

ART. XLII. — *Notes on American Earthquakes*: No. 13; by Professor C. G. ROCKWOOD, Jr., Ph.D., Princeton, N. J.

THIS article, the thirteenth in the series, embodies such notices as have come to the knowledge of the writer in regard to the earthquakes which occurred in North and South America and the adjacent islands, during the year 1883. The information has been derived from the current newspapers; from the Monthly Review of the U. S. Signal Service; and from Professor F. E. Nipher, Director of the Missouri Weather Service; Charles Carpmael, Superintendent of the Canadian Meteorological Service; and J. M. Batchelder of Cambridge, Mass.

Items which are regarded as doubtful are, as heretofore, printed in smaller type; and in many cases the source of the information is indicated. Also, to avoid the danger of confounding *a. m.* and *p. m.* dates, the system of numbering the hours of the civil day from one to twenty-four has been adopted.

1883.

Jan. 1.—At 2^h 58^m and 8^h 28^m two earthquake shocks at Addison, Me.—*U. S. Weath. Rev.*

A shock in other parts of Maine and Nova Scotia about 22^h on the previous day was noticed in the last report (this Journal, xxv, p. 360).

Jan. 6.—Between 2^h and 3^h a shock was reported to have been felt in northern Ohio.—*N. Y. Times.*

Jan. 9.—At 3^h a shock from east to west at Huntingdon, Ont.—*Canadian Meteorol. Serv.*

Jan. 11.—Between 1^h and 2^h a decided shock was felt along the Mississippi River, from St. Louis, Mo., to Memphis, Tenn.

It was reported from numerous places as far east of the river as Shelbyville in central Illinois, Shawneetown on the Ohio River, and Clarksville and Nashville, Tenn., and from places in south-eastern Missouri; but does not seem to have been felt west of a line joining St. Louis and Memphis, unless a doubtful report from Protem, Taney county, in southwestern Missouri, of a slight shock at about 12^h of the 10th is to be referred to the same, which does not seem probable. The most careful statement of time was from St. Louis, where the report was: "Four distinct shocks, beginning at 1^h 11^m 30^s, each shock followed by tremors lasting five to ten seconds, direction S.E. to N.W., no sound, entire time 50 to 60 seconds." At other places the time was given all the way from 1^h to 2^h, with a preference for 1:15 or 1:20. In most of the reports no mention is made of more than one shock; but at Memphis three were noted, and at Cape Girardeau, Mo., two; while at Anna, Ill., a slight shock had been noticed at 14^h 25^m of the 10th. The severity of the movement was greater than in either of the two earthquakes which in the September and October previous had affected this region. Buildings were rocked, chandeliers caused to swing, engine bells rung, etc. The greatest motion was reported from Cairo, Ill., and vicinity, which also is about the middle of the area shaken.

Jan. 11.—At 19^h 34^m a strong earthquake shock was felt at Iquique, Pisagua, Dolores, Posa Almonte, La Noria and Huanillos, all in southern Peru. The motion lasted about 30 seconds, and a lighter shock followed a few minutes afterward.

Jan. 23.—At 5^h a slight earthquake at Los Angeles, Cal., vibration from north to south. Two distinct shocks were felt, separated by an interval of about two seconds.—*U. S. Weath. Rev.*

Jan. 23.—At 23^h 40^m a sharp shock at San Francisco, Cal. and vicinity.—*U. S. Weath. Rev.*

Feb. 4.—At 5^h a distinct shock was felt at Bloomington, Ill. and at various places in northern Indiana and southern Michigan. At the former place a prolonged rumbling was heard, followed by the shock. At St. Louis, Mo., this shock was noticed by several observers, as "two sharp sounds about four seconds apart," which were not at first attributed to subterranean causes, until it was found that they had been heard by many persons.

Feb. 4.—At 15^h 5^m a slight shock was felt at Wolfborough, N. H., followed ten minutes later by a second shock which was also reported at Cornish, Me., at 15^h 16^m.

Feb. 5.—At 10^h 37^m a sharp shock was felt at Panama and in adjacent parts of the Isthmus. The Central and South American Company's submarine cable was somewhat injured.

Feb. 6.—At 16^h 30^m a slight earthquake at San Diego, Cal., direction of movement from north to south.—*U. S. Weath. Rev.*

Feb. 27.—At about 22^h 20^m what appeared to be a double shock of earthquake, accompanied by loud noises, was felt in

southeastern Connecticut, southern Rhode Island and adjacent parts of Massachusetts, and was so reported by many newspapers. It appears, however, that a brilliant meteor passed over the country, at a low elevation, at the same time, and an investigation of the occurrence by Prof. H. A. Newton of Yale College, renders it probable that all the phenomena of vibration and noise were due to the explosion of this meteor and not to an earthquake.

Feb. 28.—“A strong earthquake shock was felt at Monte Christo, province of Manobi, Ecuador. The earth trembled for several seconds, but no damage was done.”—*Newark (N. J.) Daily Advertiser.*

Mar. 5.—A shock at Tarbo, State of Cauca (U. S. of Colombia), extending to Carthagena on the Atlantic.

Mar. 7.—At 23^h 23^m a slight shock at Andes, Chili.

Mar. 8.—At 15^h 10^m a slight shock at Copiapo, Chili.

Mar. 8.—At 18^h an earthquake was felt on the Isthmus of Panama and widely through adjacent portions of the States of Colombia. At Carthagena and Turbu at the mouth of the Atrato it was sharp but not dangerous. In the State of Antioquia it was more severe; and in the towns of Antioquia, Santa Rosa, Yarumal and others, the cathedrals and other buildings were injured.

This and the three preceding notices are from Panama letters in the N. Y. Times.

Mar. 11.—At 10^h 57^m and 11^h 7^m two distinct shocks felt at Waterloo, St. Johns, and Cowansville, Quebec.

Mar. 11.—At 18^h 57^m a slight shock with rumbling, was felt in parts of Harford and Baltimore Counties, Maryland; sufficiently strong to rattle dishes and alarm many people. A second shock was reported to have occurred between midnight and 1^h of the 12th.

Mar. 23.—At 21^h 25^m a slight shock at Huntingdon, Quebec.—*Canadian Meteorol. Serv.*

Mar. 27.—At 20^h 35^m a slight shock at Iquique, Peru, preceded by rumbling noise.—*N. Y. Times.*

Mar. 30.—At 7^h 48^m, 7^h 52^m and 8^h 15^m light shocks were felt at San Francisco, Cal. and southward. At Watsonville, Santa Cruz County, nine shocks were felt; at Hollister, San Benito County, plate glass windows were broken, and brick walls cracked.

April 1.—At 1^h a smart shock at Hamilton, Ont.—*Canadian Meteorol. Serv.*

April 2.—At 8^h 50^m two light shocks, north to south, at San Francisco, Cal.—*U. S. Weath. Rev.*

April 12.—At 2^h 36^m a shock was felt at Cairo, Ill., lasting thirty seconds, vibration S.S.W. to N.N.E.

April —Newspaper advices from Panama late in June, contain vague reports of seismic phenomena in the valley of the Atrato, States of Colombia, occurring during the last of April, by which Rio Sucio, forty miles from the Atlantic and Turbu, on the Gulf of Uraba, suffered injury; but reliable details of the phenomena have not come to hand.

May 1.—10^h and May 4.—14^h 30^m, earthquakes are reported to have occurred in connection with an eruption of the volcano Ometepe, on the island of the same name, in Lake Nicaragua. News of the occurrence first reached the New York papers, via Panama, on July 4, in a vague and probably exaggerated form. Although the fact of some eruption there seems to be confirmed by later advices, no reliable details are known.

May 4.—At 11^h 45^m a slight shock at Helena, Montana, from east to west.

May 10.—During the night of the 10th–11th a shock from north to south was felt in Victoria, British Columbia.

May 19.—A severe earthquake occurred in Ecuador, creating alarm in Quito and still more in Latacunga, fifty-five miles south of Quito, where a number of houses were overthrown. The neighboring villages also suffered very severely. An officer stationed in the village of Toacaso reported the first shock at 17^h 30^m, a second and more destructive one between 23^h and 24^h, and during that night *sixteen* shocks; while occasional shocks occurred during the succeeding days. An eruption of Cotopaxi was in progress at the time.

May 21.—“At 7 A. M. a slight earthquake was felt at Mompos, on the river Magdalena, in the State of Bolivar; which was followed by a sharper one at 2 A. M. on the 22d, on which day shocks were also felt at San Salvador and Guayaquil.”—*N. Y. Herald.*

May 22.—At 23^h 30^m two distinct shocks were felt at Catlettsburg, Ky.

May 28.—At 21^h 55^m two earthquakes occurred in Valparaiso, Chili, in rapid succession.

June 3.—At daylight a strong and somewhat prolonged earthquake was experienced in Callao, Peru, but did no damage. At 1^h 30^m the same day, a much slighter movement was felt in Lima.

June 10.—At 9^h a shock lasting six seconds at Martinique, West Indies.—*J. M. B.*

June 19.—A new volcanic outbreak, accompanied by earth tremors, is reported to have occurred in the island of Ometepe in Lake Nicaragua.

June 21 and 23.—Several earthquake shocks were experienced at Andes, Chili; and at 2^h 55^m of the 23d a sharp shock was felt at Valparaiso.

July 1.—At 3^h a slight shock at Carson City, Nevada.—*U. S. Weath. Rev.*

July 6.—At 11^h 15^m a light shock at Cairo, Ill., lasting five seconds.

July 7.—At 10^h 50^m a light earthquake at Los Angeles, Cal., direction not determined.—*U. S. Weath. Rev.*

July 7 and 9.—At midnight on the 7th and at 2^h on the 9th, sharp shocks were felt in San Salvador.—*N. Y. Times.*

July 14.—At 1^h 30^m a light shock, lasting eight seconds, at Cairo, Ill., reported also at Wickliffe, Ballard Co., Ky.

July 20.—At 16^h 48^m a severe shock was felt at Panama, direction west and east.—*N. Y. Times.*

July 30.—Two shocks, with rumbling sound, were reported at Gilroy, Cal.; hour not stated.—*N. Y. Times.*

Aug. —Surgeon Main, at Brownsville, Texas, in a report to the Surgeon General of the Marine Hospital Service, says: "Early in August there was an earthquake shock at Pachuca, Mexico, causing twenty deaths and the destruction of twenty houses."

Aug. 4.—At 11^h and 12^h 50^m light shocks, east to west, at Oakland, Cal.—*U. S. Weath. Rev.*

Aug. 19.—At 2^h 55^m three slight shocks at Carson City, Nev.—*U. S. Weath. Rev.*

Aug. 27.—Prof. Geo. Davidson of San Francisco, reported to the U. S. Coast Survey, that at 1^h earthquake waves commenced to be recorded on the Saucelito tide gauge and continued to be observed during the 28th; height of waves one foot, time between crests about forty minutes. These waves were at first referred to the great explosion of Krakatoa in the Straits of Sunda, which took place on the same day about six or seven hours, actual time, before the time here stated. While this is possible, is it not more probable that they were due to some of the seismic phenomena vaguely reported as having occurred in the Aleutian Islands? (c. f. Oct. 6, this article).

Aug. 28.—At Talcahuano, Chili, earthquake waves were reported, commencing just before noon and continuing the rest of the day. These were very likely to be referred to the Krakatoa explosion on Aug. 27th.

Aug. 28.—At 22^h a sharp shock was felt at St. Thomas, West Indies.—*N. Y. Times.*

Aug. 29.—At 20^h a strong shock of earthquake lasting about fifteen seconds was felt at Guayaquil. At the same time there were reports of shocks felt in Salvador, Colombia and Ecuador, but no details are known to the writer.

Aug. 30.—Two shocks at St. Thomas, W. I., almost simultaneous; the first light, the second severe.—*N. Y. Times.*

Sept. 1.—At 8^h 25^m a light shock at Los Angeles, Cal., vibration north to south, followed by a second shock after four seconds.—*U. S. Weath. Rev.*

Sept. 5.—At 4^h 30^m, shocks were felt at Los Angeles, Santa Barbara (4^h 15^m) and Wilmington, Cal., the vibrations were N.E. to S.W. and were sufficient "to cause chandeliers to sway with considerable motion."

Sept. 6.—At 23^h prolonged shocks were felt at Lima, Peru.—*U. S. Weath. Rev.*

Sept. 10.—At 4^h 10^m a strong shock at Lima, Peru, duration 15 seconds, direction S. to N.

Sept. 13.—Panama advices of Oct. 28 say that a strong earthquake and rumbling noises occurred at Cucuta, Santander, on this date, and that on the previous day a movement had been felt at Santa Rosa, Manizales and Medellin.—*N. Y. Times*.

Sept. 13.—At 14^h 30^m a shock, lasting five seconds, at Santa Barbara, Cal.—*U. S. Weath. Rev.*

Sept. 21.—At 6^h 45^m a heavy rumbling noise followed by an earthquake shock, occurred at Greensborough, Guilford Co., N. C.—*U. S. Weath. Rev.*

Sept. 28.—About midnight two slight shocks were felt at Portland, Oregon.—*N. Y. Times*.

Oct. 6.—About 8^h occurred a heavy explosion at Mount St. Augustin, on the coast of Alaska, by which the mountain peak was split in two and a series of earthquake waves started in the neighboring seas. It was followed by a period of volcanic activity lasting for some weeks. For further details the reader is referred to an article by Professor Geo. Davidson of the U. S. Coast Survey, in *Science*, vol. iii, p. 186.

It may be added that there have been reports of volcanic activity at other points in the peninsula of Alaska, and in the chain of Aleutian Islands, notably at Bogoslov near Unalashka, during the summer and fall, but authentic details are not yet at hand. See articles by W. H. Dall, *Science*, iii, 89, and Geo. Davidson, *Science*, iii, 282.

Oct. 9-10.—At 23^h 3^m of the 9th, two light shocks, of about two seconds duration, were felt at San Francisco and vicinity. At 1^h 2^m of the 10th, a much more severe shock followed. It was felt somewhat widely through the surrounding country and was most severe on the bay of San Francisco, opposite that city, but only slight damage was done. At Oakland loud and prolonged rumbling noises accompanied the shock. The direction of vibration was north and south.

Oct. 13-14.—On these dates the tide-gauge at Colon, Isthmus of Panama, indicated abnormal movements of the sea, which were referred to earthquakes at Santander and Guayaquil; but no other account of earthquakes at these places on those dates has reached the writer. The tide-gauge of the island of Naos on the Pacific showed nothing abnormal.

Oct. 15.—An earthquake "at night" at Point des Monts, on the Gulf of St. Lawrence.—*Canadian Meteorol. Serv.*

Oct. 16.—At 3^h 15^m a slight shock at Cape Mendocino, Cal.—*U. S. Weath. Rev.*

Oct. 17.—At 3^h 30^m a shock at Contoocook, N. H.—*J. M. B.*

Oct. 20.—About 13^h 15^m a sharp shock was felt throughout the island of Bermuda, but no damage was done. The oscillation continued ten seconds, the direction being from west to east.

Oct. 24.—At 16^h 14^m a severe shock, continuing about fifteen seconds, occurred at Cape Mendocino, Cal., direction from S.S.W. to N.N.E.—*U. S. Weath. Rev.*

Oct. 30.—“In the morning” two light shocks at Oakland, Cal., from north to south.—*U. S. Weath. Rev.*

Nov. 4.—A shock at Cove Creek, Utah.—*N. Y. Tribune.*

Nov. 5.—A strong earthquake “at night” at Point des Monts on the Gulf of St. Lawrence.—*Canadian Meteorol. Serv.*

Nov. 11.—At 18^h 15^m a slight shock at Poway, San Diego Co., Cal.—*U. S. Weath. Rev.*

Nov. 13.—Panama advices of Nov. 17th say: “Slight earthquake shocks were felt on the Isthmus on the 13th inst., and a week earlier other shocks occurred.”—*Newark (N. J.) Daily Advertiser.*

Nov. 22.—At 11^h two shocks at Point des Monts, Gulf of St. Lawrence.—*Canadian Meteorol. Serv.*

Dec. 5.—At 9^h 20^m shocks occurred at Melbourne, Izard Co., and Rovenden Springs, Ark., accompanied by a loud noise.

Dec. 12.—At 23^h 40^m a slight shock occurred at Los Angeles, Cal., and on the 13th another.—*U. S. Weath. Rev.*

Dec. 16?—At 15^h a slight shock at Poway, San Diego Co., Cal.—*U. S. Weath. Rev.*

Dec. 22.—At 20^h an earthquake at Point des Monts, Gulf of St. Lawrence.—*Canadian Meteorol. Serv.*

The foregoing notes include seventy-eight notices, of which nine are in small type. They are distributed by localities as follows:

Canada	8
New England	3
Atlantic States	2
Mississippi Valley	11
Pacific Coast	23
Mexico	1
West Indies	4
Central America, Colombia, Venezuela, Ecuador	14
Peru and Chili	10
Not counted (Feb. 27, June 19)	2
	78

The following may be selected as the more important earthquakes of those above noted: Jan. 11, Cairo, Ill.; Mar. 8, Panama; May 19, Ecuador; Aug. —, Mexico; Oct. 6, Alaska. The great majority of the shocks were very moderate and caused little or no damage.

Princeton, N. J., Mar. 26, 1884.