550.34

SECTION V.—SEISMOLOGY.

SEISMOLOGICAL REPORTS FOR DECEMBER, 1917.

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[Dated: Weather Bureau, Washington, D. C., February 2, 1918.]

TABLE 1.—*Noninstrumental earthquake reports, December, 1917.*

Day.	Approximate time, Greenwich Civil.	Station.	Approximate latitude.	Approximate longitude.	Intensity Rossi-Forel.	Number of shocks.	Duration.	Sounds.	Remarks.	Observer.
1917.	H. m.	CALIFORNIA.	° ′	° ′			M. s.			
Dec. 8	9 45	Calexico	32 41	115 30	4	1	5	Rumbling...	Doors and dishes rattled	Ivan R. Ralston.
20	8 23	Barrett Dam	32 40	116 44	3	1		None		Lorenzo Watts.
		Brawley	33 00	115 31	4	1	5	Rumbling		M. D. Witter.
		Calexico	32 41	115 30	3	1	5	Rumbling		H. M. Rouse.
		Calexico	32 41	115 40	4	2	5	None		Ivan R. Ralston.
		IDAHO.								
12	12 00	Ashton	44 04	111 29	2	1	0	None		A. M. Slatery.
		Chesterfield	42 53	111 52	5	1	3	None		Charles S. West.
		Fort Hull	43 09	112 10	3	1	2	None		C. H. Southworth.
		Idaho Falls	43 29	112 01	2	1		None		Anna Lee Bridges.
		Irwin	43 28	111 20	5	1	20	None		Lula Sanders.
		Pocatello	42 52	112 29	3	1		None		A. R. Teeple.
		Sugar	43 52	111 44	2	1		None		Hattie Gearhart.
		WYOMING.								
12	11 50	Bedford	42 54	110 58	5	1	30	Rumbling...		Charles G. Heiner.

TABLE 2.—*Instrumental reports, December, 1917.*

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

[For significance of symbols see REVIEW for July, 1917, p. 373.]

Alaska. *Sitka.* *Magnetic Observatory.* U. S. Coast and Geodetic Survey. J. W. Green.

Lat. 57° 03′ 00″ N.; long., 135° 30′ 06″ W. Elevation, 15.2 meters.

Instruments: Two Bosch-Omori, 10 and 12 kg.

Instrumental constants: E: V 10, T_0 16; N: V 10, T_0 15

Date.	Character.	Phase.	Time.	Period, T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1917.			H. m. s.	Sec.	μ	μ	km.	
Dec. 21		eP_E	17 56 46					
		eN	17 58 03					
		eS_E	17 59 16					
		M_E	18 00 01		670			
		eL_E	18 01 02	18				
		M_E	18 07 22	18	650			
		M_N	18 07 49	14		950		
		C	18 12 ..	12				
		F	20 18 ..					
21		e_N	20 56 16					No phases.
		e_E	20 57 04					
		M_N	21 03 28			60		
		F	21 35 ..					
26		e_N	13 35 38					No phases. Driving clock on E-component had stopped.
		M_N	13 46 ..	11		20		
		F	13 58 ..					
28								Imperfect record. Impossible to determine any of the phases of earthquake on this date.
29		eP_N	22 59 30	3				E-component not recording.
		S_N	23 07 06	10				
		eI_N	23 15 40	26				
		M_N	23 20 20	15		600		
		C	23 26 ..	10				
		F	23 50 ..					

Arizona. *Tucson.* *Magnetic Observatory.* U. S. Coast and Geodetic Survey. F. P. Ulrich.

Lat., 32° 14′ 48″ N.; long., 110° 50′ 06″ W. Elevation, 769.6 meters.

Instruments: Two Bosch-Omori, 10 and 12 kg.

Instrumental constants: E: V 10, T_0 19; N: V 10, T_0 19

Date.	Character.	Phase.	Time.	Period, T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1917.			H. m. s.	Sec.	μ	μ	km.	
Dec. 21		eP_E	18.01 24	6				
		eS_E	18 07 34					
		eL_E	18 13 00	14				
		M_E	18 25 59	13	20			
		F_E	19 08 ..					
25		e_E	5 31 06					
		e_N	5 31 11					
		M_E	5 37 07	7	10			
		M_N	5 37 50	8		10		
		F	5 51 ..					
28		P	21 21 57	4				
		eL_N	21 34 30	14				
		eL_E	21 36 29	12				
		M_E	21 42 51	10	10			
		M_N	21 45 30	11		20		
		F	22 04 ..					
29		eP_E	22 55 18	8				
		eP_N	22 55 22	8				
		eS_E	22 59 30	10				
		eS_N	22 59 36	12				
		L	23 02 12	20				
		M_E	23 03 ..	13	6,260+			Movement limited by brushes.
		M_N	23 06 ..	11		6,000+		
		C	23 10 ..	14				
30		F	1 15 ..	10				

TABLE 2.—*Instrumental reports, December, 1917*—Continued.

California. *Berkeley. University of California.*

Lat., 37° 52′ 16″ N.; long., 122° 15′ 37″ W. Elevation, 85.4 meters.

(*See* Bulletin of the Seismographic Stations, University of California.)

California. *Mount Hamilton. Lick Observatory.*

Lat., 37° 20′ 24″ N.; long., 121° 38′ 34″ W. Elevation, 1,281.7 meters.

(*See* Bulletin of the Seismographic Stations, University of California.)

California. *Point Loma. Raja Yoga Academy.* F. J. Dick.

Lat., 32° 43′ 03″ N.; long., 117° 15′ 10″ W. Elevation, 91.4 meters.

Instrument: Two-component, C. D. West seismoscope.

1917.			H. m. s.	Sec.	μ	μ	km.	
Dec. 3					50	50		Tremors recorded during the 24 hours ending 16h 00m on dates given.
5					50	50		
6					50	100		

California. *Santa Clara. University of Santa Clara.* J. S. Ricard, S. J.

Lat., 37° 26′ 36″ N.; long., 121° 57′ 03″ W. Elevation, 27.43 meters.

(*See* Record of the Seismographic Station, University of Santa Clara.)

Colorado. *Denver. Sacred Heart College.* Earthquake Station. A. W. Forstall, S. J.

Lat., 39° 40′ 36″ N.; long., 104° 56′ 54″ W. Elevation, 1,655 meters.

Instrument: Wiechert 80 kg., astatic, horizontal pendulum.

Instrumental constants .....

1917.			H. m. s.	Sec.	μ	μ	km.	
Dec. 12	II_r	L_N	12 20 ..					P and S waves not discernable.
		L_E	12 30 ..					
		M_N	(?)					
		M_E	12 20 40	4–6		*4,000		
		F_E	12 22 ..					
		F_N	12 23 ..					
21	I_r	L_E	18 12 ..					P and S waves not discernable.
		L_N	18 13 ..					
		M	18 14 ..	10–13	*1,000	*1,000		
		F_N	18 20 ..					
		F_E	18 21 ..					
27								Very strong activity at intervals.
28								
28	I_r	L	21 38 ..	0.5				
		F	21 50 ..					
29	III_r	P	22 58 ..					
		L	23 02 ..	5–6	*10,000	*8,500		
		M_E	23 08 ..	7				
		M_N	23 10 ..	5				
		C_E	23 15 ..					
		C_N	23 19 ..					
		F_E	23 29 ..					
		F_N	23 30 ..					

* Trace amplitude.

District of Columbia. *Washington. U. S. Weather Bureau.*

Lat., 38° 54′ 12″ N.; long., 77° 03′ 03″ W. Elevation, 21 meters.

Instrument: Marvin (vertical pendulum), undamped. Mechanical registration.

Instrumental constants.. V 110 T_0 6.4

1917.			H. m. s.	Sec.	μ	μ	km.	
Dec. 12		S?	11 04 23					
		L?	11 06 19					
		F	11 15 ..					
21		P	18 03 35				5,600	
		S	18 10 30					
		SR1	18 13 20					
		L	18 14 42	20				
		L	18 20 15	20				
		F	19 45 ..					
21		P?	21 01 15					
		S	21 08 23					
		L	21 18 25	16				
		F	22 00 ..					
23		eL	14 38 ..					
		L	14 45 ..					
		F	15 00 ..					
23		?e	15 59 20					
		S	16 04 10					
		L	16 05 45					
		L	16 09 30					
		F	16 30 ..					
26		e	5 30 ..					
		L	5 35 ..					
		F	5 50 ..					
26		eL	13 58 ..					
		F	14 30 ..					
28		P	21 23 21				4,820	
		S	21 29 53					
		SR1	21 33 21					
		L	21 35 ..					
		L	21 40 15	20				
		F	21 45 ..					
29		P	22 56 35				3,040	
		S	23 01 21					
		L?	23 03 ..					
		L	23 05 20	28				
30		F	00 30 ..					

District of Columbia. *Washington. Georgetown University.* F. A. Tondorf, S. J.

Lat., 38° 54′ 25″ N.; long., 77° 04′ 24″ W. Elevation, 42.4 meters. Subsoil: Decayed diorite.

Instruments: Wierchert 200 kg. astatic horizontal pendulums, 80 kg. vertical.

Instrumental constants.. E: V 165 T_0 5.4 ε 0; N: 143 5.2 0; Z: *80 3.0 0*

1917.			H. m. s.	Sec.	μ	μ	km.	
Dec. 12	III	e	11 00 09					e doubtful.
		S	11 04 46					
		eL	11 06 03					
		F	11 16 ..					
21	IIIu	e	18 03 23					Microseisms present, but not heavy. P and S waves on Mainka 7m 14s.
		S	18 10 46					
		L_N	18 20 13	21				
		L_E	18 20 13	20				
		M_N	18 24 59			*2,000		
		M_E	18 26 27		*2,900			
		F	19 45 ..					
				VERTICAL.				
		e_Z	*18 03 43*					*S waves not discernible.*
		L_Z	*18 21 09*	*20*				*No distinct main.*
		F_Z	*19 18* ..					
21		e_N?	21 05 56					Heavy microseisms.
		e_E?	21 06 10					
		eL?	21 18 12					S waves in nowise discernible.
		F	22 09 ..					
23		e?	15 59 00					Heavy microseisms present.
		L	16 06 02	17				
		F	16 25 ..					

* Trace amplitude.

TABLE 2.—*Instrumental reports, December, 1917*—Continued.

District of Columbia. *Washington. Georgetown University.* F. A. Tondorf, S. J.—Continued.

Date.	Character.	Phase.	Time.	Period, T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1917.			*H. m. s.*	*Sec.*	*μ*	*μ*	*km.*	
Dec. 26		e_N?	5 30 00					Gram very difficult. Microseisms present.
		e_E?	5 30 04					
		S_N?	5 34 29					
		S_E?	5 34 41					
		eL?	5 35 24					
		F	5 52 ..					
26								Quake between 13h and 14h et postea lost in changing sheets.
28		e	21 23 28					Heavy microseisms present.
		eL	21 35 00					
		L	21 41 16	14				Sinusoidal waves from 21h 49m to 22h. F waves lost in microseisms.
	II-III	iP_N	22 56 28					Heavy microseisms.
		iP_E	22 56 30					
		S_N	23 01 16					F uncertain.
		S_E	23 01 18					
		eL	23 03 07	17				
		M_N	23 10 17			*1,900		
		M_E	23 12 27		*2,200			
30		F	1 (ca)					
				VERTICAL.				
29		iP_Z	*23 56 31*					*S waves not quite as certain as P waves.*
		S_Z	*23 01 39*					
		L_Z	*23 05 44*	33				
30		F_Z	*1 00(ca)*					*No distinct main.*

* Trace amplitude.

Hawaii. *Honolulu. Magnetic Observatory.* U. S. Coast and Geodetic Survey. Frank Neumann.

Lat., 21° 19′ 12″ N.; long., 158° 03′ 48″ W. Elevation, 15.2 meters.

Instrument: Milne seismograph of the Seismological Committee of the British Association, E-W component.

Instrumental constant....T_0 18.6

Date.	Character.	Phase.	Time.	Period, T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1917.			*H. m. s.*	*Sec.*	*μ*	*μ*	*km.*	
Dec. 3		e	4 56 12					
		M	5 04 00	19	100			
		F	5 22 ..					
9		eL	2 44 00					
		M	2 45 00	18	100			
		F	2 48 ..					
9		e	16 11 48					
		M	16 14 00	19	100			
		F	16 27 ..					
11		e	13 32 12					
		M	13 36 48	20	100			
		F	13 44 ..					
13		e	3 18 18					
		M	3 30 36	19	100			
		F	3 32 ..					
15		eL	16 03 42					Phases uncertain on account of wind tremors.
		M	16 08 00	18	100			
		F	16 10 ..					
17		e	19 27 06					Observer in the room at the time.
		M	19 28 00	20	300			
		F	19 31 ..					
21		eP	18 03 18					Seismograph not working properly. Impossible to determine phases.
21		eL	21 09 00					
		M	21 09 24	11	900			
		C	21 12 00					
		F	21 18 ..					

Kansas. *Lawrence. University of Kansas.* Department of Physics and Astronomy. F. E. Kester.

Lat., 38° 57′ 30″ N.; long., 95° 14′ 53″ W. Elevation, 301.1 meters.

Instrument: Wiechert.

Instrument constants..

	V	T_0	e
E	177	3.4	4:1
N	205	3.4	4:1

(Report for December, 1917, not received.)

Maryland. *Cheltenham. Magnetic Observatory.* U. S. Coast and Geodetic Survey. George Hartnell.

Lat., 38° 44′ 00″ N.; long., 76° 50′ 30″ W. Elevation, 71.6 meters.

Instruments: Two Bosch-Omori, 10 and 12 kg.

Instrumental constants..

	V	T_0
E	10	33
N	10	25

Date.	Character.	Phase.	Time.	Period, T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1917.			*H. m. s.*	*Sec.*	*μ*	*μ*	*km.*	
Dec. 12		e_E	11 04 40					Very faint. N component too disturbed by wind tremors to distinguish any seismic motion.
		F	11 08 ..					
21		eP_E	18 03 36	2				
		S_E	18 10 58	4				
		S_N	18 11 06	4				
		eL_N	18 20 30	17				
		eL_E	18 20 46	17				
		M_E	18 27 08	15	600			
		M_N	18 27 57	15		580		
		C	18 32 00					
		F	19 02 ..					
26		e	5 33 00					
		M_N	5 38 38	10		10		
		M_E	5 39 ..	10	10			
		F	5 54 ..					
28		eP_E	21 23 58					
		eS_N	21 30 57					
		eS_E	21 31 17					
		eL_E	21 41 37	12				
		eL_N	21 41 48	12				
		M_E	21 46 43	17	200			
		M_N	21 53 25	12		140		
		C	22 01 ..					
		F	22 29 ..					
29		eP_N	22 56 27	4				
		eP_E	22 56 32	4				
		S	23 01 27	8				
		eL_E	23 04 25	18				
		eL_N	23 04 50	14				
		M_E	23 10 27	14	450			
		M_N	23 15 08	12		100		
		C	23 28 ..					
30		F	00 09 ..					

TABLE 2.—*Instrumental reports, December, 1917*—Continued.

Massachusetts. *Cambridge. Harvard University Seismographic Station.* J. B. Woodworth.

Lat., 42° 22′ 36″ N.; long., 71° 06′ 59″ W. Elevation, 5.4 meters. Foundation: Glacial sand over clay.

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

Instrumental constants.. V, T_0, ε: E 80 23 0; N 50 25 4:1

Date.	Character.	Phase.	Time.	Period, T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
			H. m. s.	*Sec.*	*μ*	*μ*	*km.*	
1917. Dec. 30		iM$_E$	3 07 08		*500			Local frost cracks; ground half bare, half iced over temperatures from 0° to −14°F on a.m. of 30th, Greenwich mean time.
		C	3 07 10					
		F	3 07 13					
30		iM$_E$	3 20 42		*500			
		C	3 30 44					
		F	3 20 50					
30		iM$_E$	3 21 48					
		F	3 21 56					
30		iM$_E$	3 22 50					
		C	3 22 52		*1,000			
		F	3 23 00					
30		iM$_E$	4 09 42		*1,300			
		F	4 09 47					
30		iM$_E$	5 21 57		*500			
		C	5 21 59					
		F	5 22 07					
30		P$_E$	6 49 50				6?	No reports.
		iM	6 49 50					
		C	6 49 51					
		F	6 49 56					
30		M$_E$	7 03 20					
		C	7 03 22					
		F	7 03 29					
30		iM$_E$	7 48 44					
		C	7 48 45					
		F	7 48 49					
30		P$_E$	7 55 23				10?	No reports.
		M	7 55 24					
		F	7 55 33					
30		M$_E$	9 11 20					
		C	9 11 23					
		F	9 11 29					
30		M$_E$	9 54 32					
		C	9 54 34					
		F	9 54 36					
30		M$_E$	9 58 14					
		C	9 58 16					
		F	9 58 20					
30		M	10 44 52					
		C	10 44 54					
		F	10 44 57					
30		M	10 45 41					
		F	10 45 43					
30		M	12 08 14					
		F	12 08 16					
30		M	14 22 11					
		F	14 22 12					
31		iM$_E$	6 40 46		*500			
		C	6 40 48					
		F	6 40 59					
31		iM	9 44 08		$250			†
		C	9 44 10					
		F	9 44 14					
31		iM	11 26 55					
		C	11 27 01					
		F	11 27 06					

*Trace amplitude.

†Dec. 31, press report from Maynard, Mass., states that at an early hour this morning (eastern standard time) earth tremors shook houses, broke dishes, and caused people to think there had been an explosion. Several wide cracks in the ground, extending in some places more than half a mile, have been found. A large pear tree on the premises of William H. Millington on Bent Avenue was split from the base to the topmost limb. Two large crevices have been found on the Millington property.—(Note from Boston Post, Jan. 1, 1918, through Harvard University.)

Missouri. *Saint Louis. St. Louis University.* Geophysical Observatory. J. B. Goesse, S. J.

Lat., 38° 38′ 15″ N.; long., 90° 13′ 58″ W. Elevation, 160.4 meters. Foundation: 12 feet of tough clay over limestone of Mississippi system, about 300 feet thick.

Instrument: Wiechert 80 kg. astatic, horizontal pendulum.

Instrumental constants.. V, T_0, ε: 80 7 5:1

Date.	Character.	Phase.	Time.	Period, T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
			H. m. s.	*Sec.*	*μ*	*μ*	*km.*	
1917. Dec. 21	III	iP	18 09 12				2,011	
		iS$_E$	18 12 36					
		iS$_N$	18 12 42					
		L$_E$	18 13 12					
		L$_N$	18 13 12	18		*3,000		
		M$_N$	18 20 24					
		M$_E$	18 22 06	12	*3,000			
		F	19 00 ..					
28	III	e$_N$?	19 37 30					Shocks recorded intermittently on E–W.
		F$_N$	20 10 ..					
29	II	iP	22 55 48				2,736	
		iS$_N$	23 00 09					
		iS$_E$	23 00 12					
		L$_N$	23 01 18	30		*12,000		
		L$_E$	23					
		F	24 00 ..					

* Trace amplitude.

New York. *Buffalo. Canisius College.* John A. Curtin, S. J.

Lat., 42° 53′ 02″ N.; long., 78° 52′ 40″ W. Elevation, 190.5 meters.

Instrument: Wiechert 80 kg. horizontal.

Instrumental constants.. V, T_0, ε: 80 7 5:1

(Report for December, 1917, not received.)

New York. *Fordham. Fordham University.* Daniel H. Sullivan, S. J.

Lat., 40° 51′ 47″ N.; long., 73° 53′ 08″ W. Elevation, 23.9 meters.

Instrument: Wiechert, 80 kg.

Instrumental constants. V, T_0, ε: E 72 6.6 1.5:1; N 72 7.1 3.8:1

Date.	Character.	Phase.	Time.	Period, T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
			H. m. s.	*Sec.*	*μ*	*μ*	*km.*	
1917. Dec. 21		eP$_E$	17 59 08					N–S not recording.
		eS$_E$	18 06 19					
		L$_E$	18 16 49					
		M$_E$	18 21 24	17	*2,060			
		C$_E$	18 33 24					
		F$_E$	19 05 24					
21		eL?	21 16 44	12				
		F	21 30 ..					
28		eP$_E$	21 26 27					
		eP$_N$	21 26 29					
		eL	21 35 50?					
		M	21 40 00 / 21 57 00	13				Sinusoidal. No decided max.
		F	22 20 00					
29		iP$_E$	22 52 32					N–S not recording satisfactorily.
		iS$_E$	22 57 45					
		L$_E$	23 02 04					
		M$_E$	23 07 04	14	*2,300			
		F$_E$	23 55 ..					

* Trace amplitude.

TABLE 2.—*Instrumental reports, December, 1917*—Continued.

New York. *Ithaca. Cornell University.* Heinrich Ries.

Lat., 42° 26′ 58″ N.; long., 76° 29′ 09″ W. Elevation, 242.6 meters.

Instruments: Two Bosch-Omori, 25 kg., horizontal pendulums (mechanical registration).

Instrumental constants.. { E: V 13, T_0 22, ε 4:1; N: V 14, T_0 25, ε 4:1 }

Date.	Character.	Phase.	Time.	Period, T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1917.			*H. m. s.*	*Sec.*	*μ*	*μ*	*km.*	
Dec. 21		e_N	18 03 17	4				
		S_N	18 10 26	7				
		L_N	18 18 25	24				
		M_N	18 30 18	11		*1,500		
		F_N	20 06 ..					
21		e_N	21 08 05	6				
		L_N	21 17 50	16				
		F	21 56 ..					
23		eL	16 10 50	13				
		F	16 24 ..					
26		e	14 04 07	9				
		F	14 13 ..					
28		e_N	21 30 21	8				
		eL_N	21 40 11	18				
		F	23 03 00					
29		P_N	22 56 56	6				
		S_N	23 02 18	13				
		L_N	23 06 19	43				
		M_N	23 13 25	20		*2,500		
		F	24 43 ..					

* Trace amplitude.

Panama Canal Zone. *Balboa Heights.* The Panama Canal.

Lat., 8° 57′ 39″ N; long., 79° 33′ 29″ W. Elevation, 27.6 meters.

Instruments: Two Bosch-Omori, 100 kg.

Instrumental constants.. V 35, T_0 20

Date.	Character.	Phase.	Time.	Period, T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1917.			*H. m. s.*	*Sec.*	*μ*	*μ*	*km.*	
Dec. 26		M_E	1 25 48	20	*300			
		M_N	1 25 52	20		*500		
29		P	22 54 40					
		L_E	22 58 12					
		L_N	22 58 14					
		M_E	22 55 ..	20	*5,600		1,175	Direction probably NW.
		M_N	22 55 01	20		*1,500		
		F_E	23 48 40					
		F_N	23 49 ..					

* Trace amplitude.

Porto Rico. *Vieques. Magnetic Observatory.* U. S. Coast and Geodetic Survey. F. L. Adams.

Lat., 18° 09′ N; long., 65° 27′ W. Elevation, 19.8 meters.

Instruments: Two Bosch-Omori.

Instrumental constants.. { E: V 10, T_0 17.5; N: V 10, T_0 18.0 }

Date.	Character.	Phase.	Time.	Period, T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1917.			*H. m. s.*	*Sec.*	*μ*	*μ*	*km.*	
Dec. 21		eL_E	18 24 55	24				North component not recording.
		M_E	18 36 ..	19	40			
		C	18 48 ..					
		F	19 05 ..					
29		e_E	22 57 05					
		e_N	22 57 20					
		eL_N	23 02 ..					North component not recording properly.
		eL_E	23 02 07	30				
		M_E	23 14 40	17	30			
		C	23 17 ..	12				
		F	23 56 ..					

Vermont. *Northfield. U. S. Weather Bureau.* Wm. A. Shaw.

Lat., 44° 10′ N; long., 72° 41′ W. Elevation, 256 meters.

Instruments: Two Bosch-Omori, mechanical registration.

Instrumental constants.. { E: V 10, T_0 15; N: V 10, T_0 16 }

Date.	Character.	Phase.	Time.	Period, T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1917.			*H. m. s.*	*Sec.*	*μ*	*μ*	*km.*	
Dec. 21		P	18 03 26					
		S	18 10 36					
		L	18 14 20					
		L	18 20 00	20				
		F	19 00 ..					
21		eL	21 20 30					
		F	21 45 ..					
28		P?	21 23 26					
		S?	21 30 00					
		eL	21 36 00					
		L	21 41 30	20				
		F	22 30 ..					
29		P	22 57 16					
		S	23 02 40					
		L	23 08 50	28				
		F	24 00 ..					

Canada. *Ottawa. Dominion Astronomical Observatory.* Earthquake Station. Otto Klotz.

Lat., 45° 23′ 38″ N.; long., 75° 42′ 57″ W. Elevation, 83 meters.

Instruments: Two Bosch photographic horizontal pendulums, one Spindler & Hoyer 80 kg. vertical seismograph

Instrumental constants.. V 120, T_0 26

Date.	Character.	Phase.	Time.	Period, T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1917.			*H. m. s.*	*Sec.*	*μ*	*μ*	*km.*	
Dec. 21		O	17 54 45				5,040	
		P	18 03 16					
		S	18 10 ..					
		SR1	18 13 ..					
		L_N	18 17 ..	24				
		M_N	18 22 ..	20		200		
		L	18 25 ..	12				
		L	18 41 ..	12				
		L	18 46 ..	10				
		L	19 10 ..	10				
		LR1?	20 25 ..	irreg.				
		F	21 00 ..					
21		e_N	21 07 44					Probably of the order of about 5,000 kilometers, and resembles the preceding quake but is less intense.
		e_N	21 13 ..	4				
		e_N	21 13 30†	8				
		eL?	21 17 ..	16				
		L	21 18 ..	16				
		L	21 25 ..	12				
		L	21 33 ..	12				
		L_N	21 40 ..	10				
		F	22 10 ..					
23		eL_N	14 37 ..	12				
		eL_N	14 45 ..					
		L_N	14 50 ..	8				
		L_N	14 55 ..					
		F	15 00 ..					
23		eS_N?	16 05 ..	5				
		eL_N	16 07 30†	15				
		L_N	16 17 ..	11				
		F	16 35 ..					
26		eL_N	13 57 ..	15				
		eL_N	14 15 ..	11				
28		O	21 14 37				5,140	
		P_E	21 23 14					
		S	21 30 04					Note the marked resemblance in these phases to those on Dec. 21.
		SR1	21 33 02					
		eL_N?	21 36 30†					
		L	21 38 ..	18				
		M_N	21 42 30†	20		80		
		L	21 48 ..	12				
		L	21 53 ..	11				
		L	22 01 ..	9				
		L	22 10 ..	9				
		L_N	22 29 ..	11				
		F	23 00 ..					

† Original time in tenths of a minute.

TABLE 2.—*Instrumental reports, December, 1917*—Continued.

Canada. *Ottawa. Dominion Astronomical Observatory.* Earthquake Station. Otto Klotz—Continued.

Date.	Character.	Phase.	Time.	Period, T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1917.			*H. m. s.*	*Sec.*	*μ*	*μ*	*km.*	
Dec. 29	.....	*O*	22 50 29	.....	.....	.....	3,690	Guatemala.
		P	22 57 24	.....	.....	.....	.....	
		S	23 02 53	.....	.....	.....	.....	
		eL$_N$	23 06 30†	.....	.....	.....	.....	
		L	23 10 ..	30	.....	.....	.....	
		M	23 16 ..	.....	.....	.....	.....	
			23 24 ..	18	.....	.....	.....	
		L	23 30 ..	16	.....	.....	.....	
		L	23 42 ..	12	.....	.....	.....	
			24 00 ..	.....	.....	.....	.....	
30	.....	L	00 10 ..	.....	.....	.....	.....	
		F	00 30 ..	.....	.....	.....	.....	

† Original time in tenths of a minute.

Canada. *Toronto. Dominion Meteorological Service.*

Lat., 43° 40′ 01″ N.; long., 79° 23′ 54″ W. Elevation, 113.7 meters. Subsoil: Sand and clay.

Instrument: Milne horizontal pendulum, North. In the meridian.

Instrumental constant.. T_0 18. Pillar deviation, 1 mm. swing of boom=0.50″.

Date.	Character.	Phase.	Time.	Period, T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1917.			*H. m. s.*	*Sec.*	*μ*	*μ*	*km.*	
Dec. 20	.....	L$_E$	2 56 00	.....	.....	.....	.....	
		M	2 57 36	.....	*300	.....	.....	Gradual thickening.
		F	3 28 24	.....	.....	.....	.....	
21	.....	P		.....	.....	.....	.....	P lost changing sheet.
		S or L.	18 10 18	.....	.....	.....	.....	
		Li	18 18 36	.....	.....	.....	.....	
		Li	18 21 36	.....	.....	.....	.....	
		M	18 24 12	.....	*6000	.....	.....	
		F?	20 05 30	.....	.....	.....	.....	
21	.....	L?	21 09 00	.....	.....	.....	.....	
		L	21 16 36	.....	.....	.....	.....	Air currents on. P and S masked.
		L$_E$	21 20 36	.....	.....	.....	.....	
		M	21 22 30	.....	*800	.....	.....	
		F	.....	.....	.....	.....	.....	
23	.....	L	14 38 48	.....	*50	.....	.....	
		F	14 42 54	.....	.....	.....	.....	
		L	16 06 36	.....	*50	.....	.....	
		F	16 09 54	.....	.....	.....	.....	
26	.....	L$_E$	4 46 42	.....	.....	.....	.....	
		Li	4 47 12	.....	.....	.....	.....	
		M	4 48 00	.....	*500	.....	.....	Guatemala earthquake.
		F	5 19 30	.....	.....	.....	.....	
26	.....	Le	5 37 06	.....	.....	.....	.....	
		L	5 38 06	.....	.....	.....	.....	
		M	5 38 30	.....	*700	.....	.....	Guatemala.
		F	5 55 06	.....	.....	.....	.....	
26	.....	L$_E$	6 36 30	.....	.....	.....	.....	
		M	6 36 48	.....	*300	.....	.....	Guatemala.
		F	6 48 12	.....	.....	.....	.....	
26	.....	S or L.	13 55 42	.....	.....	.....	.....	
		L	13 59 24	.....	.....	.....	.....	
		M	13 59 48	.....	*200	.....	.....	Guatemala.
		F	14 17 42	.....	.....	.....	.....	
28	.....	S$_E$	21 30 06	.....	.....	.....	.....	No P waves registered.
		L$_E$	21 38 00	.....	.....	.....	.....	
		L	21 41 06	.....	.....	.....	.....	
		M	21 44 30	.....	*2300	.....	.....	
		L$_E$	22 04 24	.....	.....	.....	.....	
		F	23 43 42	.....	.....	.....	.....	
29	.....	L	20 27 54	.....	.....	.....	.....	
		L$_E$	20 29 48	.....	.....	.....	.....	
		M	20 30 06	.....	*300	.....	.....	Thickening.
		F	20 49 24	.....	.....	.....	.....	
29	.....	P	22 57 00	.....	.....	.....	.....	
		S	23 02 36	.....	.....	.....	.....	
		Li	23 04 24	12?	.....	.....	.....	
		L	23 07 12	.....	.....	.....	.....	
		Li	23 09 48	.....	.....	.....	.....	
		M	23 15 54	.....	*4100	.....	3,810	Disastrous Guatemala earthquake.
30		L$_E$	1 01 06	.....	.....	.....	.....	
		F	2 03 36	.....	.....	.....	.....	
31	.....	L	16 31 06	.....	.....	.....	.....	
		L	16 35 30	.....	.....	.....	.....	
		M	16 41 24	.....	*200	.....	.....	Thickening.
		F	16 55 48	.....	.....	.....	.....	

* Trace amplitude.

Canada. *Victoria, B. C. Dominion Meteorological Service.*

Lat., 48° 24′ N.; long., 123° 19′ W. Elevation, 67.7 meters. Subsoil: Rock.

Instrument: Wiechert, vertical; Milne horizontal pendulum, North. In the meridian

Instrumental constant.. T_0 18. Pillar deviation, 1 mm., swing of boom=0.54″.

Date.	Character.	Phase.	Time.	Period, T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
1917.			*H. m. s.*	*Sec.*	*μ*	*μ*	*km.*	
Dec. 20	.....	M	2 50 00	.....	*100	.....	.....	
21	.....	P	17 58 21	.....	.....	.....	.....	
		L	18 02 39	.....	.....	.....	.....	
		M	18 06 07	.....	*7000	.....	2,660	Alaska?
		F	19 47 46	.....	.....	.....	.....	
			VERTICAL.		A_E			
		P	*17 59 02*	*3–4*	.....	.....	.....	
		S	*18 03 56*	*7–8*	.....	.....	.....	
		L	*18 03 45*	*12–14*	.....	.....	.....	
		M	*18 07 58*	*12*	*67*	.....	*2,360*	
21	.....	P	20 51 18	.....	.....	.....	.....	
		S	20 55 14	.....	.....	.....	.....	
		L	21 00 10	.....	.....	.....	.....	
		M	21 05 05	.....	*300	.....	2,390	Alaska.
		F	21 39 30	.....	.....	.....	.....	
22	.....	P or L.	14 20 33	.....	.....	.....	.....	
		M	14 22 32	.....	*200	.....	.....	
		F	14 31 57	.....	.....	.....	.....	
23	.....	L	14 20 37	.....	.....	.....	.....	
		M	14 22 01	.....	*200	.....	.....	
		F	14 32 43	.....	.....	.....	.....	
23	.....	P or L.	15 48 54	.....	.....	.....	.....	
		M	15 50 52	.....	*200	.....	.....	
		F	15 58 14	.....	.....	.....	.....	
26	.....	P?	4 54 26	.....	.....	.....	.....	
		L	4 58 52	.....	.....	.....	.....	
		M	5 01 20	.....	*200	.....	?	Guatemala.
		F	5 03 18	.....	.....	.....	.....	
26	.....	P	5 42 55	.....	.....	.....	.....	
		S?	5 45 58	.....	.....	.....	.....	
		L	5 48 57	.....	.....	.....	.....	
		M	5 51 55	.....	*300	.....	.....	Guatemala.
		F	5 56 53	.....	.....	.....	.....	
26	.....	M	6 49 27	.....	*100	.....	.....	Guatemala.
26	.....	P	13 36 04	.....	.....	.....	.....	
		S	13 40 02	.....	.....	.....	.....	
		L	13 42 01	.....	.....	.....	.....	
		M	13 44 30	.....	*300	.....	.....	Guatemala.
		F	13 51 26	.....	.....	.....	.....	
28	.....	P	21 19 20	.....	.....	.....	.....	Alaska, fine record.
		L	21 22 49	.....	.....	.....	.....	
		M	21 28 16	.....	*2,000	.....	2,070	
		L$_E$	21 58 54	.....	.....	.....	.....	
		F	22 50 35	.....	.....	.....	.....	
			VERTICAL.		A_Z			
		P	*21 19 05*	.....	.....	.....	.....	
		S	*21 22 47*	.....	.....	.....	.....	
		L	*21 23 47*	.....	.....	.....	.....	
		M	*21 27 49*	.....	*67*	.....	*2,220*	
		F	*22 02 00?*	.....	.....	.....	.....	
29	.....	P	20 39 33	.....	.....	.....	.....	
		L	20 42 33	.....	.....	.....	.....	
		M	20 44 03	.....	*200	.....	.....	
		F	20 49 33	.....	.....	.....	.....	
29	.....	P	22 58 09	.....	.....	.....	.....	
		S	23 03 30	.....	.....	.....	.....	
		L	23 07 26	.....	.....	.....	.....	
		M	23 17 46	.....	*8,600	.....	.....	Guatemala.
		F	25 09 24	.....	.....	.....	.....	
			VERTICAL.		A_Z			
		P	*22 58 19*	*3*	.....	.....	.....	
		S	*23 05 01*	*12*	.....	.....	.....	
		L	*23 11 31*	*18*	.....	.....	.....	
		M	*23 17 15*	*16*	*23*	.....	*4,990*	*Guatemala.*
		F	? ? ?					
31	.....	M	16 29 06	.....	*100	.....	.....	

* Trace amplitude.

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

Date.	Character.	Phase.	Time.	Period. T.	Amplitude. A_E	Amplitude. A_N	Distance.	Remarks.
Alaska. *Sitka. Magnetic Observatory.* U. S. Coast and Geodetic Survey. J. W. Green.								
Lat. 57° 03′ 00″ N.; long., 135° 30′ 06″ W. Elevation, 15.2 meters.								
Instruments: Two Bosch-Omori, 10 and 12 kg.								
Instrumental constants... E: V 10, T_0 16.7; N: V 10, T_0 15.4								
			H. m. s.	*Sec.*		μ	*km.*	
1917. Nov. 16	.....	e_E.....	3 31 34	.....	.....	.....	.....	
		e_N.....	3 32 54	.....	.....	.....	.....	
		eL_N...	3 50 30	32	.....	.....	.....	
		M_N....	4 02 56	32	.....	20	.....	
		F.....	5 38 ..	.....	.....	.....	.....	
Massachusetts. *Cambridge. Harvard University Seismographic Station.* J. B. Woodworth.								
Lat., 42° 22′ 36″ N.; long., 71° 06′ 59″ W. Elevation, 5.4 meters. Foundation: Glacial sand over clay.								
Instruments: Two Bosch-Omori 100 kg. horizontal pendulums (mechanical registration).								
Instrumental constants.. E: V 80, T_0 23, ε 0; N: V 50, T_0 25, ε 4:1								
1917. Nov. 24	.....	L_E....	12 11 31	20	.....	.....	.....	
		F.....	12 21 47	.....	.....	.....	.....	
Missouri. *Saint Louis. St. Louis University.* Geophysical Observatory. J. B. Goesse, S. J.								
Lat., 38° 38′ 15″ N.; long., 90° 13′ 58″ W. Elevation, 160.4 meters. Foundation: 12 feet of tough clay over limestone of Mississippi system, about 300 feet thick.								
Instrument: Wiechert 80 kg. astatic, horizontal pendulum.								
Instrumental constants.. V 80, T_0 7, ε 5:1								
1917. Nov. 6	I.....	S_N....	14 02 12	.....	.....	.....	.....	These were omitted from the regular report for November, 1917.
		S_E....	14 02 24	.....	.....	.....	.....	
		L.....	14 03 36	.....	.....	.....	2,600	
		F_E....	14 08 ..	.....	.....	.....	.....	
		F_N....	14 10 ..	.....	.....	.....	.....	
7	I.....	eP_N...	1 41 54	.....	.....	.....	.....	
		S_N....	1 44 18	.....	.....	.....	2,400	
		S_E....	1 44 30	.....	.....	.....	.....	
		L_E....	1 45 18	.....	.....	.....	.....	
		L_N....	1 45 30	.....	.....	.....	.....	
		F_E....	1 52 00	.....	.....	.....	.....	
		F_N....	1 52 06	.....	.....	.....	.....	

SEISMOLOGICAL DISPATCHES.[1]

Idaho Falls, Idaho, December 12, 1917.

Distinct vibrations of the earth were felt here at 4 o'clock this morning. No damage was done. (Assoc. Press.)

New York, N. Y., December 27, 1917.

Guatemala City was partly destroyed by an earthquake on Christmas Day according to meager advices reaching here tonight. According to the message, the disturbance began late Tuesday night and was still continuing at 1 o'clock Wednesday afternoon. (International News.)

San Salvador, December 30, 1917.

Guatemala City has been completely destroyed by an earthquake. (Assoc. Press.)

Cable to Navy Department, December 30, 1917.

Bad earthquake yesterday finished the work of others. Everything in ruins and beyond description as a result of last night's shock. One hundred and twenty-five thousand people are in the streets.

[1] Reported by the organization indicated and collected by the seismological station, at Georgetown University, Washington, D. C.

Guatemala City, Guatemala, December 31, 1917.

Earth shocks that began here at 11 o'clock Christmas night, and are still continuing, caused millions of dollars of damage to this city, the death of a few persons, and injury of about 100 others. Every house in the city was rendered uninhabitable, and the entire population is living in the parks and open spaces. The first shocks were light, giving warning of the heavy ones that might follow. The devastation wrought was widespread. (Assoc. Press.)

EARTHQUAKES FELT IN THE UNITED STATES DURING 1917.

550.341 (73)

W. J. HUMPHREYS,
Professor in Charge of Seismological Investigations.

[Dated: Weather Bureau, Washington, D. C., Feb. 2, 1918.]

During the year 1917, 112 separate earthquakes strong enough to be felt were reported from different parts of the continental United States, as listed in the accompanying Table 1 and graphically represented (a dot for each report) on Chart XI (XLV–122) at the end of this issue of the REVIEW.

None of the 'quakes reported resulted in any appreciable damage.

'Quakes of moderate intensities, *V–VI* (Rossi-Forel), occurred in California on March 3, April 13, on six dates in May, and on August 19 and 28; at Panhandle, in Texas, on March 28; in northeastern New York on May 22, and in the State of Washington on November 12 and 14.

A 'quake of intensity *VII* on July 7 broke the Los Angeles aqueduct.

On April 9 a 'quake of intensity *VI*, central in eastern Missouri, was felt in 10 States. A second shock of intensity *V* followed the first 2 hours and 43 minutes later, and was felt in both Missouri and Illinois. This quake is discussed in detail by R. H. Finch in this REVIEW, April, 1917, pages 187–188.

On September 3 a 'quake of intensity *VI* was reported from 34 separate points in Minnesota, central about Brainerd, Lincoln, and Staples. This 'quake is discussed in detail by C. J. Posey in this REVIEW, November, 1917, pages 556–558.

TABLE 1.—*Places in the United States reporting earthquakes during 1917.*

[Consult also Chart XI (XLV–122) in this issue.]

Place.	Approximate latitude (north). ° ′	Approximate longitude (west). ° ′	Number of quakes reported.	Place.	Approximate latitude (north). ° ′	Approximate longitude (west). ° ′	Number of quakes reported.
ALABAMA.				CALIFORNIA—con.			
Greensboro	32 41	87 32	1	Cedarville	41 32	120 08	2
Rosemary	32 40	87 30	1	Cloverdale	38 46	123 00	1
ARKANSAS.				Coachella	33 40	116 10	1
				El Cajon	32 48	116 58	1
				Eureka	40 48	124 11	3
Black Rock	36 08	91 04	1	Fairmont	34 45	118 25	1
Corning	36 23	90 33	1	Ferndale	40 35	124 16	1
Hardy	36 19	91 22	1	Fillmore	34 23	118 54	1
Marked Tree	35 32	90 22	1	Heber	32 45	115 31	1
Osceola	35 43	89 54	1	Hollister	36 50	121 20	1
Paragould	36 05	90 25	1	Indio	33 43	116 12	2
Piggott	36 22	90 10	1	Julian	33 05	116 39	5
Pocahontas	36 15	90 55	1	Lakeport	39 04	122 56	1
St. Francis	36 25	90 06		Lone Pine	36 37	118 01	2
CALIFORNIA.				Los Angeles	34 03	118 15	2
				Los Gatos	37 12	121 58	3
				Markleeville	38 48	119 46	1
Banning	33 58	116 52	1	Mayfield	37 23	122 05	1
Barrett Dam	32 40	116 44	2	Mecca	33 34	116 05	2
Berkeley	37 52	122 16	3	Mesa Grande	33 11	116 45	1
Bishop	37 22	118 24	4	Mojave	35 03	118 12	1
Blythe	33 35	114 38	1	Mount Wilson	34 13	118 04	3
Boulevard	32 38	116 15	1	Neenach	34 47	118 37	1
Brawley	33 00	115 31	4	Nellie	33 22	116 52	1
Cahuila	33 32	116 45	4	Nordhoff	34 35	119 14	1
Calexico	32 41	115 30	22	Ojai	34 25	119 12	3
Campbell	37 17	121 57	1	Olancha	36 15	118 00	1
Carmel	36 34	121 56	1	Owenyo	36 40	118 01	1