RECORDS OF SEISMOGRAPHS IN NORTH AMERICA
AND THE HAWAIIAN ISLANDS. No. II.¹

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The following table contains the records of seismographs in North America and the Hawaiian Islands for the second half of 1904. The times are Greenwich mean civil time beginning at midnight. The following abbreviations are used:

P. T. = *preliminary tremors*; *P. P.* = *principal part*, sometimes called *long waves*. The location of the stations, the type of instrument installed and the components of the motion registered are as follows:

Baltimore, Md. (*B*)—Latitude N $39^{\circ} 17'.8$; longitude W $76^{\circ} 37'.2$; Milne; nw.

Cheltenham, Md. (*C*)—Latitude N $38^{\circ} 44'.0$; longitude W $76^{\circ} 50'.5$; Bosch-Omori; n and e.

Honolulu, H. I. (*H*)—Latitude N $21^{\circ} 19'.2$; longitude W $158^{\circ} 03'.8$; Milne; e.

Mt. Hamilton, Cal. (*MH*)—Latitude N $37^{\circ} 20'.4$; longitude W $121^{\circ} 38'.6$; Ewing; all components.

Porto Rico. (*PR*)—Latitude N $18^{\circ} 08'.3$; longitude W $65^{\circ} 26'.4$; Bosch-Omori; n and e.

Sitka, Alaska. (*S*)—Latitude N $57^{\circ} 02'.9$; longitude W $135^{\circ} 20'.2$; Bosch-Omori; n and e.

St. Louis, Mo. (*SL*)—Latitude N $38^{\circ} 38'.3$; longitude W $90^{\circ} 17'$; Vincentini pendulum; n and e.

Toronto, Ont. (*T*)—Latitude N $43^{\circ} 39'.6$; longitude W $79^{\circ} 23'.4$; Milne; e.

Victoria, B. C. (*V*)—Latitude N $48^{\circ} 27'$; longitude $123^{\circ} 22'$; Milne; e.

Washington, D. C. (*W*)—Latitude N $38^{\circ} 54'.3$; longitude W $77^{\circ} 03'.1$; Bosch-Omori; n.

¹ The first paper of this series appeared in this journal for June, 1905.

TABLE IV.
Register of Earthquakes, July 1 to December 31, 1904.

No.	Stat.	Comp.	Date	P. T. Commence	2d Group Commence	P. P. Comments	Max.	End	Max. Amplit.	Period of Pendulum	Remarks
				<i>h m</i>	<i>h m</i>	<i>h m</i>	<i>h m</i>	<i>h m</i>	<i>mm.</i>	<i>sec.</i>	
75	PR.	N.	July 10	23 00.3				23 15.0		27.4	
	PR.	E.		23 00.4				23 14.7		23.2	
	T.	E.		23 07.0		23 11.0		23 30.0	0.2	14.6	
	V.	E.		23 22.5				23 41.0	0.3	15	
	B.	N. W.				23 08.0		23 13.0	0.3	16	Times very inaccurate.
80	B.	N. W.	July 13	17 53.0				18 10.0	11.5		Times inaccurate.
81	H.	E.	" 23	0 44.8	0 53.8	1 11.9	1 14.9	2 04.2	1.5	19.3	A number of small movements looking in places like very long period waves.
82	B.		" 12					24			
	H.	E.	July 24	10 59.8		11 03.3	11 10.3	12 14.3	1.0		
83	T.	E.		11 05.5				12 12.0	0.1		
	V.	E.		11 00.0				12 06.5	0.4		
	B.	N. W.		11 15.0			11 35.8	12 00.0	0.9		
	PR.	N.		11 37.0				11 53.0			
84	T.	E.	July 27			16 16.0		16 31.0	0.05		Very slight thickening.
	V.	E.				16 07.0		17 00.0 ?	0.5		Small abrupt commencement.
	B.	N. W.				16 11.5		24 29 ±	0.1		
85	B.	N. W.	Aug. 8-9			23 50.0		24 02.0	0.4		
	T.	E.				23 55.5		24 02.0	0.2		
	H.	E.				23 10.3		23 41.3	0.5		Slight swelling of line. Time inaccurate.
	V.	E.				24 03.0		24 08.0	0.2		Slight, gradual thickening.
86	T.	E.	Aug. 11			6 08.0		6 14.0	0.2		
	V.	E.				6 14.0		6 18.0	0.2		Gradual ending.
	H.	E.	Aug. 18	5 04.6			5 37.6	6 07.6	0.6		
87	B.	N. W.	" 24	21 25.0				23	0.3		Small swelling.
88	T.	E.		21 24.0			22 12.5	23 31.0	1.0		Extended, small.
	V.	E.		21 12.3			21 30.0	23 36.5	1.0		Moderate, much extended.
	H.	E.		21 10.7			21 38.3	24 10.0	3.0		
	PR.	N.		21 55.0	21 19.5	21 26.3		22 55.0			
	PR.	E.		22 00.0				22 44.0			Doubtful.
	S.	E.		21 11.2				22 43.0			

TABLE IV. *Register of Earthquakes, July 1 to December 31, 1904.—Continued.*

No.	Stat.	Comp.	Date	P. T. Commence	2d Group Commence	P. P. Commence	Max.	End	Max. Amplit.	Period of Pendulum	Remarks
				<i>h m</i>	<i>h m</i>	<i>h m</i>	<i>h m</i>	<i>h m</i>	<i>num.</i>	<i>sec.</i>	
88	S.	N.	Aug. 24	21 21.0		22 23.1	22 28.0	22 28.0			Very small.
89	MH.		Aug. 27	20 58.8		22 30.5	23 02.0	23 02.0	9.3		R-F v or vi; duration about 1 minute.
90	SL.	N.	"	22 06.8		22 29.3	24 00.0	24 00.0	20.0		
	PR.	E.		22 08.6		22 29.3	24 09.0	24 09.0	16.5		
	T.	E.		22 04.4		22 11.0	24 33.0	24 33.0	18.0 +		Off paper for 1 and ½ minutes.
	B.	N. W.		22 04.2		22 14.0	24 30.0	24 30.0	16.6		Time very inaccurate.
	W.	N.		22 05.0	22 16.0	22 21.7	23 24.7	23 24.7	26.8	26	
	V.	E.		22 00.7		22 05.0	24 44.5 ?	24 44.5 ?	18.0 +		Off paper over 2 minutes.
	H.	E.		22 04.3	22 10.5	22 13.8	22 08.9	22 10.0	12.3		Max. real.
	S.	E.		22 00.8		22 03.4	22 16.0	23 51.0	52.0		Typical, large.
	S.	N.		22 01.1		22 03.7	22 05.1	24 07.0	55.0		
91	T.	E.	Aug. 30	12 08.7	12 39.5	12 45.0	12 49.0	13 22.0	0.6		Decided.
	V.	E.		12 07.6		12 29.6	12 36.8	13 16.5	0.9		Small, well marked.
	H.	E.			12 13.2	12 29.6		12 54.0	0.4		Small, well defined.
	PR.					12 45.0		13 27.0	0.4		
	PR.	E.				12 47.0		13 21.0	0.7		
	S.	E.		12 23.5		12 27.0	12 29.5	12 58.0	1.0		
	S.	N.		12 23.5		12 27.0	12 29.5	12 40.0	0.7		
	B.	N. W.	Sept. 3	17 16.0	12 37.5	12 48.5	12 49.5	13 39.0	0.5		Times very inaccurate.
92	PR.	N.		17 15.0				17 26.0			
	PR.	E.		17 15.0			3 12.5	3 43.5	1.0		
93	H.	E.	Sept. 8	2 36.5			18 29.0	18 29.0	0.1		Brief thickening.
94	V.	E.	Sept. 11	18 24.2			7 14.5	7 14.5	0.4		
95	T.	E.		6 40.5			6 39.0	7 03.0 ?	0.4		
	V.	E.		6 34.0			6 40.3	7 05.0	0.5		Small, well defined.
	H.	E.		6 16.1				7 28.0			
	PR.	N.				6 52.0		7 28.0			
	PR.	E.				6 47.0		7 26.0			

TABLE IV. *Register of Earthquakes, July 1 to December 31, 1904.—Continued.*

No.	Stat.	Comp.	Date	P. T. Commence	2d Group Commence	P. P. Commence	Max.	End	Max. Amplit.	Period of Pendulum	Remarks
				<i>h m</i>	<i>h m</i>	<i>h m</i>	<i>h m</i>	<i>h m</i>	<i>mm.</i>	<i>sec.</i>	
95	S.	N.	Sept. 11	6 26.2		6 29.0		6 43.7			Very small.
	S.	E.		6 20.0				6 49.0	0.2		
96	B.	N. W.				6 53.0		7 17.0	0.2		Phases indefinite.
	H.	E.	Sept. 13	17 27.7				17 54.0	0.3		Marked thickening at intervals.
97	T.	E.	Sept. 15	1 53.5				19 30.0	0.05		Quick jar; E. Q. felt in Toronto.
98	H.	E.	"	17 20 03.7				20 33.7	0.6		Very small.
99	S.	E.	" 18-19	23 51.3				25 01.3			Active.
	S.	E.		23 57.0				25 06.0			Began gradually.
	V.	E.		23 55.3			24 20.5	25 20.5	1.0		
	H.	E.		0 00.2			0 01.2	0 30.0	1.0		
	T.	E.		0 04.0			0 30.0	1 25.0	1.1		
	PR.	N.						0 57.0			
	PR.	E.						1 02.0			
100	H.	E.	Sept. 19	5 05.6				7 12.0	1.0		Small and continuous.
	V.	E.					5 25.6	6 40.9	0.4		Active.
	T.	E.		5 24.0			6 25.5	6 56.5	1.0		
	PR.	N.					6 21.2	6 50.0			
	PR.	E.					5 50.0	6 48.0			
101	V.	E.	Sept. 19					18 29.0	0.1		Very small.
	T.	E.					18 36.2	18 42.0	0.2		Very small; local.
	S.	E.					18 19.4	18 34.2			
102	S.	E.	Sept. 20				18 20.3	18 32.0	0.1		Very small.
	T.	E.					13 58.8	14 10.0	0.1		Times inaccurate.
	V.	E.					13 43.3	14 02.8	0.1		
103	B.	N. W.	Sept. 24				5 47.8	6 08.0	1.3		
	V.	E.		5 24.2				5 43.0	0.5		
	T.	E.		5 21.2				5 53.0	0.3		
	S.	E.		5 27.7				5 38.0			
	S.	N.		5 27.6				5 37.6			
104	H.	E.	Oct. 1	10 34.1				11 13.0	0.2		

TABLE IV. *Register of Earthquakes, July 1 to December 31, 1904.—Continued.*

No.	Stat.	Comp.	Date	P. T. Commence	24 Group Commence	P. P. Commence	Max.	End	Max. Amplit.	Period of Pendulum	Remarks
				h m	h m	h m	h m	h m	mm.	sec.	
105	H.	E.	Oct.	2 22 02.4	h m	22 12.7	22 17.1	22 44.2	0.7		
106	H.	E.	"	3 3 37.9			4 24.6	5 05.0	1.7		Max. doubtful.
	T.	E.		3 33.0			4 25.0	5 16.0	0.7		Small and prolonged.
	V.	E.		3 41.0			4 27.2	5 11.0	0.4		Prolonged.
	PR.	N.		3 51.0				4 37.0			
	PR.	E.		4 08.0				4 28.0			
	S.	N.		3 30.5				4 38.8			
	S.	E.		3 30.5				4 40.5			
107	H.	E.	Oct.	5 19 27.4			19 17.4	20 06.0	0.6		Long waves.
108	H.	E.	"	8 19 12.9			14 18.9	19 36.2	0.6		
109	B.	N. W.	"	9 14 11.4		14 16.8		14 52.0	2.3		
	PR.	N.		14 09.0				14 48.0			
	PR.	E.		14 07.0				14 50.0			
	T.	E.		14 03.0			14 16.0	15 05.0 ?	1.8		P. T. well marked.
	V.	E.		14 13.0			14 24.9	15 03.0 ?	1.4		
	H.	E.		14 39.7				14 47.8	0.2		
	S.	N.		14 10.5		14 16.5	14 18.7	14 40.3	0.8		Small, typical.
	S.	E.				14 18.0					Brief thickening.
110	V.	E.	Oct. 20	23 32.3			23 35.6		0.2		
111	PR.	N.	"	25 9 55.0			10 20.0		0.2		
	PR.	E.		9 56.0			10 17.0		0.1		14 Slow waves 163s period followed by A. C. to 13h.
112	B.	N. W.	Oct. 28	1 09.0			1 47.0		0.1		
	H.	E.	"	28 14 31.3			15 21.3		0.5		Local.
114	PR.	N.	Nov. 1	9 29.1			9 29.4	9 32.6	0.6		Slow waves about 150s period followed by A. C. to 13h.
	PR.	E.		9 29.2			9 29.5	9 32.6	0.4		Brief thickening.
115	B.	N. W.	Nov. 6	11							Four beads, probably not E. Q. Scarcely noticeable.
116	V.	E.	"	8 2 30.0			2 31.0		0.15		
117	B.	N. W.		3 17.0			3 32.0		0.5		
118	V.	E.	Nov. 21	3 47.0			4 43.0 ?		0.05		

TABLE IV.

Register of Earthquakes, July 1 to December 31, 1904.—Continued.

No.	Stat.	Comp.	Date	P. T. Commence	2d Group Commence	P. P. Commence	Max.	End	Max. Amplit.	Period of Pendulum	Remarks
				<i>h m</i>	<i>h m</i>	<i>h m</i>	<i>h m</i>	<i>h m</i>	<i>mm.</i>	<i>sec.</i>	
118	T.	E.	Nov. 21	4 01.5		3 22.7		4 50.0 ?	0.4		Prolonged. Max. lost by time break.
	H.	E.	" 21	3 19.4		13 17.0	13 18.9	4 14.7	2.0		
119	PR.	N.		13 16.7		13 17.3	13 17.4	13 30.0			Extended. Extended.
	PR.	E.	Nov. 22	13 15.7		2 05.3		3 03.0 ?	0.2		
120	T.	E.				1 50.2		2 31.2	0.15		
	V.	E.				1 32.2	1 38.5	2 36.5	1.7		Scarcely noticeable.
	H.	E.		1 16.1	1 24.2	12 29.0		12 42.0			
121	PR.	N.	Nov. 24			12 30.0		12 40.0			
	PR.	E.				12 33.2					
	B.	N. W.				12 35.7		12 41.3	0.2		Local. ?
	T.	E.				12 53.5		12 55.0	0.05		
	V.	E.				7 34.5		8 19.0	0.15		
122	T.	E.	Nov. 27			7 17.0	7 26.0	8 16.0	0.25		Very small.
	V.	E.				7 19.3		7 29.1	0.5		
	H.	E.							0.4		
123	H.	E.	Dec. 2	2 08.7		2 36.5		2 55.0	1.9	28	
124	C.	N.	" 2	2 31.0		2 36.3		3 06.2	2.0	31	
	H.	E.		2 30.5		2 51		3 17.0	1.0		
	T.	E.		2 32	2 40.5		2 53.0	3 23.0	1.1		
	T.	E.		2 32.4		2 36.3	2 40.0	3 10.0	1.4		
	B.	N. W.		2 31.7			2 37.7	3 14.6			
	S.	N.		2 42.6				3 14.3			
	S.	E.		2 41.3				3 05.0	2.0		
	PR.	N.		2 27.3	2 31.9	2 34.3	2 37.1	3 04.5	2.4		
	PR.	E.		2 27.2	2 31.8	2 35.8	2 39.2	3 37.0 ?	2.0		
	V.	E.		2 28.0			2 51.8	3 57.0	0.6		
125	H.	E.	Dec. 3			8 18.3		8 50.0	0.35		
125a	V.	E.	" 4			8 42.5		18 26.7	0.2		
126	PR.	N.	" 5	18 09.6				18 26.7			
	PR.	E.		18 09.6							
127	H.	E.	Dec. 11	9 10.1		9 21.7	9 32.7	9 52.0	0.8		

TABLE IV.
Register of Earthquakes, July 1 to December 31, 1904.—Concluded.

No.	Stat.	Comp.	Date	P. T. Commence	24 Group Commence	P. P. Commence	Max.	End	Max. Amplit.	Period of Pendulum	Remarks
128	PR.	N.	Dec. 11	h m 17 15.3	h m 17 21.4	h m 17 24.4	h m 17 35.7	h m 17 45.3	mm. 0.4	sec.	
129	PR.	E.	"	17 15.4		17 24.4	17 35.7	17 50.4	0.3		
130	B.	N. W.	Dec. 15	20 23.0			20 49.0	21 07.0	0.5		
131	H.	E.	"	19 18 12.6			18 36.8	19 11.6			
	S.	N.	"	20				6 51.0			
	S.	E.		5 53.0		6 24.8	6 30.0	6 53.0			
	C.	N.		5 51.0	5 56.2	6 00.0	6 04.3	7 41.3	27.5		
	H.	E.		5 55.8	6 05.8	6 18.3	6 21.8	8 37.0	5.0		
	PR.	N.		5 50.2		5 53.8	5 54.7	7 21.2	28.0	26.2	
	PR.	E.		5 50.2		5 53.8	5 58.2	7 24.2	35.0	22.2	
	B.	N. W.		5 55.0	5 55.7	5 57.4	6 05.7	7 47.0	15.0		Three distinct successive vibrations shortly after commencement.
	T.	E.		5 56.3		6 00 ?	6 05.1	8 36.3	11.0		Extended.
132	V.	E.	Dec. 21	5 53.3		6 16 ?	6 27.5	8 11.3 ?	3.0	25	
	C.	N.		1 28.8		1 40.0	1 58.0	1 58.0	1.4	18	
	C.	E.				1 38.8	1 58.0	1 58.0	1.6		
	PR.	N.		1 41.5		1 45.3	1 50.3	2 20.0	0.4		
	PR.	E.		1 41.5		1 45.3	1 48.5	2 18.0	0.4		
	T.	E.		1 50.5		1 55.7	1 57.2	2 12.5	2.0		
	V.	E.				2 07.5	2 23.0	2 33.0	0.25		
	B.	N. W.				1 50.5	3 Max. equal	2 23.0	1.2		
133	H.	E.	Dec. 23	15 30.6		15 35.5	15 36.3	15 51.0	1.0		Small.
134	PR.	N.	"	21 09.2		21 13.0	21 36.3	21 57.0			
	PR.	E.	"	21 09.3		21 13.3		21 45.0			

Records are missing at the following times:

Baltimore: Jan.—3d, 6h-4d, 14. 7h; 27d, 13. 1h-28d, 0. 3h. Feb.—15d, 20. 1h-20d, 14. 9h. April—2d, 15h-4d, 19. 2h. May—5d, 17. 7h-24. 5h. June—22d, 10. 6h-18. 9h. July—18d, 10. 2h-20. 7h. Aug.—1d, 20. 8h-8d, 16. 7h. Sept.—3d, 17. 8h-24. 3h; 7d, 12. 3h-24h; 10d, 21. 3h-11d, 0. 4h. Oct.—5d, 10. 8h-24. 2h; 8d, 17h-24. 8h; 24d, 19h-21. 8h. Nov.—7d, 12. 6h-16h; 9d, 13h-13. 8h and 17h-18. 7h; 21d, 18h-19. 7h. Dec.—25d, 2. 9h-25d, 7. 5h; 26d, 10h-19. 3h.

Sitka: Sept.—E, 2d, 20. 2h-6d, 2. 4h; N, 6d, 19. 2h-9d, 2. 5h; E, 26d, 2. 4h-27d, 2. 1h; E, 27d, 6. 2h-28d, 2. 6h. Oct.—9d, E pendulum not in good adjustment; N, 12d, 5. 9h-13d, 2. 4h; 24d, 5. 4h-25d, 2. 4h. Nov.—N, 18d, 11. 3h-19d, 2. 4h; 20d, 3. 6h-21d, 2. 3h.

Honolulu: April—16d, 18. 1h-22d, 23. 2h; 23d, 0h-23d, 19. 4h. May—23d, 22. 1h-24d, 19. 4h. June—2d, 8. 4h-19. 1h; 6d, 17h-7d, 18. 9h; 25d, 9. 5h-18. 9h; 26d, 16. 2h-20. 6h. Aug.—10d, 23. 5h-12d, 1. 5h. Sept.—8d, 8. 6h-19. 4h; 23d, 9. 1h-18. 8h. Dec.—2d, 3. 4h-20. 4h.

Small disturbances, lasting several hours and sometimes a day or two, occur from time to time. They have been referred to as "air currents" by Milne. The Germans call them "Unruhe," and have ascribed some of them to storms on the coast. They are given here for the sake of comparison with other stations so that it can be determined whether they occur simultaneously at distant points or are purely local phenomena. They are as follows:

Baltimore: Jan.—1d, 3. 3h-18h; 10d, 10. 7h-19h; 17d, 11h-18. 3h; 19d, 1h-5. 5h; 24d, 8. 5h-25d, -1h; 28d, 3h-19h; 29d, 3h-6h; 31d, 14h-19h. Feb.—1d, 3h-8h; 9d, 2h-6h; 10d, 2h-7h; 21d, 3h-7h; 21d, 11. 2h-17. 5h; 25d, 8h-12. 2h; 26d, 2h-5h; 27d, 1h-6h. March—3d, 21. 1h-24h; 9d, 8. 7h-12. 3h; 10d, 6. 7h-12. 1h; 11d, 8h-11. 5h; 17d, 9. 3h-12. 3h; 27d, 7h-20h. April—13d, 9h-13h; 17d, 7h-17h; 20d, 3h-15h. Sept.—22d, 5. 2h-16h. Oct.—7d, 7h-13h; 8d, 15. 5h-17h; 24d, 6h-13h; 27d, 6h-13h; 29d, 6h-13h; 31d, 2h-13h. Nov.—8d, 5h-9h; 10d, 6h-13h; 11d, 10h-13h; 12d, 3h-13h; 13d, 18h-14d, 9. 1h; 15d, 10h-12h; 18d, 6h-14h; 27d, 7. 5h-28d, 12h. Dec.—1d, 3. 5h-12h; 3d, 2h-12h; 4d, 7h-12h; 5d, 2h-9h; 9d, 4h-12. 5h; 10d, 6h-12. 5h; 11d, 1h-15h; 12d, 2. 5h-11. 5h; 14d, 2. 4h-8. 2h; 15d, 3h-7. 2h; 18d, 12. 5h-22h; 22d, 1. 8h-9h; 25d, 1h-25h; 29d, 3h-7. 8h; 30d, 4h-8h.

Sitka: Oct.—13d-18d; Nov.—4d-6d; 20d-22d; Dec.—19d.

Notes to Table IV.

In comparing the records from different stations of the same disturbance discrepancies are frequently found; they are more frequent in the case of small earthquakes where the preliminary tremors and the second group may not be perceptible; by assigning the beginning of the record to the principal part, the discrepancy often disappears. I have therefore made this change in the reports sent me, where I have thought it justifiable; i. e. in nearly all very small disturbances: sometimes harmony can be produced by assigning the reported beginning or the long waves to the beginning of the second group; but this does not occur often; it is justified in the first case because the first preliminary tremors may be too small to be observed, and in the second, on account of difficulty in certain seismograms, of deciding what is to be taken to represent the beginning of the large waves. In making these studies, I have had the benefit of Circular No. II of the Seismological Committee of the British Association for the Advancement of Science, which gives the records from a large number of instruments in various parts of the world for the period under consideration. This has been of special value in locating earthquakes whose origins are not very near North America. I have also had copies of the seismograms of the North American and Hawaiian stations for many of the disturbances and these have been a very great help.

75. July 10.—Very slight shock first felt at Porto Rico and last at Victoria, but on account of the smallness of the records the time was undoubtedly not accurate. The disturbance probably occurred on the steep slope north of Porto Rico. It was felt at all the seismological observatories on the eastern Atlantic border from Great Britain to Cape Town.

80. July 13.—Sudden displacement of the pendulum, dying out with some interruptions; probably not due to an earthquake as it was not recorded except in Baltimore.

83. July 24.—The records are not sufficiently concordant to determine the origin; but the shortness of the P. T.'s at Honolulu, about 3.5 minutes, shows that the origin is probably not more than 500 or 600 miles from that station. This disturbance rather curiously was felt at many stations scattered over the world.

84. July 27.—Origin not far from Victoria, on account of absence of P. T.'s, and probably to the northeast; then, as observed, Baltimore would show a larger amplitude than Toronto on account

of the different directions of the beams at the two places. It was also felt at some distant stations.

85. Aug. 8-9.—The Honolulu record has a sharp beginning with no discoverable P. T.'s, which suggests that the origin was near that station; but a disturbance was recorded twenty and eleven minutes earlier in New Zealand and in West Australia, respectively, and referred to an origin just east of New Zealand. A disturbance was also recorded in England and in India at about the same time and with slightly greater amplitudes. It seems not unlikely the records refer to more than one earthquake.

86. Aug. 11.—Recorded also in England; origin not determined.

87. Aug. 18.—Other records show the origin probably north of Australia.

88. Aug. 24.—The Honolulu record indicates an origin about 2,000 miles distant; it is probable that the disturbance took place to the southeast of this station, and that the disturbances recorded in England and India were stronger than at intermediate points on account of the convergence of the surface waves on the opposite side of the world.

89. Aug. 27.—Local disturbance near Mt. Hamilton, Cal.; too small to be recorded at distant stations.

90. Aug. 27.—This was a very heavy shock originating in the region just south of the Alaskan Peninsula where many earthquakes occur. The origin of this shock seems to have been not far from the Queen Charlotte Islands. At Sitka, Victoria and Toronto, the pointers of the seismographs went off the recording paper; all the reporting stations show large amplitudes. Seismographs all over the world recorded a well marked disturbance. Although the shock must have been felt generally in southern and southwestern Alaska, the only report which has come to the writer is from Rampart, about the middle of the Alaskan Peninsula.

91. Aug. 30.—This earthquake seems to have originated to the southeast of Lake Baikal, Siberia, and not far from it, at about 11h 50m. I have referred the beginnings of the Toronto and Baltimore records to the second group and those of Porto Rico to the long waves. The times of the beginning of the Sitka records are very difficult to determine.

92. Sept. 3, and 94. Sept. 8.—These appear to be local disturbances near Porto Rico and Victoria respectively.

93. Sept. 8.—This had its origin in the eastern hemisphere.

95. Sept. 11.—The origin appears to be in Siberia or China. A

disturbance is reported from Rampart, Alaska, about three hours later, strong enough to frighten the people, but not to do any damage. It is not the same earthquake as that recorded instrumentally.

96. Sept. 13.—These records may represent the same disturbances, but are not very accordant in time on account of the small amplitudes, which make it difficult to determine when the movement really began.

97. Sept. 15.—A slight local shock near Toronto.

99. Sept. 18-19.—Origin apparently in the Arctic Ocean, northwest of Alaska.

100. Sept. 19.—Origin in the western Pacific.

101. Sept. 19.—Origin may be the same as 99, namely in the Arctic Ocean. The seismograph was not recording at Baltimore during the last three shocks.

102. Sept. 20.—Origin probably in the northwestern part of North America, or possibly in the Arctic Ocean.

103. Sept. 24.—Perhaps same origin as last, but data are insufficient to decide. Records very small; the larger one at Baltimore is probably due to the direction of the beam.

104. Oct. 1.—Small shock originating probably not far from the Philippines.

105. Oct. 2.—Origin near Japan. It was felt in Tokyo.

106. Oct. 3.—Origin probably in southwestern Asia.

107. Oct. 5.—The origin seems not far from New Guinea. Instruments recorded the shock in western Australia, Honolulu, Siberia, and in England. The last is not far from the antipodes of the origin.

109. Oct. 9.—Origin in the eastern Atlantic Ocean.

111. Oct. 25.—Origin probably somewhere in the Atlantic Ocean.

113. Oct. 28.—Origin probably in the eastern Indian Ocean.

114. Nov. 1.—Origin probably northeast of Porto Rico.

112. Oct. 18 and 115. Nov. 6.—Series of very long waves of small amplitude the cause of which is quite unknown. No earthquake is recorded any where at the times of their occurrence.

118. Nov. 21.—Origin probably in the southern Pacific Ocean, though the record from Honolulu indicates an origin within 500 or 600 miles from that station.

119. Nov. 21.—Origin probably northeast of Porto Rico; not reported elsewhere.

120. Nov. 20.—Origin probably about 2,500 miles southwest of Honolulu.

121. Nov. 24.—Origin probably northeast of Porto Rico. The Baltimore record was disturbed by air-currents.

122. Nov. 27.—Origin is apparently southeast of Aleutian Islands, in Lat. 50° N. and Long. 162° W.; the disturbance occurred about 7h 01m.

123 and 124. Dec. 2.—There appears to have been two disturbances, which have overlapped each other; the first occurred somewhere in the eastern hemisphere about 1h 30m and was recorded at Honolulu. The second occurred on the equator in 110° W. Long. which is immediately south of Lower California at about 2h 20m and was recorded at all our stations.

125. Dec. 4.—Small disturbance with origin perhaps northwest of Honolulu; but the data are insufficient to decide.

126. Dec. 6.—Origin probably north of Porto Rico.

127. Dec. 11.—Origin probably in the southwestern Pacific Ocean.

128. Dec. 11.—Origin probably in the northeastern Atlantic Ocean.

130. Dec. 19.—Origin probably in the eastern hemisphere.

131. Dec. 20.—The origin is about 500 miles north of Porto Rico; and the time of occurrence was 5h 46m; this centre of large earthquakes is the nearest one to the eastern part of the United States and all the instruments in this region gave large displacements, showing an important earthquake. It was recorded all over the world. Baltimore and Toronto were from four to six minutes late in taking up the P. T.'s, which is probably due to their beams being nearly parallel with the direction of the motion. The Honolulu record, curiously, indicates an origin much nearer to that station.

132. Dec. 21.—There is great discordance between the various records of this earthquake, but it is not unlikely that it has the same origin as the last.

133. Dec. 23.—Origin in the western Pacific Ocean.

134. Dec. 28.—This shock apparently originated in the same place as 131 and 132.

It is interesting to note that some of these disturbances, namely: Nos. 90, 124, and 131 were recorded not only by seismographs, but also by magnetographs. (See Earthquake Disturbances recorded on the magnetographs, etc., by J. E. Burbank, *Terr. Mag.*, Sept., 1905, pp. 113-126.)

The majority of earthquakes originate in certain limited regions and are not scattered indifferently over the whole earth. The principal regions near North America are: I.—The Alaskan Bay, south of the Peninsula; II.—Mexico, Central America, and the neighboring ocean to the southwest; III.—The Caribbean Sea and the region immediately north of it; IV.—The Atlantic Ocean in the neighborhood of Newfoundland; V.—The eastern Atlantic Ocean; VI.—Perhaps several centres within 2,000 miles of Hawaii, though these have not been well located. There are other regions where slight earthquakes occur with more or less frequency, such as the Pacific Coast, the region to the southeast of St. Louis, New England, etc; but it is rare for an earthquake in one of these regions to compare in vigor with disturbances in the regions enumerated above. If we group the earthquakes for the whole year 1904 according to their probable origins we have the following groups:

I.—Alaska Bay,—28, 33?, 46, 52?, 58?, 59?, 73?, 90, 94, 122.

II.—Mexico and Central America,—30, 124.

III.—Caribbean Sea,—8, 13, 49?, 51, 54, 55, 56, 64, 75, 92, 114, 119, 121, 126, 131, 132?, 134.

IV.—Western Atlantic,—43?.

V.—Eastern Atlantic,—2, 4, 50?, 109, 111, 128.

VI.—Near Hawaii,—12, 20, 31, 38, 42, 61, 65, 66, 70, 71, 72, 74, 83?, 88, 125?.

It appears immediately that the region about the Caribbean Sea was the most prolific of earthquakes in 1904, and the Alaskan Bay region was the next. The Hawaiian disturbances are scattered over too large an area to be considered as coming from a single centre, but they are quite numerous. A few, (99, 101, 102, and 103) appear to originate in the northern part of North America or in the neighboring Arctic Ocean.

Johns Hopkins University, Baltimore, December 19, 1905.