				
	L		8 30 ..					
	F		8 30 ..					

*Trace amplitude.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _E	A _N		
CANADA. Dominion Observatory, Ottawa—Continued.								
1920.								
Oct. 28	O		H. m. s.	Sec.	μ	μ	Km.	Press reports quake 900 miles from La Plata.
	P _N		12 50 11				8,080	
	PR1 _N		13 01 36					
	PR2 _N		13 04 45					
	PR2 _N		13 06 21					
	S _N		13 11 00					
	i _N		13 11 24					
	i _N		13 12 42					
	SR1 _N		(13 16 14)					
	SR2 _N		(13 19 10)					
	eL _N		13 25 08					
	L		13 26 45	24				
	L		13 28 ..	28				
	F		14 30 ..					

CANADA. Dominion Meteorological Service, Toronto.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _E	A _N		
CANADA. Dominion Meteorological Service, Toronto.								
1920.								
Oct. 1			H. m. s.	Sec.	μ	μ	Km.	Light off 19:06 to 19:10 attending in-strument; quake lost.
			21 00 54					
			21 09 00					Micros render read-ings doubtful.
			21 13 42					
			21 17 24					*600
			21 18 48					
			21 40 54					Micros.
			21 40 54					
			17 01 06					Small micros going on.
			17 04 30					
			17 08 48					*400
			17 09 54					
			17 09 54					Micros.
			17 09 54					
			7 53 54					*100
			7 56 54					
			14 54 30					*200
			14 57 30					
			8 17 36					Faint record.
			7 28 24					
			8 27 24					*300
			8 34 42					
			8 42 48					*1000
			8 58 24					
			9 05 54					*1000
			9 43 30					
			9 56 42					Faint trace.
			9 56 42					
			13 12 54					*400
			13 20 06					
			13 22 06					*400
			13 22 06					
			11 07 36					*300
			11 10 30					
			11 19 18					*300
			11 25 24					
			11 28 24					*100
			11 28 24					
			12 05 42					*100
			12 08 48					
			12 29 30					*1,200
			12 30 06					
			12 31 42					*800
			12 41 42					
			12 55 24					*800
			12 59 42					
			13 00 06					*200
			13 00 06					
			2 34 06					*200
			2 42 12					
			2 43 00					*200
			2 58 24					
			19 25 48					*200
			19 28 48					
			7 43 48					*300
			7 59 12					
			8 01 06					*300
			8 17 36					
			8 25 30					*800
			8 25 30					
			13 00 36					*800
			13 01 12					
			13 11 00					*800
			13 12 06					
			13 13 54					*800
			13 15 54					
			13 19 42					*800
			13 25 30					
			13 25 30					*800
			14 08 06					

*Trace amplitude.

TABLE 2.—Instrumental seismological reports, October, 1920—Contd.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _h	A _v		
CANADA. Dominion Meteorological Service, Victoria.								
1920.			<i>H. m. s.</i>	<i>Sec.</i>	<i>μ</i>	<i>μ</i>	<i>Km.</i>	
Oct. 1		P.	19 10 10				1,400	Probably Alaska.
		M.	19 12 37		*1,000			
		F.	19 21 28					
5		L.	19 10 51					Fender Island reported quake at 12:35 p. m. Pacific Stand. Time.
		M.	19 12 49		*400			
		F.	19 17 15					
7		P?	21 06 18				8,300?	
		S.	21 15 53					
		L.	21 29 10					
		M.	21 34 05		*500			
		F.	22 35 27					
8		S?	17 07 47					
		L?	17 12 17					
		L.	17 14 29					
		M.	17 17 05		*300			
		F.	17 37 23					
12		P.	7 43 56					
		L.	7 47 23					
		M.	7 53 46					
		F.	7 58 41					
15		L.	14 56 12					
		M.	14 58 40					
		F.	15 07 02					
18		P.	8 15 58					
		S.	8 21 02					
		L.	8 28 25					
		M.	8 36 46		*1,000		3,170	
		F.	10 03 20					
18		P.	12 14 00					
		M.	12 15 14					
		F.	12 17 27					
18		P.	12 52 20				450	Merged into ne- quake.
		M.	12 53 19					
				VERTI- CAL.				
		P.	12 55 10				520	
		L.	12 54 25					
		M.	12 54 25				3	
		F.	13 02 00					
18		P.	13 01 12					
		M.	13 02 41				660	
		F.	13 12 01					
				VERTI- CAL.				
		P.	13 02 00					
		L.	13 04 00		2.5		840	
		M.	13 04 15		5			
		F.	13 14 00		7			
20		P.	10 43 12					
		M.	11 00 25					
		F.	11 33 22					
22		S or L.	12 33 00					
		eL.	12 48 10					
		M.	12 57 35					
		F.	13 43 20					
23								Clock stopped.
26		P.	19 30 29					
		L.	19 31 58					
		M.	19 33 26					
		F.	19 34 25					
28		L.	7 36 31					
		M.	7 44 23					
		F.	8 29 38					
28		P?	13 05 06?					
			or 08 03					
		S or L.	13 12 58					Press dispatches say 900 miles from La Plata.
		eL.	13 13 08					
		M.	13 13 57					
		eL.	13 20 40					
28		P.	13 31 39					
		L.	13 35 35					
		M.	13 40 01					
		F.	15 20 50					

*Trace amplitude.

Reports for October, 1920, have not been received from the following stations:

- ALASKA. U. S. C. & G. S. Magnetic Observatory, Sitka.
- ARIZONA. U. S. C. & G. S. Magnetic Observatory, Tucson.
- HAWAII. U. S. C. & G. S. Magnetic Observatory, Honolulu.
- KANSAS. University of Kansas, Lawrence.
- MARYLAND. U. S. C. & G. S. Magnetic Observatory, Cheltenham.
- MASSACHUSETTS. Harvard University, Cambridge.
- MISSOURI. St. Louis University, St. Louis.
- NEW YORK. Canisius College, Buffalo; Fordham University, New York.
- PORTO RICO. U. S. C. & G. S. Magnetic Observatory, Vieques.

SEISMOLOGICAL DISPATCHES.

[Collected by Earthquake Station, Georgetown University, Washington, D. C.]

Clarmont-Ferrant, France, October 4.—An earth shock was felt this morning in the vicinity of Issoire, Department of Puy-de-Dome. The tremors lasted only a few seconds and no damage was reported.—*Associated Press.*

London, October 8.—Two violent earth tremors were felt in Mantua, Northern Italy, at midnight Wednesday, according to a telegram to the Rome Epoca, says a Central News dispatch from Rome, dated Thursday. The inhabitants fled into the streets in alarm. The message reported some property damage had been caused.—*Associated Press.*

Mexico City, October 9.—Reports received here of an earthquake yesterday in Northwestern Vera Cruz say there were no casualties.—*Associated Press.*

Vera Cruz, October 9.—Northwestern sections of the State of Vera Cruz were severely shaken by an earthquake at 10:30 o'clock yesterday morning. The regions of Cordoba, Jalapa, Teccele, Cosautlan and the entire district which was visited by the earthquake disaster of last January felt the full strength of the shock. No casualties had been reported, but property damage was said to be heavy.—*Associated Press.*

Manila, P. I. October 10.—A severe earthquake to-day at Baguis, capital of Bengust, Province of Yuzon, about 150 miles north of here, damaged the observatory there, broke water mains on the military reservation and cracked a number of concrete walls. A landslide occurred as a result of high water in the river at Baguio. No loss of life was reported. The shock was felt slightly in Manila.—*Associated Press.*

Toulouse, France, October 20.—Earthquake shocks were felt yesterday in several places in the Hautes Pyreneese Department.—*Associated Press.*

Granada, Spain, October 23.—An earthquake shock lasting 10 minutes was felt at 6 o'clock Friday evening throughout the Province. Damage was done in some villages, but it has not been ascertained as yet whether there were any casualties.—*Associated Press.*

Redding, Calif., October 27.—Lassen Peak was in pronounced eruption to-day. For more than half an hour, beginning at 2:40 p. m., black smoke rolled out of the northern part of the crater. To-day's eruption was the second outpouring in less than a week. A substantial outbreak occurred Saturday.—*Associated Press.*

Valparaiso, October 28.—Violent earthquake shocks with a vertical movement shook the Provinces of Atacama and Coquimbo, north of this city, at 8:05 o'clock this morning, the tremors lasting 2½ minutes. The cities of Copiape and Valanar, in the Province of Atacama, were most seriously shaken, old structures in both towns being damaged. Reports received here state no one was injured during the earthquake.—*Associated Press.*

NEWSPAPER CLIPPINGS.

[By the Associated Press.]

Washington, October 22.—An earthquake shock of considerable intensity was recorded by the seismograph of the Georgetown University at 7:19 o'clock this morning, continuing for nearly an hour. It is estimated that the center of the disturbance was 4,300 miles from Washington.

Buenos Aires, October 28.—El seismografo de la Universidad de la Plata ha registrado un fuerte terremoto a las 8.52 minutos. Se estima que el centro del disturbio esta situado a 1,400 kilometros de distancia.

LATE REPORTS.

TABLE 2.—Instrumental reports.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _N		
ALABAMA. Spring Hill College, Mobile.								
1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
July 7		P _N	18 06 48					N component undamped; no trace on E.W.; time uncertain.
		M _N	18 11 30					
		F _N	18 20 00					

DISTRICT OF COLUMBIA. Georgetown University, Washington.								
Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _N		
1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Sept. 7		eL	6 26					No distinct M on MS.
8		e _m	2 06 23					
		e _m ?	2 06 16					
		i _m	2 10 42					
		S _m ?	2 11 45					
		S _m ?	2 11 54					
		i _m	2 20 44					
		eL _m	2 21 30	22				
		L _m	2 45 16	22				
		F	3 30					
9		eL _m	19 58					
		L _m	20 01 24	24				
		F	20 45					
20		eP _m	14 57 55					
		eP _N	14 57 55					
		i _m	15 06 22					
		eS _m	15 09 17					
		eS _N	15 09 17					
		eL _m	15 28 24					
		eL _N	15 29 18					
		L _m	15 38	27				
		L _N	15 38 14	22				
		M ₁	15 41 00	24	*2,000			
		M ₂	15 48 00	20	*2,200			
		F	17 45					
				VERTICAL.				
		e _m	14 58					
		S _m	16 09 20					
		eL _m	16 28 24	22				
		L _m	16 37 56	24				
		M ₁	16 44 26			*900		
		F	17 29					
21		e _m	18 05					
		e _N	18 05 14					
24		eP _m	22 01 43					
		eP _N	22 01 43					
		S _m	22 07 04					
		S _N	22 07 07					
		eL _m	22 10 06					
		L _m	22 13 28	19				
		F	22 33					
27		e _m	5 42					
		e _N	5 42					
		S _m ?	5 45 17					
		F	6 00					

ARIZONA. U. S. C. & G. S. Magnetic Observatory, Tucson.								
Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _N		
1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Sept. 8		eP _m	1 58 20					L waves not distinguishable.
		P _N	1 58 22					
		eS _m	2 08 37		30			
		iS _m	2 08 38			40		
		F _N	2 17					
		F _m	3 09					
20		P	14 52 22	4				Phases well marked.
		S _N	15 02 50	5				
		S _m	15 02 54					
		L _m	15 21 05	34				
		L _N	15 22 35	23				
		M _N	15 28 30	18		10		
		M _m	15 32 15	18	80			
		C _N	15 33	17				
		C _m	15 41	16				
		F _N	15 45	17				
		L _m and e _m	16 58	20				
		F _m	17 17					

*Trace amplitude.

ARIZONA. U. S. C. & G. S. Magnetic Observatory, Tucson—Con.									
Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.	
					A _m	A _N			
1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>		
Sept. 24		P _m	22 02 15	4					
		P _N	22 02 18	4					
		P _m	22 03 42						
		P _N	22 03 50						
		eS _m	22 08 11						
		S _m	22 08 14						
		eL _m	22 13 45						
		L _m	22 14 45						
		M _m	22 15 27	9	20				
		M _N	22 17 27	8		20			
		C _N	22 18	8					
		C _m	22 19						
		F _N	22 27						
		F _m	22 28						
27		e _m	5 27 10						
		e _N	5 27 38						
		L _m	5 28 27						
		L _N	5 28 23						
		M _m	5 28 58		250				
		M _N	5 29 34			160			
		C _m	5 30 38						
		C _N	5 32 30						
		F _N	5 45	7					
		F _m	5 52	6					
29		e _m	12 00 57						
		e _N	12 01 04						
		eL _m	12 01 30						
		M _m	12 02 29	6	20				
		M _N	12 02 50	6		10			
		C _m	12 03						
		C _N	12 04						
		F _m	12 05						
		F _N	12 06						

HAWAII. U. S. C. & G. S. Magnetic Observatory, Honolulu.								
Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _N		
1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Sept. 1		L	3 08 00					Tremor.
		M	3 13 00	17	*100			
		C	3 17					
		F	3 22					
3		L	3 42 54					Tremor.
		M	3 45 00	17	*100			
		C	3 53					
		F	3 56					
8		P	1 54 24	17				Clock stopped 2.22, and remainder of record lost; L difficult to place.
		iS	2 00 36	17				
		eL	2 07					
		M	2 17 00	17	*1,100			
9		eP	19 04 48	20				L difficult to place.
		eS	19 12 18	17				
		L	19 21 00	18				
		M	19 26 48	16	*1,700			
		C	19 58	17				
		F	22 04	20				
10		e	22 21 36					Slight record.
		eL	22 26 00					
		M	22 32 00	17	*100			
		C	22 37					
		F	23 12					
20		iP	14 48 36	16				L indistinguishable from the S waves.
		P _R	14 51 24	16				
		iS	14 56 18	16				
		S _R	15 00 48	17				
		M	15 10 06	17	*35,000			
		C	16 26	17				
		F	21 56	17				
21		eP	2 51 24					
		L	2 58 36					
		M	3 09 12	18	*1,100			
		C	3 12 30					
		F	3 47 12					
21		e	5 21 00					
		L	5 31 30					
		M	5 36 00	17	*200			
		C	5 41					
		F	6 06					

*Trace amplitude.

TABLE 2.—Instrumental reports—Continued.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _E	A _N		
HAWAII. U. S. C. & G. S. Magnetic Observatory, Honolulu—Con.								
1920.			<i>H. m. s.</i>	<i>Sec.</i>	<i>μ</i>	<i>μ</i>	<i>Km.</i>	
Sept. 21	P		17 56 54	17				
	eS		18 01 00	17				
	eL		18 04 00	19				
	M		18 13 18	19	*400			
	C		18 17 ..	19				
	F		19 11 ..	17				
23	P		5 48 18	17				L difficult to place.
	S		5 52 48	17				
	eL		5 55 48	17				
	M		6 11 42	17	*200			
	C		6 13 54	17				
	F		6 57 ..	17				
24	eS		22 16 30	17				This interpretation adopted after comparison with Tucson and Vieques.
	L		22 29 06	17				
	M		22 35 48	17	*300			
	C		22 39 ..	17				
	F		23 30 ..	17				

MARYLAND. U. S. C. & G. S. Magnetic Observatory, Cheltenham.								
Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
			<i>H. m. s.</i>	<i>Sec.</i>	<i>μ</i>	<i>μ</i>	<i>Km.</i>	
1920.								
Sept. 8	e _N		2 10 44			50		L waves not clearly present. Nothing on E-W.
	i _N		2 20 45					
	F _N		2 42 ..					
20	i _E		14 58 05					P tremors faint in both components.
	e _N		15 04 55					
	e _S		15 19 09					
	L _N		15 38 11	28				
	L _N		15 39 49					
	M _N		15 46 36	18	90			
	M _N		15 51 27	17		290		
	C _N		15 50 ..	18				
	C _N		16 00 ..	17				
	F _N		16 24 ..	17				
	F _N		17 21 ..	17				
27	e _N		5 42 28					L waves not clearly present on E-W.
	e _N		5 42 35					
	eL _N		5 42 48					
	M _N		5 43 46	12		40		
	C _N		5 46 ..	9				
	F _N		5 48 ..					
	F _N		5 58 ..					

PORTO RICO. U. S. C. & G. S. Magnetic Observatory, Vieques.								
Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
			<i>H. m. s.</i>	<i>Sec.</i>	<i>μ</i>	<i>μ</i>	<i>Km.</i>	
1920.								
Sept. 8	ePR _N		2 06 34					L waves not present; interpretation adopted after comparison with Tucson and Honolulu.
	ePR _E		2 06 52					
	S _E		2 15 06					
	F _N		2 20 ..					
	F _N		2 29 ..					
20	ePR1 _N		15 01 36					This interpretation adopted after comparison with Tucson and Honolulu.
	ePR1 _E		15 01 35					
	ePR2 _E		15 05 20					
	iSR1 _E		15 18 09	16				
	L _E		15 40 06	38				

*Trace amplitude.

PORTO RICO. U. S. C. & G. S. Magnetic Observatory, Vieques—Con.								
Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
			<i>H. m. s.</i>	<i>Sec.</i>	<i>μ</i>	<i>μ</i>	<i>Km.</i>	
1920.								
Sept. 20	I _N		15 41 13	23				
	M _N		15 42 01	25	70			
	M _N		15 42 50	24		60		
	C _N		15 49 ..	18				
	C _E		15 58 ..	18				
	L _{NS}		16 44 ..	18				
	F _N		16 59 ..	18				
	F _N		17 17 ..	16				
24	iP		21 59 46	6				Long waves not present on NS; P and S both well marked.
	iS		22 08 45	13				
	L _E		22 05 13	58				
	M _N		22 05 24	10	30			
	C _E		22 06 ..	10				
	F _N		22 11 ..	10				
	F _N		22 28 ..	10				

MASSACHUSETTS. Harvard University, Cambridge.								
Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
			<i>H. m. s.</i>	<i>Sec.</i>	<i>μ</i>	<i>μ</i>	<i>Km.</i>	
1920.								
Aug. 3	O		19 57 15	3			7,770	69° .93 arc; E gives P and S less distinct; M phases distorted by winding drums.
	P _N		20 08 24.5	3				
	S _N		20 17 32.5	3				
	eL _N		20 31 32.5	58				
	M _N		20 36 ..	20				
	C _N		20 40 ca.					
	F _N		21 44 ca.					
13	e _N		2 13 04	3				Possibly only a group of micros; not recognizable* as possibly seismic on E record; weak micros were running before and after these phases.
	F _N		2 14 37	3				Distance from L-S; L difficult to fix. Record indistinct on NS.
	e _N		2 21 24	3				
	F _N		2 23 56	3				
20	OT		16 14 59				9,315?	
	e _N		16 27 07					
	S _E		16 37 53					
	L??		16 51 47	20				
	L _E		16 55 49	25				
	L _E		17 05 23	18				
	L _E		17 17 00	16				
	L _E		18 04 31	16				
	F _E		18 41 ca.					
21	L _N ?		21 32 20	15				Not legible on N. Periods decrease rapidly to 3 secs.
	L _N		21 34 35	15				
	F _N		21 38 37	15				
26	OT		22 58 55				8,050?	Deducted terms from E.; I-O/8050 kms. gives VL 231.6 kms. per sec. S _N doubtfully fixed. IFS 23-10-18. Great irregularity in period after initial L.
	iPR?		23 10 19	2				
	S _E		23 18 59	6				
	S _E		23 19 41	6				
	e _N		23 30 54	7				
	eL _N		23 33 10	25				
	eL _N		23 33 17	25				
	L _N		23 36 30	20				
	L _N		23 39 00	20				
	L _N		23 43 00	15				
27	F _E		0 36 ca.					

SEISMOLOGY.*

W. J. HUMPHREYS, Professor in Charge.

[Dated: Weather Bureau, Washington, D. C., Jan. 3, 1921.]

TABLE 1.—Noninstrumental earthquake reports, November, 1920.

Day.	Approximate time, Greenwich civil.		Station.	Approximate latitude.	Approximate longitude.	Intensity Ross-Forl.	Number of shocks.	Duration.	Sounds.	Remarks.	Observer.
1919.			MAINE.								
Nov. 9	H.	M.	Eastport.....	45 00	67 00	4	1	Sec. 2	Loud rumbling...	Felt at several other towns in State also.	G. Brown.
			OREGON.								
9	20 20		Portland.....	45 30	122 40	3	1	5	None.....	Felt by many.....	E. H. Jones.
28	11 43		Portland.....	45 30	122 40	3	1	3	do.....	do.....	F. D. Young.
			WASHINGTON.								
28	11 33		Longmire.....	46 50	121 50	4	1	35	Rumbling.....	Felt at Paradise Inn also.....	J. B. Flett.
	11 40		Delroit.....	47 20	122 50	3	2	10	None.....	Felt by one.....	W. O. Eckert.
			UTAH.								
20	5 40		Brigham.....	41 30	112 00	6	1	30	Rumbling.....	Felt by many.....	J. N. Andersen.
25	24 00		St. George.....	37 05	113 30	6	1	60	do.....	Felt by everyone.....	R. U. Macfarlane.

TABLE 2.—Instrumental seismological reports, November, 1920.

Time used: Mean Greenwich, midnight to midnight. Nomenclature: International.

[For significance of symbols see REVIEW for January 1920, pp. 62-63.]

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _x	A _y		
CALIFORNIA. Theosophical University, Point Loma.								
1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Nov. 6					100	100		Tremors.
8					50	50		
10					100	100		
12					100	100		
14					100	100		
15					100	100		
21					50	100		
23					100	150		
24					100	100		
27					100	100		
28					100	100		
30					100	100		

COLORADO. Sacred Heart College, Denver.								
Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Nov. 2		L _N	2 51 —					
		F _N	2 58 —					
13		L _N	1 29 —					Wavelets and thickening of penmarks.
		F _N	1 37 —					
16								Activity and visible wavelets on NS.
20		L _N	24 39 —					P not visible; hardly any record on EW.
		M _N	24 42 —	7-10	*500	*500		
		C _N	24 46 —					
		F _N	24 49 —					
20		L _N	2 36 —					P not visible; no record on EW.
		F _N	2 42 —					
29		L _N	21 26 —					Somewhat doubtful as to being seismic.
		F _N	21 32 —					

*Trace amplitude.

DISTRICT OF COLUMBIA. Georgetown University, Washington.								
Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Nov. 4		eL	2 16 00					Very heavy micros.
		S	2 20 05					
		L	2 28 11	9				
		F	2 40 —					
6		C _m	10 53 40					
		C _l	10 53 44					
		eL _m	10 59 24	11				
		eL _N	10 59 42	14				
		F	11 10 —					
12		C _m	5 57 27					Heavy micros; NS does not show.
		L _m	6 09 22	21				
		F	6 20 —					
16		P _m	8 38 55					NS out of order.
		eL _m	8 46 36					
		F	9 30 —					
28		e	11 42 36					Heavy micros.
		S _y	11 48 58					
		F	12 30 —					
29		P _m	8 11 44					Heavy micros. Difficult to interpret.
		S _m	8 18 45					
		eL _m	8 24 00					
		F	9 20 —					

DISTRICT OF COLUMBIA. U. S. Weather Bureau Washington.								
Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Nov. 4		P	2 15 10				2,300	
		S	2 19 00					
		eL	2 22 00					
		F	2 40 —					
6		P	10 48 44				2,500	
		S	10 52 48					
		eL	10 57 —					
		L	10 59 —	16				
		F	11 15 ca.					
12		S	6 00 02				3,300	
		L	9 00 00					
		F	9 25 03	24				
16		P	8 38 55				4,000	
		PRJ	8 40 30					
		S	8 44 37					
		eL _T	8 51 00					
		M _m	8 53 40		*19,000			
		F	9 30 ca.					
28		e	11 45 50					
		M	11 49 10		*1,500	*1,500		
		F	12 10 —					
29		P						Lost in heavy micros. Times uncertain.
		S	8 19 08					
		eL	8 23 —					
		M	8 29 30		*9,000	*9,000		
		F						Lost in micros. The Valdez-Sitka, Valdez-Cordova, and Valdez-Seward cables were broken by an earthquake at 10:03 p. m., 150th meridian time, Nov. 28.

*Trace amplitude.

ILLINOIS. U. S. Weather Bureau, Chicago.								
Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
1920.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Nov. 1		eL _m	17 55 50	22				
		F	18 30 ca.					
4		P	2 17 47				2,300	
		S	2 21 23					
		L	2 23 10					
		L	2 28 30	18				
		F	2 50 ca.					
6		P	10 51 15					
		S	10 55 56					
		L	10 58 50					
		L	11 01 45	16				
		F	11 40 ca.					
6		eL	22 11 —					
		L	22 16 30					
		F	22 30 ca.	18				
12		S	6 03 00				7,000	P lost in micros.
		L	6 14 40					
		L	6 20 —	15				
		F	7 20 ca.					
16		P	8 39 15				3,600	
		S	8 44 41					
		L	8 47 50					
		M	8 52 30		*8,500	*8,500		
		F	10 20 ca.					
20		eL	7 43 40					
		F	7 50 ca.					
26		eL	9 25 50	33				
		L	9 28 —	24				
		L	9 37 —	16				
		F	10 20 ca.					
28		P	11 27 40				2,800	
		S	11 42 04					
		L	11 45 17					
		F	12 30 —					
29		P	8 12 27				4,000	
		PRJ	8 13 24					
		S	8 18 15					
		L	8 21 07					
		F	9 30 ca.	16				

*Trace amplitude.

TABLE 2.—Instrumental seismological reports, November, 1920—Continued.

NEW YORK. Cornell University, Ithaca.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Nov. 4	e.	2 18 40	3				Clock error uncertain.
	IP.	2 16 50	4				
	S.	2 20 50					
	F.	2 37 ..					
16	In.	8 38 25	3				Clock error uncertain.
	ST.	8 44 10	5				
	e.	8 46 40	5				
	L.	8 51 05	6				
	F.	9 18 ..					
28	eL.	11 47 ..	7				
	F.	11 57 ..					
29	P?	8 18 13	5				
	ST.	8 23 56	4				
	L.	8 27 15	7				
	F.	8 49 ..					

CANAL ZONE. Panama Canal, Balboa Heights.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Nov. 13	Pa.	1 46 46				238	Direction probably W. or SW.
	Pa.	1 46 48					
	Sp.	1 47 18					
	Sp.	1 47 30					
	M.	1 47 33		*0,500			
	M.	1 47 32			*1,800		
	F.	1 50 40					
	F.	1 51 10					

* Trace amplitude.

VERMONT. U. S. Weather Bureau, Northfield.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Nov. 4	eL.	2 21 20					
	F.	2 24 ca.					
16	e.	8 44 30					
	M.	8 51 40		*1,000	*1,000		
	F.	9 10 ca.					
28	e.	11 48 ..					
	F.	12 ca.					
29	e.	8 21 ..					
	L.	8 24 ..	10				
	F.	8 45 ca.					

* Trace amplitude.

CANADA. Dominion Observatory, Ottawa.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Nov. 4	e.	2 21 40					Lost in micros.
	F.	2 45 ..					
6	ca.	10 55 47					NS lost in micros.
	eL.	11 00 21					
	L.	11 08 31	12				
	F.	11 15 ..					
8	e.	19 26 00					Reported from St. Thomas de Joliette, Quebec.
	e.	19 27 33					
12	e.	6 00 33					
	eL.	6 07 17					
	L.	6 11 ..	20				
	F.	6 40 ..					
16	O.	8 30 54				3,900	
	IP.	8 33 09					
	S.	8 43 54					
	eL.	8 48 32	Irreg.				
	L.	8 49 23	22				
	F.	9 35 ..					
SASKATOON RECORD.							
	eP.	8 35 08				2,510	
	IS.	8 39 14					
	L.	8 41 ca.					
29	eL.	9 24 00	20-14				
	F.	9 50 ..					
28	eL.	11 46 54					Irregular L waves of small amplitude.
	F.	12 18 ..					
29	O.	8 05 10				3,740	
	eP.	8 12 09					
	S.	8 17 41					
	eL.	8 20 52	23				
	L.	8 35 ..	12				
	F.	9 00 ..					

CANADA. Dominion Meteorological Service, Toronto.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Nov. 4	L.	2 22 18		*300			Micros.
	L.	2 27 36					
	F.	.....				
6	e.	10 54 54					Small micros going on at intervals throughout day; feeble shocks reported from Joliette, Que., at 20h. 25m. G. M. T. Window frames trembled.
	L.	10 53 24					
	eL.	11 00 36					
	M.	11 02 18		*300			
	F.	11 24 54					
8							
12	e.	6 02 00					P not recorded; S indistinct.
	L.	6 11 45					
	eL.	6 13 54					
	M.	6 18 36		*400			
	F.	6 38 42					
16	S.	78 44 12					P not recorded; S indistinct.
	eL.	8 47 12					
	iL.	8 50 30					
	M.	8 51 13		*1,200			
	F.	9 35 36					
26	eL.	9 33 30					From L-S.
	M.	9 34 36		*200			
	F.	9 54 54					
28	L.	11 46 54					From L-S.
	F.	11 57 54		*200			
29	S.	8 18 00				3,450	
	eL.	8 21 18					
	L.	8 22 48					
	eL.	8 28 24					
	eL.	8 30 06					
	M.	8 30 43		*300			
	F.	8 51 18					

* Trace amplitude.

CANADA. Dominion Meteorological Service, Victoria.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Nov. 12	P.	6 06 10				5,100?	
	ST.	6 13 03					
	L.	6 25 20					
	M.	6 32 43					
	F.	6 54 50		*500			
16	P.	8 36 20				2,330	
	S.	8 40 15					
	L.	8 43 12					
	M.	8 44 11		*2,500			
	eL.	8 45 31					
	F.	9 14 11					
VERTICAL.							
	P.	8 36 20	3			2,600	
	S.	8 40 40	6				
	L.	8 44 15	8				
	M.	8 47 15	20	3			
26	L.	79 39 51					In Washington State; felt in Seattle, Spokane; probably south of Victoria.
	M.	79 41 50		*300			
	F.	79 46 17					
28	P.	11 30 48					330
	L.	11 31 32					
	M.	11 31 47		*1,300			
	F.	11 43 05					
VERTICAL.							
	P.	11 30 53	2			260	
	L.	11 31 28	3				
	M.	11 31 41	5	36			
	F.	11 40 00					
29	P.	8 06 46				2,030	Alaska, near Kodiak.
	S.	8 10 13					
	L.	8 12 40					
	M.	8 13 54		*600			
	F.	8 29 39					
VERTICAL.							
	P.	8 07 30	3			2,220	
	S.	8 11 20	5				
	M.	8 11 40					

* Trace amplitude.

TABLE 2.—Instrumental seismological reports, November, 1920—Contd.

No earthquakes were recorded at the following stations during November, 1920:

ALABAMA. *Spring Hill College, Mobile.*

Reports for November, 1920, have not been received from the following stations:

ALASKA. *U. S. C. & G. S. Magnetic Observatory, Sitka.*

ARIZONA. *U. S. C. & G. S. Magnetic Observatory, Tucson.*

HAWAII. *U. S. C. & G. S. Magnetic Observatory, Honolulu.*

KANSAS. *University of Kansas, Lawrence.*

MARYLAND. *U. S. C. & G. S. Magnetic Observatory, Cheltenham*

MASSACHUSETTS. *Harvard University, Cambridge.*

MISSOURI. *St. Louis University, St. Louis.*

NEW YORK. *Cornell College, Buffalo; Fordham University, New York.*

PORTO RICO. *U. S. C. & G. S. Magnetic Observatory, Vieques.*

TABLE 3.—Late reports (instrumental).

ALASKA. *U. S. C. & G. S. Magnetic Observatory, Sitka. No earthquakes recorded during October, 1920.*

ARIZONA. *U. S. C. & G. S. Magnetic Observatory, Tucson.*

1920.		H. m. s.	Sec.	μ	μ	Km.	
Oct. 1	en	18 54 25	4				
	es	18 58 10					
	LN	19 00 05					
	LN	19 00 10					
	MN	19 01 19	12		190		
	MN	19 01 18	13	650			
	CN	19 08 —	8				
	CN	19 04 —	9				
	FN	19 20 —	7				
	FN	19 22 —	8				
8	PN	16 56 14	4				
	ePN	16 56 14	4				
	SN	16 59 59					
	SN	16 59 57	5				
	LN	17 02 50	6				
	LN	17 02 53	7				
	MN	17 03 45	5		50		
	MN	17 03 19	4	50			
	CN	17 08 —					
	CN	17 07 —					
18	FN	17 11 —					
	FN	17 17 —					
	PN	8 23 11	5				Long waves not present.
	SN	8 32 23	6				
	SN	8 32 40	6				
22	FN	8 54 —					
	FN	9 18 —					
	iPN	12 20 47	5				Long waves not clearly present.
	PN	12 20 48					
	SN	12 29 36					
28	FN	12 35 —					
	FN	12 54 —					
	PN	13 01 29	4				
	ePN	13 01 22	3				
	SN	13 10 35					
	eLN	13 24 56		10			
	FN	13 19 —					
	FN	13 38 —					

MARYLAND. *U. S. C. & G. S. Magnetic Observatory, Cheltenham.*

1920.		H. m. s.	Sec.	μ	μ	Km.	
Oct. 1	en	19 01 05					
	en	19 09 35					
	LN	19 12 05					
	MN	19 14 30	10		10		
	FN	19 40 —					
8	P	16 56 48					L waves can not be separated from S waves.
	SN	17 01 04					
	MN	17 08 33			30		
	CN	17 18 —					
	FN	17 28 —					
18	FN	17 18 —					
	iPN	8 24 21	3				L waves not present on E.
	PN	8 24 21	3				
	SN	8 34 49			190		
	SN	8 34 45			50		
22	eLN	9 02 45					
	MN	9 09 30	18		10		
	FN	9 35 —					
	FN	8 55 —					
	iPN	12 20 02	3				L waves not on E; and only few on N.
26	ePN	12 20 04	4				
	SN	12 23 10	12				
	eSN	12 23 18					
	eLN(T)	12 39 40					
	FN	13 09 —					
28	FN	12 35 —					
	en	19 19 20					Record difficult to interpret.
	eLN	19 26 32					
	MN	19 28 12	8		10		
	FN	17 55 —					
	iPN	13 00 55	3				L waves not clearly present.
	ePN	13 01 09	3				
	SN	13 10 03					
	SN	13 10 18					
	FN	13 36 —					
FN	13 17 —						

TABLE 3.—Late reports (instrumental)—Continued.

HAWAII. U. S. C. & G. S. Magnetic Observatory, Honolulu.							PORTO RICO. U. S. C. & G. S. Magnetic Observatory, Vieques.							
1920.		H. m. s.	Sec.	μ	μ	Km.	1920.		H. m. s.	Sec.	μ	μ	Km.	
Oct. 1...	e	19 16 36					Oct. 2	IP	15 47 48					Strongly felt at Vieques.
	M	19 22 00	17	*100				L	15 47 53					Similar to two underground explosions.
	F	19 29 ..						M	15 47 53		300	1,350		
3	P	5 35 06						Cw	15 48 20					
	M	5 35 54	16	*300				Cs	15 48 18					
	F	5 59 ..						F	15 53 ..					
7	eP	21 03 18	18				7	Ls	21 08 06					
	Fr	21 10 30						Ms	21 09 08	14	80			
	S	21 17 24	19					Fs	21 21 ..					
	L	21 35 54	21											
	M	21 45 54	18	*200			8	es	16 57 21					No definite maximum.
	C	21 50 ..	18					ew	17 00 57	13	10			
	F	23 12 ..	17					Fs	17 11 ..					
8	es	17 10 00					22	es	12 22 47					Times uncertain for this record.
	eL	17 18 00		*100				ew	12 23 35					
	F	17 25 ..						es	12 26 45					
10	eL	20 28 48						Cs	12 26 55	12				
	M	20 35 00	17	*100				Ms	12 26 53			50		
	F	20 39 ..						Mm	12 27 46		50			
15	e	14 28 36						Fw	12 40 ..					
	L	14 37 24	18					Fs	12 41 ..					
	M	14 47 42	16	*300			27	Ip	11 45 21					End merged with following quake; seems to be local shock.
	C	15 00 ..						Ls	11 45 50				440	
	F	15 57 ..						Mw	11 46 10			320		
18	IP	8 20 18	15					Cs	11 46 21					
	IS	8 27 18	17					Cw	11 49 30					
	L	8 39 00	18					Cs	11 50 00	5				
	M	8 45 48	17	*3,300			27	ePw	11 54 10					Seems to be a local shock.
	C	8 54 ..	17					Pw	11 54 08					
	F	10 39 ..	17					Ms	11 54 57				190	
20	eP	10 13 24	18					Cw	11 55 09			225		
	S	10 23 18	17					Cs	11 57 57					
	eL	10 35 24	20					Cw	11 58 44	6				
	M	10 59 06	18	*400				Fw	12 08 ..					
	C	11 11 ..	19					Fs	12 12 ..	5				
	F	11 27 ..	18				28	es	12 58 41					Record scant and difficult to interpret.
20	e	19 57 06						ew	13 00 22				10	
	e	20 00 00						es	13 05 08					
	eL	20 08 00	19					Is	13 08 48					
	M	20 14 48	17	*100				Ms	13 09 40			10		
	C	20 17 ..						Ys	13 13 ..					
	F	20 24 ..						Fw	13 16 ..					
22	e	11 07 00	18											
	S	11 09 48	18											End merged with the succeeding record.
	L	11 18 56	18											
	M	11 30 00	18	*200										
	C	11 33 ..	18											
	F	11 33 ..	18											
22	eP	12 22 54												(eP) faint and difficult to place.
	S	12 34 00	16											
	L	12 54 36	22											
	M	13 03 18	17	*500										
	C	13 08 ..	17											
	F	15 03 ..	17											
24	eP	1 48 00	18											(eP) faint and uncertain.
	S	1 54 30	19											
	L	1 59 24	20											
	M	2 01 12	19	*600										
	C	2 13 ..	18											
	F	2 56 ..	18											
28	eP	7 32 00	15											Interpretation not clear.
	L	7 38 12	15											
	M	7 39 36	15	*400										
	C	8 02 ..	16											
	F	9 01 ..												
28	eP	13 03 12												
	S	13 13 54												
	L	13 35 00												
	M	13 39 24	17	*500										
	C	13 54 ..												
	F	14 10 ..												

* Trace amplitude.

SEISMOLOGY.

W. J. HUMPHREYS, Professor in Charge.

[Dated: Weather Bureau, Washington, D. C., Feb. 2, 1921.]

TABLE 1.—Noninstrumental earthquake reports, December, 1920.

Day.	Approximate time, Greenwich civil.	Station.	Approximate latitude.	Approximate longitude.	Intensity Ros.-Forel.	Number of shocks.	Duration.	Sounds.	Remarks.	Observer.
CALIFORNIA.										
1920.	H. m.		° ' "	° ' "			Sec.			
1	1 30	Maricopa.....	35 05	119 23	4	1	10	None.....	Felt by many.....	E. F. Foulke.
		Taft.....	35 15	119 30	5	1		do.....	do.....	Associated Press.
4	11 55	Los Alamos.....	34 45	120 15	4	1	Long.....	do.....	do.....	H. R. Gewe.
5	12 03	Maricopa.....	35 05	119 23	4	1	10	do.....	Felt by many.....	E. F. Foulke.
		Ojai.....	34 25	119 12	5	1	1	Faint.....	do.....	W. H. Duncan.
		Santa Barbara.....	34 23	119 40	5	1	10 ca.	None.....	Felt by everyone.....	A. W. Maiter.
6	20 25	Los Angeles.....	34 03	118 15	3	3	1	Rattling.....	Felt by many.....	R. F. Young.
13	17 37	Lone Pine.....	36 37	118 01	4	1	Several.	Rumbling.....	Felt by several.....	G. F. Marsh.
15	3 57	San Diego.....	32 48	116 58	3	1	Few.....	None.....	do.....	E. P. Kissler.
18	17 26	Hemet.....	33 45	116 45	5	2	10	do.....	Felt by many.....	Associated Press.
20	20 30	Spreckels.....	36 35	121 38	3	1	2	do.....	do.....	C. E. McManigal.
19	12 15	Spreckels.....	36 35	121 38	3	2	3.2	do.....	During thunderstorm.....	S. I. Gleason.
20	4 30	Brawley.....	32 59	115 40	4	2	5	Rumbling.....	Felt by many.....	Do.
	5 15	Amos.....	33 05	115 16	5	2		do.....	do.....	M. D. Witter.
		Blythe.....	33 35	114 45	3	1		None.....	do.....	R. H. Freeman.
	5 31	Calexico.....	32 41	115 30	2	1	15	do.....	do.....	W. J. Custer.
	14 46	Calexico.....	32 41	115 30	3	1	45	do.....	do.....	W. S. Pratt.
	15 10	Amos.....	33 05	115 16	3	1	Few.....	do.....	do.....	Do.
	15 15	Blythe.....	33 35	114 45	3	1		do.....	do.....	R. H. Freeman.
	15 45	Brawley.....	32 59	115 40	7	1		do.....	do.....	W. J. Custer.
									Shocks throughout day; felt heavily at Westmoreland also.	M. D. Witter.
21	14 48	Calexico.....	32 41	115 30	3	1	30	do.....	do.....	W. S. Pratt.
	15 00	Amos.....	33 05	115 16	4	1	Few.....	do.....	do.....	R. H. Freeman.
	15 15	Blythe.....	33 35	114 45	4	1	Short.....	do.....	do.....	W. J. Custer.
	15 40	Blythe.....	33 35	114 45	4	1	do.....	do.....	do.....	Do.
	19 55	Salinas.....	35 36	121 40	3	1	3	do.....	Felt by many.....	E. D. Eddy.
	19 56	Spreckels.....	35 35	121 38	4	3	5, 7, 8	do.....	do.....	S. I. Gleason.
	4 18	Spreckels.....	35 35	121 38	4	1	5	Rattling.....	do.....	Do.
22	1 55	Los Angeles.....	34 03	118 15	3	2	1	None.....	Felt by several.....	R. F. Young.
COLORADO.										
29	2 50	New Castle.....	39 30	107 30	5	1	5-10	None.....		M. L. Wellen.
	3 00	New Castle.....	39 30	107 30	4	2	3-4	Rumbling.....		Mrs. Cliff.
	9 50	Glenwood Springs.....	39 30	107 15	Light.	1	2	Faint.....	Felt by many.....	Mrs. C. M. Keen.
30	17 50	New Castle.....	39 30	107 30	5	1				M. L. Wellen.
		New Castle.....	39 30	107 30	5	1				Do.
OREGON.										
15	18 50	Cascadia.....	44 15	122 30	3	1		Loud report.....	Felt by everyone.....	G. M. Geissendorfer.
TENNESSEE.										
24	? ?	Crossville.....	36 00	85 00	5	2	60	Rumbling.....	No damage.....	J. E. Converss.
	5 ca.	Decatur.....	35 32	84 50	2	1		do.....	Awakened a few.....	J. W. Linard.
	8 30	Glen Alice.....	35 50	84 50	5	1		Rumbling.....		J. C. Owings.
	8 40	Spring City.....	35 40	84 50	3	1	60	do.....		A. D. Paul.
	8 30	Rockwood.....	35 50	84 40	1	1	3 min.	None.....	Felt by many.....	Mary E. Mason.
LATE REPORTS.										
OREGON.										
Nov. 9	20 30	Astoria.....	46 10	123 50	Weak.	1			Felt by several.....	C. C. Rosenberg.
28	11 45	Astoria.....	46 10	123 50	4	1			do.....	Do.

TABLE 2.—Instrumental reports, December, 1920.

[For significance of symbols and abbreviations, and for a description of stations and instruments, see the REVIEW for January, 1920, pp. 62-63.]

Date.	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.	Date.	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.
					A _E	A _N								A _E	A _N		
ALABAMA. Spring Hill College, Mobile.																	
Dec. 16.			H. m. s.	Sec.	μ	μ	Km. 12000?	Instrument undamped.	1920.			H. m. s.	Sec.	μ	μ	Km.	Record lost between 12:45:44 and 12:52:22, including M and probably C. P-W not operating.
			0 35 50						Dec. 16.			12 17 31					
			0 57 20									12 27 01					
			1 00 20									12 39 14	55				
			1 06 00	25	9,000							12 45 44			8,380		
			1 14 30	29	12,000						13 33						
			2 30 00														

* Trace amplitude.

TABLE 2.—Instrumental reports, December, 1920—Continued.

ILLINOIS. U. S. Weather Bureau, Chicago.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Dec. 7	S?	15 33 50					
	L	16 07	28				
	L	16 11	22				
	L	16 18	18				
	F	16 40 ca.					
10	P	4 33 12				8,900	
	S	4 48 16					
	L	5 05	45				
	L	5 19	30				
	F	5 22	15				
11	P?	21 26 58				3,100	
	S	21 32 46					
	L?	21 34					
	L	21 41	18				
	F	22 10 ca.					
13	P	4 11 37				4,100	
	S	4 17 30					
	eL	4 22 10					
	L	4 35	40				
	F	4 50	16				
16	P	12 19 45				9,100	China; times of phases estimated as minute marker was not working. P on both components.
	S	12 30 00					
	PR	12 23 45					
	F	17 30 ca.					
	eL	22 02	30				Decreasing gradually.
16	L	22 20	16				
	F	23					
	P	19 10 49				9,000	
	S	19 21					
	L	19 38	35				
17	L	19 50	18				Lost in micros.
	F	20 50 ca.					
	P	11 51 10				5,700	
	S	11 58 32					
	eL	12 30	20				
25	L	12 40	15				
	F	14 05 ca.					

MARYLAND. U. S. C. & G. S. Magnetic Observatory, Cheltenham.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Dec. 16	PR1 _N	12 24 14	4				This interpretation adopted after comparison with Honolulu record.
	ePR1 _E	12 25 00					
	L _N	12 51 20	59				
	L _E	13 02 38	25				
	M _N	13 10 10	18		2,150		
	M _E	13 11 40	17	2,100			
	C _N	13 22	16				
	C _E	13 27	15				
	F _N	14 08					
	F _E	14 25					

CANAL ZONE. Panama Canal, Balboa Heights.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Dec. 8	P _N	6 49 13				85	Direction unknown; generally felt.
	P _E	6 49 41					
	S _N	6 49 53					
	S _E	6 49 54					
	M _N	6 49 57		*4,000	*3,000		
	F _N	6 51 00					
	F _E	6 52 05					
10							Slight disturbance between 4:35 and 5:30 from distant movement; direction and distance unknown.
16	P _N	12 25 38				6,400 ca.	Probably S. or SW. Preliminary phases not on E-W.
	S _N	12 33 44					
	L _N	12 39 24					
	M _N	13 22 00		*4,000			
	M _E	13 25 02			*3,000		
	F _N	14 33 00					
F _E	14 48 00						

* Trace amplitude.

VERMONT. U. S. Weather Bureau, Northfield.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Dec. 16	S _N	12 30 25					China.
	eL _N	12 46	50				
	L _N	12 55	30				
	L _E	13 09	20				
	M _N	13 05		*48,000			
	F _N	14 30					

* Trace amplitude.

CANADA. Dominion Observatory, Ottawa.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Dec. 5	eP _N	10 30 30					Faint record, almost lost in micros.
	eL _N	10 37 18					
	L _N	10 39 30	20				
	F						
7	eL	15 34 03	17				Two short records of 1 waves of small amplitude; balance obscured by micros.
	eL	13 51 30	23				
	F	Micros.					
10	O	4 26 10				9,020	Quakes reported from Honduras about this date, but no trace appears on records.
	IP _N	4 38 33					
	IS _N	4 48 45					
	eL _N	5 05 42					
	L	5 12	25				
	F	5 25	19				
11	L	5 35	16				
	F	6 00					
	O	21 25 41?				(2,470)	Very irregular micros of considerable magnitude obscure the record.
	(P) _N	21 30 45					
	(S) _N	21 34 48					
	(eL) _N	21 35 54					
L	21 41	22					
F	22 ca.						
13	eP _N	4 19 25					Lost in micros.
	eP _E	4 29	40				
	L _N	4 52	21				
	L _E	5 02	16				
	F						
16	O	12 06 45				9,590	Ottawa and Saskatoon define epicenter 41° N. 62.5° E., but arcs are almost parallel and long value poorly defined; epicenter occurred 41° N. but farther east; approx. 41° N. and 83° E., with possibility of center being even farther east.
	P _N	12 19 27					
	S _N	12 30 06					
	eP	12 37 13					
	IS	12 38 04					
	eL _N	12 46	60				
	L _N	12 52	45				
	L _E	13 07	25				
	L _N	12 52	36				
	L	13 20	18				
L	13 36	17					
L	13 55	16					
L	14 12	15					
LRL	14 17	20					
L	14 40	18					
L _E	14 55	18					
F	16						
SASKATOON RECORD.							
17	O	12 05 56				9,600	Not well recorded; probably occurred in Albania.
	P _N	12 18 39					
	S _N	12 29 19					
	SRL _N	12 35 25					
	eL _N	12 44					
	M _N	12 56					
	F	15 ca.					
25	eP _N	19 29 50					Probably S. or SW. Preliminary phases not on E-W.
	eL _N	19 39	35				
	L _N	19 48 18	20				
	L	20 00	17				
	F	20 15					
16	eP _N	12 03					Probably S. or SW. Preliminary phases not on E-W.
	eL _N	12 17 30	13				
	L _N	12 20 30	23				
	L	12 30	18				
	L	13 10 ca.					

TABLE 2.—Instrumental reports, December, 1920—Continued.

CANADA. Dominion Meteorological Service, Toronto.

CANADA. Dominion Meteorological Service, Victoria.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Dec. 5	eL	10 40 42					Continuous L. waves of short periods.
	M	10 43 48		*600			
	F	11 18 12					
	L	15 33 42					Do.
		to 41 00		*300			
	L	15 52 06					
	L	to 56 48		*200			Do.
	L	16 25 54					
		to 30 42		*200			
10	7eS	4 49 06					May be a dual quake.
	S	4 52 12					
	eL	5 01 00					
	eL	5 12 24					
	eL	5 14 36					
	L	5 25 42					
	eL	5 30 12					
	M	5 30 30			*1,000		
	L	5 42 18					
	eL	6 11 42					
	Lrep	6 48 24					S. not well defined and small amplitude.
	Lrep	7 19 00					
	F	7 23 00					
11	S	21 34 24					
	SR?	21 35 42		*200			
	iL	21 40 36					
	M	21 42 36			*1,000		
	eL	21 46 36					
13	F	22 08 00					
	e	4 42 18					
	eL	4 47 30					
	eL	5 03 00					
	M	5 04 18			*300		
16	eL	5 06 18					Real P. not recorded.
	F	5 19 42					
	PR?	12 29 18					
	S	12 30 18					
	SR1	12 31 36					
	SR2	12 34 24					
	SR3	12 39 00					
	i	12 45 00					
	i	12 47 00					
	i?	12 48 00					
	eL	12 49 06					Initial L. waves difficult to interpret.
	L	12 51 48					
	iL	12 56 12					
	M1	13 00 48					
	M2	13 07 48			*44,000?		
	M3	13 13 06			*48,000?	9,625?	
		to 18 00					
	iL	13 54 24			*25,000?		
	L	14 16 00					
	L	14 35 48					
	Lrep	15 40 00					Principal group sets in. Approx. epicenter lat. 47 N., long. 114 E., or 42 N. and 141 E.
	Lrep	15 48 00					
	F	16 57 00					
17	eL	19 35 54					Eq. reported from Mendoza, Argentina, at 2.57 and 3.28 p. m.; also quake reported from Albania.
	L	19 45 12					
	eL	19 50 06					
	L	19 52 24					
	L	19 59 18					
	M	19 53 18				*400	
	F	20 14 00					
	e	12 22 48					
25	i	12 27 24					Micros.
	iL	12 29 30					
	iL	12 31 30					
	eL	12 35 18					
	M	12 40 36			*1,300		
	eL	12 59 54					
	F						

* Trace amplitude.

1920.		H. m. s.	Sec.	μ	μ	Km.	
Dec. 5	P	10 55 31					P. may be L. phase.
	M	10 57 00		*200			
	F	11 41 45					
5	P	22 26 21					
	L	22 40 30					
	M	22 45 00			*200		
7	F	22 51 00					Times doubtful; no cut-off.
	L	15 49 16				*100	
	F	15 53 10					
7	L	15 59 04				*200	Do.
	F	16 03 40					
10	iP	4 51 58					Sharp easterly movement at 4h 57m 23s; line perfectly straight previous to 4h 58m 58s.
	iS	4 57 23					
	L	5 14 26					
	M	5 18 32			*1,000		
	eL	5 43 09					
	eL	5 47 03					May be a dual quake.
	eL	5 54 57					
	Lrep	6 27 39					
	L	6 38 33					
	Lrep	6 51 15					
11	F	7 01 49					L. may be S. phase
	L	21 36 43					
	eL	21 47 18					
	M	21 51 35			*600		
	F	22 03 57					
13	P	4 05 07					
	S	4 11 35					
	L	4 22 57					
	M	4 29 54			*1,500	3,630	
	F	4 39 20					
16	P?	12 19 27				7,000?	P. waves not distinct and beginning of S. doubtful.
	S	12 25 06					
	SR1?	12 26 44					
	SR2	12 28 22					
	SR3	12 29 10					
	SR4	12 30 22					
	i	12 34 04					
	iL	12 36 50					
	L	12 44 02					
	L	12 46 30					
	L	12 51 10					Group of L. sets in, principal portion begins.
	L	to 01 30					
	M	12 54 35?			*35,000?		
	L	13 04 32					
	L	13 08 26					
	L	13 18 20					
	L	13 29 14					
		to 15 07 14					
	eLrep	15 23 10					
	eL	15 36 14					
	eL	16 09 56					
	F	16 19 12					
	VERTICAL.						
	P	12 16 30		2.5		5,380	Times of S. and L. difficult to determine, and minute contacts on smoked paper weak.
	S	12 23 30		6			
	L	12 35 00		30		50	
	M	12 53 00		30			
16	L	21 51 43					
	M	21 54 11				*200	
	F	21 58 07					
25	S	11 55 43					
	L	12 02 39					
	i	12 21 22					
	M	12 28 26				*800	
	i	12 30 46					
	F	13 24 28					

* Trace amplitude.

NONINSTRUMENTAL EARTHQUAKE REPORTS, CANADA.

November 8, Joliette Seminary, Quebec, approximate time, 15 h. 25 m.: Several feeble shocks felt, duration 6 to 7 seconds. Window frames trembled.

December 7, Atlin, B. C., approximate time, 4.30 a. m.: One sharp shock followed by tremor which lasted about 15 seconds. Number of persons awakened, direction from south to north.

Reports for December, 1920, have not been received from the following stations:

- HAWAII. U. S. C. & G. S. Magnetic Observatory, Honolulu.
- KANSAS. University of Kansas, Lawrence.
- MASSACHUSETTS. Harvard University, Cambridge.
- MISSOURI. St. Louis University, St. Louis.
- NEW YORK. Canisius College, Buffalo; Cornell University, Ithaca; Fordham University, New York.
- PORTO RICO. U. S. C. & G. S. Magnetic Observatory, Vieques.

SEISMOLOGICAL DISPATCHES RECEIVED AT THE SEISMOLOGICAL STATION, GEORGETOWN UNIVERSITY, WASHINGTON, D. C.

[Associated Press.]

Avlona, Albania, December 5, 1920.—An earthquake occurred in the Tepeleni district to the southwest of this city to-day, rendering 15,000 persons homeless.

The Asama-Yama volcano, situated 90 miles northwest of Tokyo, has been in eruption for several days. Ashes are falling over a wide area.

Valdivia, Chile, December 14, 1920.—The volcano Lanin is reported to be in a state of eruption.

Valdivia, Chile, December 14, 1920.—According to a traveler from Pucón, an earthquake in the Vallarica district began at 11 p. m., December 13, and lasted three hours. No fatalities reported.

Peking, China, December 16, 1920.—An earthquake was felt here at 8:20 p. m. The earth rocked buildings and created much excitement in the hotels and clubs.

Santiago, Chile, December 17.—A dispatch from Pucón, Province of Valdivia, states that the volcano Villarica is still discharging flame and lava and that earth tremors continue.

Santiago, Chile, December 17, 1920.—Strong earthquakes were felt at Mendoza, Argentina, at 2:57 o'clock this afternoon. They were repeated at 3:29 o'clock according to a dispatch received here. No casualties reported.

Paris, December 17, 1920.—Two violent earthquakes visited Algiers, each lasting several seconds.

Rome, December 18, 1920.—New earthquake shocks have completed the destruction of the village of Tepeleni. Twenty persons are reported killed.

Buenos Aires, Argentina, December 18, 1920.—One hundred and fifty persons are reported as killed in an earthquake which occurred yesterday afternoon in the village of La Valle, Province of Mendoza. La Valle was apparently the center of the disturbance. Houses collapsed and crevices were opened in the streets through which hot water gushed forth.

Buenos Aires, Argentina, December 18, 1920.—Minor shocks continue throughout the district, one particularly strong tremor being felt yesterday afternoon at 5:30 o'clock in the towns of San Martin and Rivadavia.

Brindisi, Italy, December 19, 1920.—Advices from Saseno give details of the earthquake which occurred concurrently with the earthquake shocks signaled in America. A number of houses disappeared in a great landslide. Thirty deaths are reported.

Buenos Aires, Argentina, December 20, 1920.—Earth tremors occurred again to-day.

Tokyo, Japan, December 20, 1920.—A wireless message from the island of Yap to-day announces that the most violent earthquake shocks occurred in the vicinity of the island, lasting several days.

Tirana, Albania, December 22, 1920.—Forty-two persons were killed, 200 were injured, and 500 made homeless by the recent earthquake in the Tepeleni district, it was learned to-day.

Tokyo, Japan, December 23, 1920.—A Shanghai dispatch to the Ashia Shimbun reports a terrific earthquake in Kan-su Province on December 16, with casualties estimated at 2,000.

Tokyo, Japan, December 23, 1920.—The continued activity of the volcano Asama is causing alarm. Violent explosions occurred in the crater on Wednesday evening and the country for many miles around was strewn with ashes. The towns around the volcano suffered from heavy earthquake shocks and showers of ashes. It is feared that the loss of life is great.

Rockwood, Tenn., December 23, 1920.—An earthquake of considerable violence accompanied by a rumbling sound was felt here and at other towns as far south as Spring City at 2 o'clock this morning.

Buenos Aires, Argentina, December 24, 1920.—A prospector reports that on December 17, the same day the earthquake occurred in Mendoza Province, he was near to Mount Cavalara. He felt a severe shock lasting 50 minutes which threw him to the ground. Afterwards he discovered a crater emitting incandescent lava, hot water and smoke.

F. A. TONDORF, S. J., Director.

TABLE 3.—Late reports (instrumental).

ALABAMA. Spring Hill College, Mobile.

No earthquakes were recorded at this station during November, 1920.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _E	A _W		
1920.								
Nov. 16			H. m. s.	Sec.	μ	μ	Km.	
			8 34 32					
			8 37 49					
			8 42 ..					
			8 43 ..					

ALASKA. U. S. C. and G. S. Magnetic Observatory, Sitka.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _E	A _W		
1920.								
Nov. 16			H. m. s.	Sec.	μ	μ	Km.	
			8 34 32					
			8 37 49					
			8 42 ..					
			8 43 ..					

ARIZONA. U. S. C. and G. S. Magnetic Observatory, Tucson.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _E	A _W		
1920.								
Nov. 16			H. m. s.	Sec.	μ	μ	Km.	
			8 45 14					Trace only on NS.
			8 52 35					
			8 54 02	9	30			
			8 55 20					
			9 07 ..					

HAWAII. U. S. C. and G. S. Magnetic Observatory, Honolulu.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _E	A _W		
1920.								
Nov. 1			H. m. s.	Sec.	μ	μ	Km.	
			17 11 12	18				
			17 21 36					
			17 33 12	18	*700			
			17 42 ..	18				
			17 51 ..					
6			21 33 30					Slight record.
			21 43 00	17	*100			
			21 52 00	17	*100			
			22 02 ..					
16			8 48 30					Slight record; phases not apparent.
			8 53 42					
			9 12 30	17	*100			
			10 03 ..					
29			8 17 18					
			8 19 42					
			8 20 30	15	*500			
			8 26 ..					
			8 45 ..					

* Trace amplitude.

MARYLAND. U. S. C. and G. S. Magnetic Observatory, Cheltenham.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _E	A _W		
1920.								
Nov. 16			H. m. s.	Sec.	μ	μ	Km.	
			8 39 05	3				Phases not clearly marked: ePe faint.
			8 39 03					
			8 47 51					
			8 53 41					
			8 53 00					
			8 53 48			30		
			8 53 52					
			8 55 00		80			
			9 02 00					
			9 05 00					

PORTO RICO. U. S. C. and G. S. Magnetic Observatory, Vieques.

Date.	Char-acter.	Phase.	Time.	Period T.	Amplitude.		Dis-tance.	Remarks.
					A _E	A _W		
1920.								
Nov. 4			H. m. s.	Sec.	μ	μ	Km.	
			2 12 38					Seems to be near shock.
			2 13 06					
			2 13 24		70			
			2 13 38			150		
			2 16 ..					
			2 22 ..					
			2 23 ..					
6			10 45 24					Do.
			10 45 26					
			10 45 52					
			10 46 08			400		
			10 46 14		120			
			10 49 ..					
			10 54 ..					
			10 55 ..					

EARTHQUAKES FELT IN THE UNITED STATES DURING 1920.

Places in the United States reporting earthquakes during 1919—Contd.

[Consult also chart XV in this issue.]

During the year 1920, 106 separate earthquakes strong enough to be felt by the senses were reported from different parts of the continental United States, as listed in the accompanying table, and graphically represented (a dot each report, not for each separate quake) on chart XV at the end of this issue of the REVIEW.

Earthquakes of moderate intensities, V-VI (adapted Rossi-Forel scale), accompanied by slight damage or none at all, occurred in California on January 1, February 9, May 18 and 20, June 16 and 28, September 9, October 5 and 12, and on several days in December; in Washington on January 24 (recorded on the seismographs at Victoria, probably having the epicenter under the Straits of Georgia); in Illinois on May 1; in Missouri on May 1; in Utah on September 18, 19, and November 20 and 25. An earthquake of considerable intensity occurred in the vicinity of Los Angeles on June 22, followed by milder shocks in July; this quake is fully treated by Stephen Taber, *Bull. Seismol. Soc. Amer.*, 10, 129-145, 1920; it was recorded by seismographs throughout the country.

Another quake of moderate intensity and wide extent occurred in Tennessee on December 24; and one is reported to have occurred in the Luray district of Virginia in July. Data concerning these are extremely meager.

Places in the United States reporting earthquakes during 1919.

[Consult also chart XV in this issue.]

Place.	Approximate latitude N.	Approximate longitude W.	Number of quakes reported.
CALIFORNIA.			
Aguanga.....	33 26	116 51	2
Amos.....	33 05	115 16	3
Avalon.....	33 15	118 15	1
Barstow.....	34 54	117 02	1
Blocksburg.....	40 17	123 39	1
Blythe.....	33 35	114 45	4
Brawley.....	32 59	115 40	2
Calxico.....	32 41	115 30	8
Centerville.....	37 30	122 00	1
Corona.....	33 52	117 35	1
El Cajon.....	32 48	116 58	3
El Centro.....	32 50	115 35	2
El Segundo.....	33 56	118 22	1
Elsinore.....	33 37	117 15	1
Escondido.....	33 06	117 05	1
Eureka.....	40 45	124 15	4
Hemet.....	33 45	116 58	4
Julian.....	33 05	116 37	3
Kennett.....	40 15	122 24	1
Lakeport.....	39 03	122 56	2
Lone Pine.....	36 37	118 01	1
Los Alamos.....	34 45	120 15	1
Los Angeles.....	34 03	118 15	20
Los Gatos.....	37 12	121 58	2
McCloud.....	41 15	122 10	1
Manhattan Beach.....	33 52	118 22	1
Maricopa.....	35 05	119 23	2
Mesa Grande.....	33 11	116 42	2
Mount Wilson.....	34 13	118 16	4
Nellis.....	33 22	116 52	1
Ojai.....	34 25	119 12	1
Palo Alto.....	37 30	122 06	1
Pasadena.....	34 05	118 10	4
Redding.....	40 35	122 25	4

Place.	Approximate latitude N.	Approximate longitude W.	Number of quakes reported.
CALIFORNIA—continued.			
Redondo Beach.....	33 50	118 22	1
Salinas.....	36 41	121 39	4
San Diego.....	32 40	117 10	5
San Francisco.....	37 48	122 25	3
San Luis Obispo.....	35 13	120 45	3
San Jose.....	37 15	121 53	2
Santa Barbara.....	34 23	119 40	8
Santa Monica.....	34 02	118 30	2
Spreckles.....	36 35	121 36	6
Taft.....	35 15	119 30	1
Venice.....	33 58	118 28	1
Warner Springs.....	33 15	116 45	4
Whittier.....	34 00	118 04	1
COLORADO.			
Glenwood Springs.....	39 30	107 15	1
New Castle.....	39 30	107 30	3
ILLINOIS.			
Centralia.....	38 30	89 10	1
Du Quoin.....	38 07	88 33	1
McLeansboro.....	38 20	89 00	2
Mount Vernon.....	38 20	89 00	1
MAINE.			
Eastport.....	45 00	67 00	1
MISSOURI.			
Columbia.....	38 55	92 15	1
Harrisonville.....	38 45	94 15	1
Springfield.....	37 10	93 10	1
Warrenton.....	38 50	91 10	1
MONTANA.			
Helena.....	46 40	112 00	1
NEW HAMPSHIRE.			
Concord.....	43 10	71 30	1
OREGON.			
Astoria.....	46 10	123 50	2
Cascadia.....	44 15	122 30	1
Crater Lake.....	42 50	122 00	1
Portland.....	45 30	122 40	2
SOUTH CAROLINA.			
Summerville.....	33 05	80 15	2
SOUTH DAKOTA.			
Oelrichs.....	43 15	103 15	1
Hot Springs.....	43 30	103 25	1
TENNESSEE.			
Crossville.....	36 00	85 00	1
Deatur.....	35 32	84 50	1
Glen Altoe.....	35 50	84 50	1
Rockwood.....	35 50	84 40	1
Spring City.....	35 40	84 50	1
Springville.....	35 52	85 27	1
UTAH.			
Beaver.....	38 12	112 45	1
Brigham.....	41 30	112 00	3
St. George.....	37 05	113 30	1
Salt Lake City.....	40 45	112 00	1
WASHINGTON.			
Anacortes.....	48 50	122 40	1
Blaine.....	49 00	122 45	1
Clallam Bay.....	48 15	124 15	1
Forks.....	47 56	121 20	1
Glenoma.....	46 30	122 07	2
Longmire.....	46 50	121 50	1
Marietta.....	46 47	122 35	1
Tatoosh.....	48 23	121 45	1
Detroit.....	47 20	122 50	1
WYOMING.			
Clark.....	44 46	109 10	1