UNITED STATES EARTHQUAKES

1928

International Seismological Centre

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U. S. DEPARTMENT OF COMMERCE

COAST AND GEODETIC SURVEY

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U. S. DEPARTMENT OF COMMERCE
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COAST AND GEODETIC SURVEY
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UNITED STATES EARTHQUAKES 1928

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INTRODUCTION

This publication is in continuance of the quarterly seismological report of the United States Coast and Geodetic Survey, covering the period from January 1, 1925, to December 31, 1927, including a supplement for the last half of 1924.

The change in plan of publication represented by the present volume and the decision to confine publication of instrumental records not included in it to the monthly seismological reports in mimeographed form, is the result of conferences and also correspondence with seismologists in this and other countries. Since the monthly seismological reports are of value only to seismologists who are actually making investigations, this bureau will carry a supply on hand from 1928 on. They will be furnished without cost to such investigators. Since the supply is limited it is hoped that only such persons and organizations will apply. These will be furnished to an established mailing list. Those who intend to make regular use of the monthly reports should request to be placed on the mailing list. Since it is recognized that in the detailed study of the records of individual earthquakes the original (or photographic copies of the original) records are needed, they will be gladly furnished to investigators.

The title that has been adopted for this publication has the merit of conciseness but it should be understood that there are included certain matters which this title might not cover with strict interpretation. The principal earthquakes of regions under the jurisdiction of the United States are included, though in the case of the Hawaiian and Philippine Islands earthquakes of volcanic origin are not included and only severe earthquakes are included in the case of the Philippine Islands, since reports are published in Manila. Earthquakes adjacent to the United States and felt within its borders or those of the regions under its jurisdiction are described except that, in the case of Canadian earthquakes felt within the United States, a general description only is given as details are given in the Canadian reports. As a reciprocal arrangement the United States earthquakes felt in Canada are published in detail in this volume. The principal earthquakes of the year which were so widely recorded that immediate determination of epicenter was made are given regardless of location and instrumental details for these are included.

It has been decided not to give individual credit for information furnished by individuals. In omitting this the bureau wishes to express its appreciation to the various organizations and individuals who have made it possible to prepare descriptions of the earthquakes of this country with a completeness and accuracy that has never

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before been possible. The principal sources of information are as follows:

United States Weather Bureau.
Division of geology and geography of the National Research Council, Arthur Keith, chairman.
Central office of the Jesuit Seismological Association at St. Louis, Mo.
The San Francisco field station of the United States Coast and Geodetic Survey, cooperating with the Seismological Laboratory of the Carnegie Institution and California Institute of Technology (H. O. Wood, research associate in charge), University of California (Perry Byerly in charge of the seismological station), and Stanford University. These persons are responsible for instrumental determination of epicenters in California when given. Among the commercial agencies in this section there are a number of cooperators, including the Pacific Telephone & Telegraph Co., The Great Western Power Co., and the Standard Oil Co. of California, also a large number of individuals.
Press dispatches (received through the courtesy of Georgetown University).
Reports from individuals.
Bulletin Seismological Society of America, 1928.

It should be pointed out that this volume is an extension of the information which appears in Special Publication No. 149 of this bureau entitled, "Earthquake History of the United States" (exclusive of the Pacific region). This publication, however, is more complete since it includes earthquakes of all grades of intensities and also includes earthquakes of the Pacific coast region. In this connection it should be stated that that region is covered through the year 1927 by the Holden and McAdie catalogues[1] and by a forthcoming publication under the auspices of the Seismological Society of America, which will extend the record to the close of 1927. There is hope that this, as well as republication of the older catalogues now out of print, will become possible in the near future.

It will be noted that the appraisal of intensities has not generally been made. Since isoseismal maps appear which are based on intensities, the Rossi-Forel scale which will be used until there is general sentiment for the adoption of a more precise scale, is given below in abbreviated form:

ROSSI-FOREL SCALE OF INTENSITIES

1. *Microseismic shock.*—Recorded by a single seismograph or by seismographs of the same model, but not by several seismographs of different kinds; the shock felt by an experienced observer.
2. *Extremely feeble shock.*—Recorded by several seismographs of different kinds; felt by a small number of persons at rest.
3. *Very feeble shock.*—Felt by several persons at rest; strong enough for the direction or duration to be appreciable.
4. *Feeble shock.*—Felt by persons in motion; disturbance of movable objects, doors, windows; cracking of ceilings.
5. *Shock of moderate intensity.*—Felt generally by everyone; disturbance of furniture, beds, etc.; ringing of some bells.
6. *Fairly strong shock.*—General awakening of those asleep; general ringing of bells; oscillation of chandeliers; stopping of clocks; visible agitation of trees and shrubs; some startled persons leaving their dwellings.
7. *Strong shock.*—Overthrow of movable objects; fall of plaster; ringing of church bells; general panic, without damage to buildings.
8. *Very strong shock.*—Fall of chimneys; cracks in the walls of buildings.
9. *Extremely strong shock.*—Partial or total destruction of some buildings.
10. *Shock of extreme intensity.*—Great disaster; ruins; disturbance of the strata, fissures in the ground; rock falls from mountains.

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[1] Smithsonian Miscellaneous Collections, 1087. A Catalogue of Earthquakes on the Pacific Coast, 1769–1897. Edward S. Holden. Smithsonian Miscellaneous Collections, 1721. Catalogue of Earthquakes on the Pacific Coast, 1897-1906. Alexander G. McAdie.

Within the United States the same regional arrangement has been followed as in the case of Special Publication No. 149 mentioned above. In the case of the Pacific coast region, Washington and Oregon have for convenience been treated separately from California.

In this report time will be indicated as continuous from 1 to 24 hours, beginning and ending with midnight.

All the epicenters indicated in this report are either estimated from noninstrumental data or determined from instrumental results. When the epicenters are based on instrumental data a statement to that effect is made in each case.

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EARTHQUAKE ACTIVITY IN THE VARIOUS STATES

Only those States are listed in which earthquakes either occurred or if occurring elsewhere were felt during the year.

Alabama: November 2, North Carolina earthquake felt.
Arkansas: Two moderate shocks.
California: Moderate activity throughout year. Strongest was that of February 28, in San Joaquin Valley.
Colorado: In April and May there were a series of shocks in the vicinity of Creede, of the swarm type. Strongest on May 10. There was one other shock farther east.
Connecticut: One moderate shock.
Georgia: One moderate shock. November 2, North Carolina shock felt.
Illinois: One moderate shock.
Kansas: One moderate shock.
Kentucky: One moderate shock. November 2, North Carolina felt.
Maine: Six shocks listed, though this includes the grouping of a number of shocks in February and March in the vicinity of Milo. April 25, New Hampshire shock felt.
Maryland: One light shock.
Minnesota: One light shock.
Missouri: Two moderate shocks.
Montana: Two moderate shocks.
Nevada: One moderate shock.
New Hampshire: Eight shocks listed. All moderate except that of April 25, which was fairly strong.
New Mexico: One slight shock.
New York: One fairly strong shock in northeast portion on March 18.
North Carolina: Four listed. That of November 2 in western portion, strong and widely felt.
Ohio: September 9, shock fairly strong in northern portion.
Oregon: One slight shock.
Rhode Island: One slight shock.
South Carolina: In addition to two moderate shocks, felt North Carolina shock of November 2.
South Dakota: November 16, shock fairly strong in Black Hills.
Tennessee: One moderate shock in west portion. North Carolina shocks of November 2 and 19 felt in eastern portion.
Texas: One Mexican shock felt in western portion.
Utah: One moderate shock.
Vermont: April 25, New Hampshire shock felt.
Virginia: One slight shock.
Washington: Three moderate shocks in addition to one in British Columbia felt in Washington.
Wyoming: Three shocks listed, that of Feburuary 13 fairly strong.
Alaska: Twenty-one shocks listed, of which one was in the Panhandle region. There were a series of shocks in the Prince William South region, the strongest on February 19 and June 21. The difficulty in locating epicenters of some of these earthquakes points to need of more instruments.
Porto Rico: Three shocks, the strongest on August 22.
Hawaiian Islands: Only minor local shocks.
Philippine Islands: Five strong shocks. Strongest were on Mindanao on December 19 and 28, the former causing a tidal wave with considerable damage.
Canal Zone: Only minor shocks.

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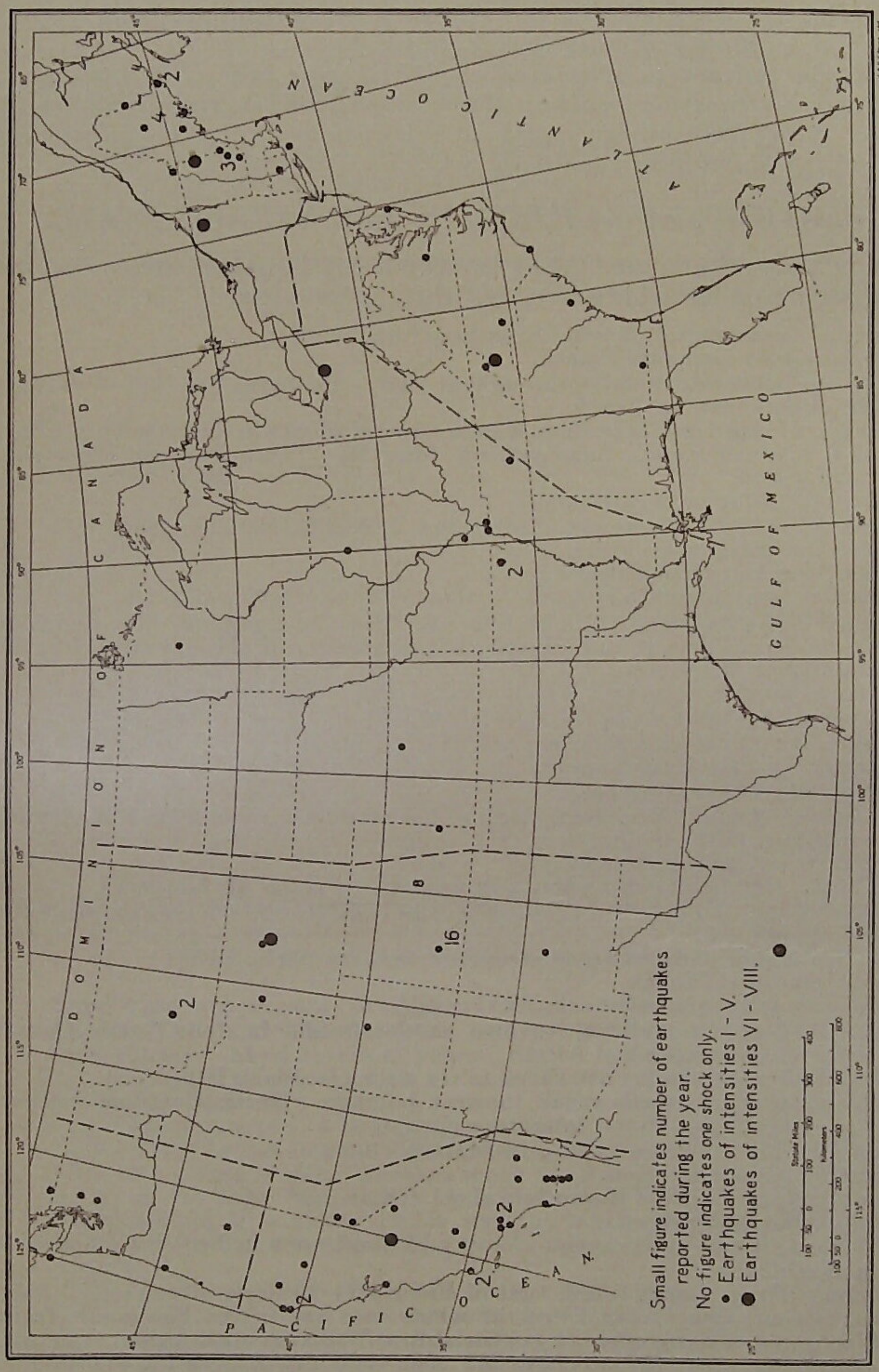

FIGURE 1.—Earthquake epicenters, 1928

NORTHEASTERN REGION

75TH MERIDIAN OR EASTERN STANDARD TIME

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January 13: 14.50, Block Island, R. I. (41°.2 N., 71°.6 W.). Two shocks, force 5, rattling sound.

February 8: Hour not given. Milo, Me., (45°.5 N., 69°.0 W.) local. First tremor distinct; shock followed at intervals of five or six minutes by lesser shocks. Buildings shaken, walls lightly damaged. Similar disturbances a few weeks ago.

February 17: 0.29 Milo, Me., local. Fourth shock in three weeks. Distinct shock followed in minute by faint jar.

March 18: 10.20, Northeastern, New York, (44°.5 N., 74°.3 W.), 12,000 square miles. Intensities (see map fig. 2). Widely felt in the northeastern part of New

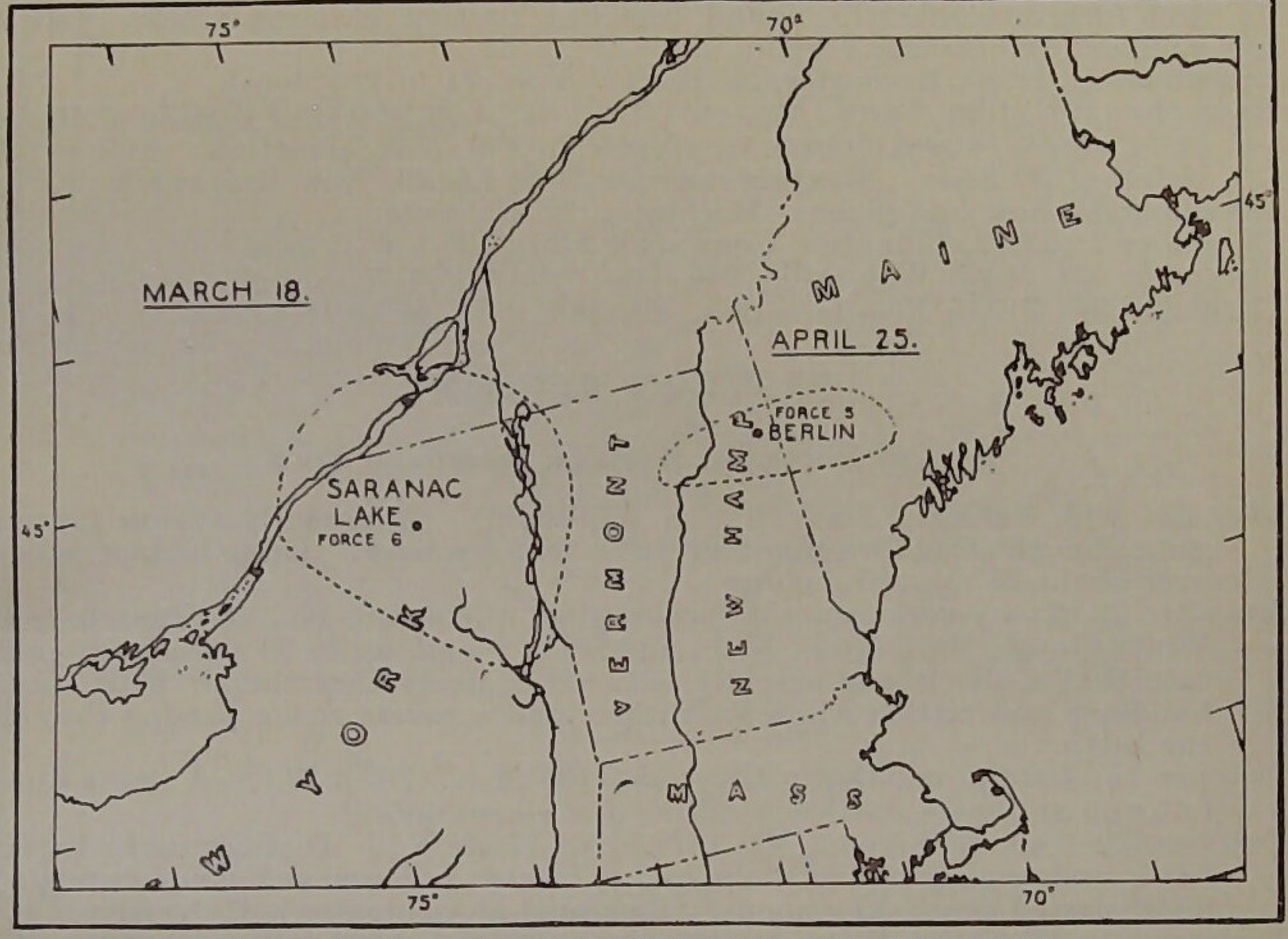

FIGURE 2.—Areas where shocks of March 18 and April 25 were felt

York State and probably in adjacent Canada. Felt with special intensity at Saranac Lake and Malone where people left their houses, and dishes fell from shelves. Most severe in years. Stated to have been an earlier shock on February 28. Shocks felt at Lake Placid, Plattsburg, Lake George. At Canton there was a rumbling sound. At Sunmount, trembling and bumping, chessmen moved on board. Generally felt at Chazy and Gabriels, where pictures and lamps swayed. Patients described sounds as like those heard at front during the war. Another shock at 22.20 in Adirondack Mountains.

March 22: 8.30, Milo, Me., local. A fairly severe shock followed by 5 or 6 others during 10 minutes. This was the most severe of series of shocks listed during the year for this place. Dishes and pictures rattled. No damage.

March 28: Hour not given. Milo, Me., local. Three heavy shocks during night, followed by four lighter ones on morning of 29th were felt.

April 25: 18.38, northern New England (44°.5 N., 71°.2 W.), 3,000 square miles. Intensity (see map). The shock was felt over a line extending 100 miles across Vermont, New Hampshire, and western Maine. Beginning in the east in Rumford, Me., people rushed into the streets, and hanging articles swayed. The shock was fairly strong at Lewiston, Me., 30 miles away. At Berlin and Gorham, N. H., which seem to have been near the epicenter, it was stated that the tremors were of much shorter period and amplitude

than in the case of St. Johnsbury, Vt.; the shock was violent in places though little damage was done. In Lydonville, Vt., some parts of the town were much more severely shaken than others. The sound was like the passing of a heavy truck.

April 28: 17.07, Concord, N. H. (43°.2 N., 71°.5 W.), local. A bumping which gave an effect like a heavy truck passing. Floor seemed to sway. Stronger at Boscawen 10 miles north. At Loudoun, 15 miles northeast of Concord, there was a heavy shock followed by several lighter ones; also at Penacook 10 miles northwest.

May 21: 19.24, Concord, N. H. Sharp bump followed by lesser ones. Not generally felt.

May 26: Hour not given. Contocook, N. H., 10 miles west of Concord.

August 30: 4.10 (?), Brooklin, Me. (44°.3 N., 68°.6 W.), local.

October 15: Hour not given. Pittsburg, N. H. (45°.1 N., 71°.4 W.), local.

October 16: 19.30, Milford and Wilton, N. H. (42°.8 N., 71°.6 W.), 100 square miles. Generally felt in these and surrounding towns. Several houses shook and furniture moved. Sound was like passing of large truck. Felt in Amherst and Mount Vernon.

November 4: 23.00, Rochester, N. H. (43°.3 N., 71°.0 W.), local.

November 19: 21.30, Perry, Me. (45°.0 N., 67°.2 W.). After rumble of 10 seconds, shock caused houses to vibrate in SE.–NW. direction. Felt within radius of 20 miles. Roaring noise at Deer Island, New Brunswick.

December 1: Hour not given. Rochester, N. H., local.

December 7: 23.12, Ellington, Conn. (41°.8 N., 72°.5 W.), local.

December 12: 14.07, Waterville, Me. (44°.6 N., 69°.6 W.), local.

December 24: 21.00, New Limerick, Me. (46°.2 N., 67°.9 W.), local.

EASTERN REGION

75TH MERIDIAN OR EASTERN STANDARD TIME

May 23: 5.15, Valdosta, Ga. (30°.8 N., 83°.3 W.). Apparently seismic tremor, some thought there was another a few minutes later. Large meteor passed over about 25 minutes before.

June 21: 23.07, a severe explosion occurred at Allentown, Pa., and reports from White House, Burlington, N. J., and other points up to 50 miles away indicate that a shock was actually felt. It is likely that the air blast shook buildings and rattled windows, rather than a severe shock passing through the earth.

October 15: Late p. m., Ocean City, Md. (38°.4 N., 75°.3 W.). A slight shock felt also at Berlin, rattled windows and shook doors.

October 30: 6.45, Richmond, Va. (37°.5 N., 77°.5 W.). Distinct earth tremor felt in region surrounding Richmond. Houses quivered and windows rattled. Shock lasted about 30 seconds. Recorded at Georgetown University.

November 2: 23.03, Southern Appalachians (36°.0 N., 82°.6 W.), 40,000 square miles. Described in article by Frank Neumann in December, 1928, number of Bulletin of Seismological Society of America. Reports were received from the following places listed alphabetically by States and the accompanying map (fig. 3) gives the isoseismal lines.

NORTH CAROLINA

Asheville: Heavy tremors, strongest along French Broad River between Asheville and Newport with heavy rumbling. Felt in all sections of Asheville but especially in Montford Hills section. People were awakened and some left buildings, including a theater which was in temporary panic. Several were rolled out of bed. Motorists reported queer behavior of cars. In Jackson Building, above fourth floor, bookcases upset and walls cracked. Floor cracked in one building. Dishes were thrown from shelves and a heavy safe moved on its rollers. Several reported two shocks. Sound like falling rock followed shock and then quivering.

Batesville: Felt by many. Buildings trembled. Dishes rattled.

Boone: Not felt.

Bryson City: Windows broken.

Charlotte: Generally felt.

Elkin: Thunder-like sound preceded shock.

Franklin: Felt by few. Two shocks in quick succession.

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Hendersonville: Thirty-second shock felt by all. Many wakened.
Jefferson: East-west swaying. Sounds heard by several.
Lenoir: Felt by nearly all. Faint sounds before shock.
Lincolnton: Light shock, generally felt. Loose objects disturbed.
Marion: Not felt.
Marshall: Felt by all. Sleepers wakened. Many frightened. Heavy jar. Sounds like thunder.
Mount Holly: Felt and sounds heard by a few.
Murphy: Light shock not generally felt. Dishes rattled.
Newland: Ground trembled for one-half minute. Roar with shock.
Newton: Light shock felt by several.

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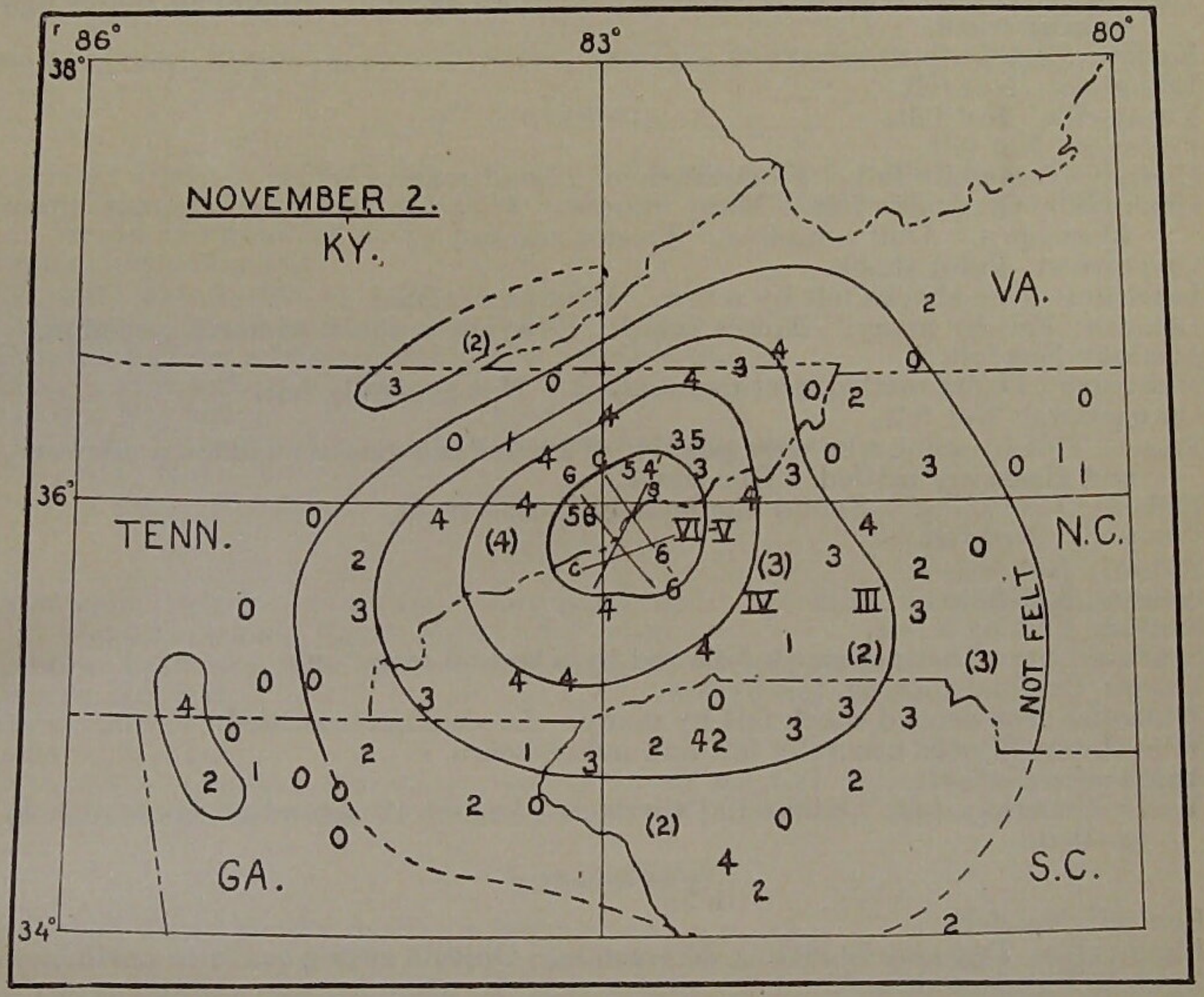

FIGURE 3.—Region where earthquake of November was felt

Rutherfordton: Two light shocks rattled windows. Not generally observed.
Shelby: Light shock.
Statesville: Not felt.
Tryon: Not felt.
Waynesville: Slight damage in business section.
Wilkesboro: Shock from NE. to SW. Sound like distant windstorm before shock.
Winston-Salem: One gradual shock with accompanying noise gave effect of passing train or heavy truck. Objects swayed or rattled. In some sections of city people were generally wakened, in others the shock was scarcely noticeable.
Yadkinville: Not felt.

SOUTH CAROLINA

Aiken: Buildings swayed.
Anderson: Two shocks, slight but rattled windows.
Andrews: Not felt.
Blackville: Felt by one.

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Bladesburg: One heard windows rattle.
Calhoun Falls: Two shocks, light rocking motion. Generally felt.
Catawba: Not felt.
Chappell: Several were positive of ground movement. Windows rattled.
Charleston: Not felt.
Cheraw: Not felt.
Chester: Plaster cracked. Dishes and pictures moved. Rapid rocking for 35 seconds.
Clemson College: A few awakened. Distinct but mild.
Columbia: Shock lasted a very short time. Noises heard by a few.
Conway: Not felt.
Darlington: Not felt.
Due West: Generally felt. One shock. Dishes rattled. Rumbling sound like passing truck.
Easley: Slightly felt.
Effingham: Not felt.
Eutawville: Not felt.
Florence: Not felt.
Gaffney: Generally felt. Floors shaken. Loud roar.
Greenville: Generally felt. Many roused. Furniture creaked. Lasted 20 to 40 seconds. Dull rumbling. Plaster cracked.
Greenwood: Faint shock.
Landrum: Two shocks felt by a few. Windows rattled.
Laurens: Felt by many. Noises heard. Swaying in south to north direction.
Marion: Not felt.
Newberry: Doors rattled, pictures swayed. Not generally felt.
Orangeburg: Not felt.
Pelzer: Felt by some who were positive of ground movement; windows, crockery, and glassware rattled. One shock.
Pickens: One shock. Sound like heavily loaded truck.
Pinopolis: Not felt.
Rimini: Not felt.
Saluda: Not felt.
Santuc: Felt by a few.
Spartansburg: Distinct shock followed by a second lesser one.
Union: Gradual rocking, felt by few.
Walhalla: Ten-second shock felt by many. Loose objects rattled.
Winnsboro: Shocks generally felt and noises heard.
Yemassee: Not felt.
York: Generally felt. Slight but distinct. Lasted 10 seconds. Loose objects rattled.

TENNESSEE

Benton: Not felt.
Blountville: Two shocks lasting 30 seconds. Objects swung south to north.
Bristol: People wakened.
Chattanooga: Generally felt. Houses rocked. People wakened and frightened.
Cleveland: Not felt.
Dandridge: People wakened.
Dayton: Not felt.
Erwin: Three slight shocks. Rocked chairs. Some alarm.
Greenville: Felt by most. Rapid trembling woke people. Top thrown off one chimney. Roaring sounds.
Jacksboro: Not felt.
Jellico: People awakened.
Johnson City: Three frame houses under construction were shaken down. Windows broken.
Jonesboro: Buildings trembled. Dishes rattled. People wakened.
Kingsport: Felt and sounds heard by few.
Kingston: Felt by half of people. Beds moved. Windows shook. First shock sharp, second like faint echo of first.
Knoxville: Felt by nearly all. Undulating motion lasted 15 seconds. Furniture shook. Faint rumbling.
Louden: One gradual shock felt by a few.
Madisonville: Two shocks. Sounds like thunder.
Marysville: Trembling.
Maynard: Not felt.

Morristown: Felt by many and some alarm. Buildings rocked. One building under construction damaged. Bump and rapid trembling.
Mountain City: Not felt.
Newport: Felt by all. Sleepers wakened and rushed into street. Rapid trembling. Trees and buildings swayed. Bricks shaken from some buildings and plaster cracked. Pictures fell from walls.
Rogersville: People generally wakened and many rushed into street. Windows rattled. Opinions differed as to one or two shocks.
Rutledge: One shock felt by several.
Sevierville: Felt by many with alarm. Light fixtures swayed. Windows rattled. Doors shook. Three shocks with sounds before and during shocks.
Sneedville: Not felt.

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ALABAMA

Birmingham: Feeble shock felt by one, sitting. North-south direction.

GEORGIA

Atlanta: Distinct tremors felt by many. Dishes rattled. Furniture shook.
Blue Ridge: Felt by several. Buildings and beds trembled. Moderately loud sound accompanied shock.
Chatsworth: Not felt.
Clayton: Faintly felt by a few.
Cleveland: Two shocks noted by a few.
Dalton: Felt by a few. Some noted two shocks.
Ellijay: Not felt.
Jasper: Not felt.
LaFayette: Abrupt bumping felt by several. One shock.
Ringgold: Not felt.
Toccoa Falls: Not felt.

VIRGINIA

Abingdon: Felt by many and many awakened. Windows trembled and some plaster cracked. Loose objects disturbed.
Bristol: Generally felt. Houses and doors shook and rocked.
Floyd: Not felt.
Independence: Not felt.
Stuart: Not felt.
Wytheville: Gradual trembling, lasting 20–30 seconds noted by a few. Dull rumbling like distant thunder at start. Windows and dishes rattled.

KENTUCKY

Eubank: Three shocks felt by a few.
Frankfort: Felt by a few. Some pictures tilted. State geologist states that first motion was wavelike in north-south direction with definite vertical movement. Two swaying motions followed by trembling lasting 3 to 5 seconds. Mild booming sound.
Greensburg: Not felt.
Lexington: Not felt.
Loudoun: Not felt.
Louisville: One abrupt shock, NE.–SW., felt by one.
Taylorsville: Not felt.
Williamsburg: Felt by a few. Dishes rattled. Sound like someone trying to enter house.

November 19: 22.45, Asheville, N. C., and Johnson City, Tenn. (35°.8 N., 82°.3 W.), 10,000 square miles. Probably aftershock of earthquake of November 2. Felt with most force in West Asheville along the French Broad River and at Hot Springs, N. C., and Erwin, Tenn. No damage.
November 22: Wilmington and Southport, N. C. (34° N., 78° W.).
December 19: 17.17, Summerville, S. C. (33° N., 80°.3 W.). Two slight shocks.
December 22: 21.30, Charlotte, N. C. (35°.3 N., 80°.8 W.). Distinct rumble and shake felt, strongly felt at county home and Mecklenburg County Industrial Home.

CENTRAL REGION

90TH MERIDIAN OR CENTRAL STANDARD TIME

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January 23: 3.19 Mount Carroll, Ill. (42°.0 N., 90°.0 W.), 400 square miles. Two shocks one-half minute apart like strong powder explosion. Most severe 6 to 10 miles south of this place. At Morrison felt like heavy explosion, felt at Savanna, Fulton, and Clinton.

March 6: 20.45, Franklin and Lynnville, Tenn. (35°.6 N., 86°.9 W.). Area uncertain. Two reports from towns 50 miles apart. Rattling sounds, trembling, and bumping at Franklin.

April 15: 9.05, Cape Girardeau, Mo. (37°.4 N., 89°.7 W.). Slight shock also felt at Jackson. Slight shock at 5.00 at New Madrid. Windows shaken, no damage.

April 23: 5.00, Hickman, Ky. (36°.6 N., 89°.3 W.). Trembling felt by several.

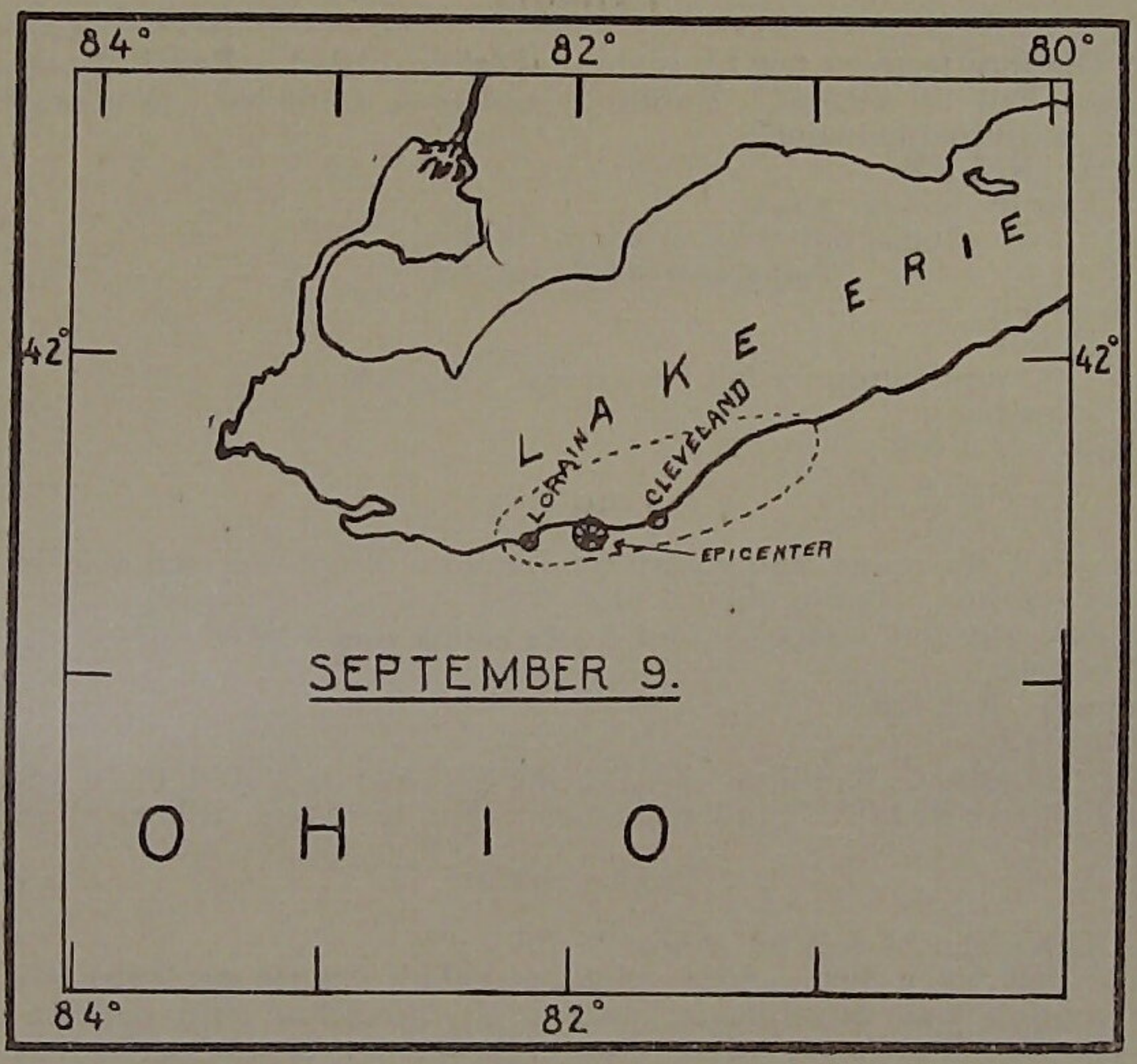

FIGURE 4.—Area affected by shock of September 9

May 31: 16.40, New Madrid, Mo. (36°.6 N., 89°.5 W.). Trembling. Some uncertainty as to date, may have been a few days earlier.

September 9: 15.00, Lorain and Cleveland, Ohio (41°.5 N., 82°.0 W.). (See map, fig. 4.) Felt along lake shore between these two cities, and with special intensity in East Cleveland where some people rushed from houses. Buildings swayed, trembling, and sounds resembling thunder. Slight at Madison and Willoughby; not felt at Norwalk. This was reported only from towns along Lake Erie. It was reported that Army airplanes were engaged in bombing practice over the lake and near Camp Perry, about 60 miles west of Cleveland at about this time. However, it is not thought that the tremors were a result of these operations.

November 8: 8.15, Beloit, Kans. (39°.5 N., 98°.1 W.). Felt at Industrial School where dishes rattled and windows shook. Recognized as an earthquake by a person with previous experience. Not reported elsewhere and must have been extremely local.

November 10: 0.20, Black Rock, Ark. (36°.2 N., 91°.1 W.). A single shock appearing to come from the west.

November 16: 7.45, Black Hills, S. Dak. (44°.0 N., 103°.7 W.), 2,000 square miles. At Custer trembling and loud rumbling. Felt on hill but not in valley. At Rochford, trembling and bumping, and a few rocks fell on

railroad track. Rumbling came from north. One person thought truck had struck house. Doors swung open. At Lead, roaring and trembling, loose objects rattled. Felt at Savoy, Maitland, and Deadwood. Slight shock at Hill City, no effect on mine workings.

December 23: 0.10, Bowstring, Minn. (47°.4 N., 94°.0 W.). House seemed to sway in east-west direction.

December 25: 21.25, Black Rock, Ark. (36°.2 N., 91°.1 W.). Trembling, windows rattled.

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WESTERN MOUNTAIN REGION

105TH MERIDIAN OR MOUNTAIN TIME

February 13: 7.00, central Wyoming (43°.5 N., 108°.2 W.), 3,000 square miles. (See map, fig. 5.) At Thermopolis, bumping and trembling. Three shocks. Sounds before shock was felt. Felt sharply in Worland, Owl Creek, Gebo,

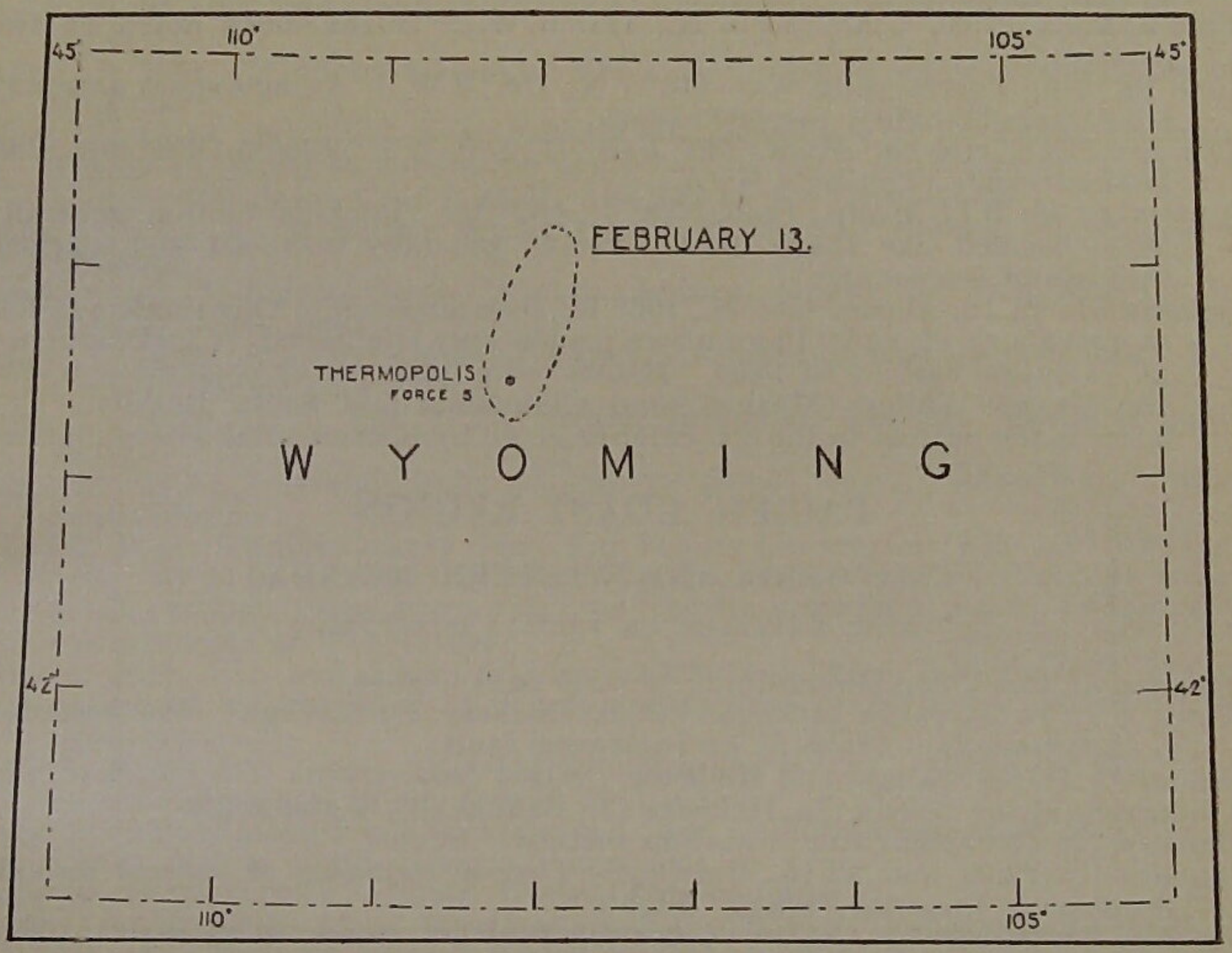

FIGURE 5.—Region affected by earthquake of February 13

Crosby, and Kirby. Not felt at Grass Creek and other towns to south of Thermopolis but was strongly felt at mine in Copper Mountains near Bonneville, where there were cracks in the rocks. Two men entered their mine while rumbling continued and found that the mine props were loose and many could be moved by hand. When they returned later they had tightened up again.

February 29: 15.38, Helena, Mont. (46°.5 N., 112°.0 W.). Fairly strong shock, generally felt, in western Montana. Strongest since June, 1925. Jog on barograph trace at Weather Bureau office. Indications are that it was generally felt in western Montana though no detailed reports were received.

March 15: 6.30 and 10.40, Belen, N. Mex. (34°.4 N. 106°.8 W.). First light. Second estimated force 4, R. F. scale, with abrupt onset and rocking motion.

March 31: 8.16, Jackson, Wyo. (43°.7 N., 110°.7 W.). Trembling generally felt. Strongest along Gros Ventre River above Keely. Not felt at Moran.

April 6: A report from Whitebird, Idaho (44°.0 N., 111°.2 W.), indicates that a long fissure extends on this date from the Salmon River to Lucille. Odor of gas emanates from fissure. No indication that this was caused by an earthquake.

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April 20–May 10: A long series of shocks in the vicinity of Creede, Colo. (37°.8 N., 107°.0 W.). In April they occurred as follows: April 20, 2.40; April 24, 3; April 29, 3, 3.20, 3.45, and 9; April 30, 8.50; May 1, 2.22, 2.25, 2.35, and 5.20; May 3, 12.40; May 4, 3.00; May 10, 3.10. Many lesser shocks not listed. In most cases there was trembling and dishes rattled. The shocks on May 1 were quite strong and more widely felt, at least 15 or 20 miles from Creede. The shock on May 10 was also more widely felt. In no case was the area over which the shocks were felt very large. While the country is sparsely settled, the weather observer at Creede was careful to get reports from various ranches and the completeness of the reports is due to her initiative. Recorded by Denver seismograph, St. Regis College.

May 28–29: Slide of part of Sphinx Mountain Yellowstone River north of Yellowstone National Park carried part of track of Northern Pacific Railroad with it. There is no evidence to show that it was accompanied by seismic tremors, though it may possibly have been related to earlier seismic activity in this region.

June 2: 2.00, Price, Utah (39°.8 N., 111°.0 W.). Slight shock noted by two persons.

June 19: 3.40, Thermopolis, Wyo. (43°.7 N., 108°.3 W.). A single shock generally felt. Sounds slightly preceded shock.

July 24: 11.55, Helena, Mont. (46°.5 N., 112°.0 W.). Slight trembling with gradual onset. Felt by a few.

September 29: 0.17 Holly, Colo. (38°.1, 102°.1). Rocking motion generally felt. Seemed like sharp blast. People generally wakened and alarmed throughout the county.

October 31: 21.16, Mexico (26° N., 106° W., instrumental). This shock was felt as a single shock at El Paso, where people were frightened. Clocks stopped at Valentine east of El Paso. Houses were damaged at Guadalupe in the Rio Grande Valley (Mexico), and Chihuahua and Santa Rosalia. The latter is the nearest to the epicenter as given by instrumental determination.

PACIFIC COAST REGION

CALIFORNIA AND WESTERN NEVADA

120TH MERIDIAN OR PACIFIC COAST TIME

January 5: 19.40, San Bernardino. Several light quakes.

January 7: 14.52, Santa Monica. Shook crockery, no damage. Well recorded on instruments. Probably on Inglewood fault.

January 7: 17.00, Salinas and Hollister. Slight quakes.

January 8: 18.50, Gilroy (7), Hollister (3), Salinas (3), Watsonville.

January 12: 23.05, San Jose. Motion vertical. Slight.

January 13: 22.00 and 22.15, Brawley. Two earthquakes of several seconds duration in Imperial Valley. Slight.

January 25: 21.30, El Centro, Calexico, Brawley (force 3 at each.) Well recorded. Origin not far south of Calexico. No damage, some alarm.

February 15: 2.00, Calexico and El Centro. Slight. Recorded near Calexico.

February 21: 10.50, Calexico, two shocks not felt elsewhere.

February 28: 19.00, Bakersfield, Kern River oil field, Caliente, Woodford, Edison. Several shocks, rattling windows and doors at Bakersfield with sound like explosion. Gildale and Oil had numerous shocks.

February 28: 19.25, Burbank. Felt by a number, and other tremors later in night. Not recorded at southern California stations. Probably very feeble and highly localized. (Maxwell Allen.) Noise like strong wind, though there was none. Force 3 at oil fields.

March 5: 20.46, Scotia, Humboldt County. Slight. Motion vertical.

March 10: 19.03, Ventura, light shock. Lasted a few seconds. Recorded on instruments.

March 15: 4.03, Santa Maria, Santa Barbara County. Lasted 15 seconds. Rolled bed on castors.

March 15: 4.20, Santa Barbara. Slight. Not certain whether this is separate shock or that felt at Santa Maria, with reported time in error.

March 15: 19.30, two shocks close together at Carson City, Nev. Dishes and windows rattled. No damage.

March 16: 6.30, Santa Maria. Slight shock, lasting 5 seconds. Recorded.

March 19: 3.50, Brawley, Imperial Valley. Rattled dishes.

March 19: 20.45, Riverside and Banning. Apparent motion from north to south. Recorded origin probably near Niland.
March 19: 20.48, Scotia, Humboldt County. Hanging objects set swinging. Series of vibrations becoming strong then dying away. Local.
March 20: 13.15, Riverside, Banning, and San Bernardino. Slight.
March 22: 0.44 Los Angeles. Slight swaying north-south.
March 28: 22.25, Santa Maria (force 6–7). Lasted 15 seconds. Shook dishes from shelves. Three distinct shocks.
April 3: 4.40, Redondo Beach, Los Angeles County, force 4. Slight bump from the southwest followed a few seconds later by a slight tremor. Maxwell Allen reports quake at Torrance and Lomita at 4.45 on 4th. Probably one of dates is in error and it is the same shock.
April 15: 13.57, Tehama County. Probably in vicinity of Lassen Peak. Felt at Red Bluff and faintly at Ukiah. Recorded at Berkeley. Force 5 at Willows and Red Bluff, 3 shocks. Recorded generally. Buildings rocked, dishes rattled.
April 16: 00 plus, two sharp shocks in Lassen region. Strongest east of mountains.
April 17: 2.39. Windows rattled at Reno, Nev. Epicenter within 10 miles of that place.
April 18: 13.40 and 22.11 near Santa Cruz Island. Felt at Santa Barbara. Placed by Wood as submarine southwest of Point Hueneme and south or southeast of Santa Cruz Island. Also felt at San Luis Obispo.
May 4: 11.22, Los Angeles. Strong thump followed by shaking of steel-frame building.
May 16: 15.17, Bishop, Inyo County. Abrupt, followed by trembling for 30 seconds. Recorded.
May 21: 16.37, Brawley, Imperial Valley. Rattled windows and dishes. Recorded. Origin near Niland.
May 27: 10.49, 15.33, and 17.58, Scotia, Humboldt County. Series of light shocks.
May 27: 21.40, Imperial, Imperial Valley. Slight shock. Recorded. Origin near Calexico.
June 3: P. m., Trinity County, force 6 at Trinity Center, Carrville, and Weaverville At 21.30 a shock was felt at Eureka and at Scotia. Probably same shock, though there are no reports from intermediate places. Chimneys thrown down at Weaverville.
June 9: 0.22, 0.31, and 4.25, Taft, Kern County. Three light shocks. Many awakened by trembling of houses and rattling of windows. Recorded at times given.
July 5: 20.40, San Diego. Rattled windows and dishes. Noted by a limited number of persons in one section of city.
July 18: 22.48, located by Wood as in Lower California southeast of Volcano Lake. Felt as slight shock at Yuma, Ariz.
July 27: 18.20, Eureka. Bump followed by trembling.
July 28: 14.02, Palo Alto. Single sharp jolt followed by fairly loud "boom." Seismograph at Stanford indicated epicenter within 10 miles.
August 2: 16.09, located by Wood in Santa Monica Bay.
August 8: 22.35, San Jose, Watsonville, Aromas. Slight. Felt at Palo Alto and San Francisco. Generally recorded.
August 14: P. m. Hayward. Cracked walls of house.
September 5: 6.42, located by Wood as on the Pinto Fault at Hill, near Twenty-nine Palms in the desert region of Riverside County. Force 5 at Los Angeles. Felt at San Bernardino and San Diego and throughout this part of southern California. Did no damage. Generally recorded. Numerous aftershocks recorded instrumentally.
September 11: 3.36 (42° N., 132° W., instrumental). Submarine off the coast. Determined instrumentally.
September 12: Force 6, Madera, Madera County, time not given.
September 16: 2.30 and 3.30, Scotia and Eureka. Generally felt with rocking in north to south direction. Second shock felt only at Scotia.
September 18: 18.46, San Diego. Slight. Generally recorded. Origin in San Jacinto fault zone near Superstition Mountain.
September 23: Calexico, El Centro, force 5, 0.30, 1.45, 2.45, 8.00, 9.41, and 9.44. A series of shocks, one heavy enough to cause people to leave their homes. The last three were the heaviest.
September 30: 20.45, Eureka. Generally felt rocking motion.

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October 2: 11.01, located by Wood as in the same location as the epicenter of September 18 shock. Felt at Los Angeles 125 miles away and area was on order of 25,000 square miles. Felt at San Diego, Pomona, and Beaumont. Slight at Imperial.
October 3: 4.28, Escondido, San Diego County. Slight.
Oct. 29: 16.00, Calexico, El Centro, and Yuma. Strongest at El Centro. No damage. Trembling felt at Yuma. Generally recorded. Epicenter near head of Gulf of California.
November 1: 21.00, Lompoc. Slight shock. Shock thought caused by boiler explosion, but later disproved.
November 5: 17.00, Scotia. Felt by a few.
November 15: 6.43, San Pedro. Located by Wood as under Santa Monica Bay.
November 16: 3.30, Bay Point. People left their homes.
November 16: 13.15, Oakland. Slight shock.
November 18: 5.37, Redondo Beach. Two shocks from west, followed in a second by faint trembling. Estimated force 3.
November 27: 12.57, Los Angeles. Shook windows. Preceded by several light shocks.
December 9: 13.43, Scotia. Bump followed by trembling from north to south. Hanging objects swayed.
December 31: 2.45, placed by Wood near Torrance in Los Angeles region. Reported from Santa Monica, Long Beach, and other beach towns and inland to Los Angeles.

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WASHINGTON AND OREGON

120TH MERIDIAN OR PACIFIC COAST TIME

January 24: 9.45, Abbotsford (49°.1 N., 122°.2 W.). Slight shock. No details.
February 2: 4.52, Startup, Wash. (47°.8 N., 121°.7 W.). Generally felt. Strong shake and roaring. Cracking of plaster and paper. People generally alarmed.
February 9: 3.05, Vancouver Island, probably off west coast (48°.5 N., 125° W.). At Alberni, British Columbia, loud report and rumble. Tidal wave at Bamfield. Fairly strong shock at Tatoosh Island, Wash., where there was a loud roaring sound. Slight at Port Townsend.
July 5: 21.30, Waldheim, Wash. (48°.1 N., 121°.6 W.). Shock felt by a few.
September 4: Newport, Oreg. (44°.7 N., 124°.1 W.). Slight shock felt also at other towns within 10-mile radius.
September 4: 23.18, Darrington, Wash. (48°.3 N., 121°.6 W.). Generally felt over area 10 miles in radius. Trembling, two shocks.

ALASKA

150° MERIDIAN TIME, EXCEPT WHERE OTHERWISE NOTED

January 24: 16.35, Seward (60° N., 150° W.). Area unknown. Intensity 6. Fairly strong at Seward. Two shocks close together; first slight, second heavier and sharper. Lasted 5 seconds. Some day during week beginning January 22, there was a shock at Latouche, 18.00 which was fairly strong.
February 1: 15.08 (135° meridian time), Haines and Annex Creek (59° N., 135° W.). No details.
February 6: 20.03, Prince William Sound (61° N., 149° W.). Alarm at Latouche. Slight at Seward. Lasted 7 seconds at Matanuska with rattling of objects. Fairly heavy at Anchorage. Too little data to fix area or epicenter.
February 7: 20.50, three shocks at Seward (60° N., 150° W.).
February 19: 11.08, Prince William Sound and Kenai Peninsula (61° N., 147° W.). A severe shock at Seward which lasted 3 seconds. Buildings swayed. Heavy snowslides along the railroad. Another felt at Latouche about midnight and another at 12.42 p. m. on the 20th. A shock at Seward on morning of 20th at time not given.
February 21: 19.49, G. M. T. (66° N., 174° W., instrumental). Strong submarine earthquake near Aleutian Islands.
March 2: 4.35, Anchorage. No details (61° N., 149° W.).
April 6: 5.15, Seward (60° N., 150° W.). Two slight shocks. Motion north to south.

April 10: 4.09, Seward (60° N., 150° W.). Light shock followed by heavier, lasting in all about one minute. East-west direction. Heavy rumbling. People generally awakened.
April 19: 2.03 and 3.00 (160° meridian time), Igloo (56° N., 160° W.). Observer not sure whether sounds he heard were due to earthquake but could find no other explanation.
April 26: 16.45, Haines. No details.
May 8: 17.35, Dawson, Yukon (64° N., 140° W.). Slight earthquake throughout Yukon River region. Low rumble. Not certain whether felt in Alaska.
May 15: Midnight (50° N., 179° W.), violent shock felt by Japanese steamer *Erie Maru*. Effect as if vessel had struck bottom.
June 8: 0.30, Cordova (60° N., 146° W.). People generally wakened. Hanging lamps swayed and plaster cracked. No damage.
June 20: 9.00, mild shock at Seward.
June 21: 6.26, Kenai Peninsula (61°.3 N., 148°.7 W., instrumental). Generally felt from Kenai Peninsula to Copper River Valley. There were three distinct shocks at 1.27, 6.26, and 7.20, of which the second was by far the strongest and was widely recorded on seismographs. Thirty miles north of Cordova men were thrown from their bunks. Plaster cracked at Cordova. Landslides at various places in the mountains. At Seward ground gave sensation of rolling waves. Lasted more than a minute at Anchorage. Heavy at Valdez. Felt at Matanuska and Chickaloon.
October 29: 21.13, Prince William Sound (61° N., 149° W.). Reported from Anchorage and Matanuska. Report from Latouche gives time one-half hour earlier.
November 12: 21.25, Anchorage (61° N., 149° W.). Single report, no details.
November 27: 11.20, Latouche (60° N., 148° W.). Awakened people. Single shock followed by trembling lasting a minute.
December 4: 6.37 (165° meridian time), Dutch Harbor (54° N., 166° W.). One shock. No damage.
December 18: 21.50, Chickaloon (61° N., 146° W.). Shock felt, no details.
December 24: 0.35, Fairbanks (65° N., 148° W.). Lasted 30 seconds, no details.

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PORTO RICO

60TH MERIDIAN TIME

August 22: 4.50, shock generally felt throughout island. Epicenter can not be determined through lack of instrumental data. Generally felt at Orovicis. Mayaguez (two shocks), Aguirre, and San Juan. Sounds thunderous at Santurce.
November 1: 11.10, Orovicis, P. R. Slight shock.
November 18: 22.35, many people alarmed at Orovicis, P. R. East to west swaying motion at San Juan. Felt at Mayaguez.

PHILIPPINE ISLANDS

February 6: Davao Province, Mindanao. Strong shock.
June 13: P. m. Heavy loss at San Jose, Mindoro Province.
August 5: P. m. Two sharp shocks at Manila. Clocks stopped. No damage.
December 19: Mindanao, shaken by severe earthquake. Many houses collapsed at Cotabato which was also seriously damaged by tidal wave, which swept up the Cotabato River. Reported 4 dead, 102 injured.
December 28: Fairly strong earthquake at Zamboanga. Felt at Jolo but much less intensely.

3569—30——3

INSTRUMENTAL REPORT ON PRINCIPAL EARTHQUAKES

International Seismological Centre

Date, station, and hour	Phase	Time component		Remarks
		North	East	
February 21				Origin, 19h 48.9m. Epicenter, 66° N., 171° W.
Charlottesville:		m. s.	m. s.	
20h	e	06.0	06.0	
	eL_1	15.0	15.0	
	M_1	20.0	20.0	
21h	F	18	12	
Chicago:				
19h	iP	57 56	57 58	
	iPR_1	59 49	59 54	
20h	iS	05 07	05 11	
	eSR_1	----------	08 25	
	eSR_2	09 35	----------	
	iL_1	16 05	15 45	
	M_1	17.7	17.7	
21h	F	35	35	
Honolulu:				
20h	eS	04 20	04 23	
	SR_1	----------	07 33	
	SR_2	08.0	----------	
	L_1	10 55	10 19	
	F	57	57	
Sitka:				
19h	iP	53 58	53 40	
	iS	57 19	----------	
	eS	----------	57 24	
	eL_1	58 55	59 02	
20h	M_1	01	01 32	
	F	45	45	
Tucson:				
19h	P	58	58	
20h	PR_1	----------	00 01	
	S	05 06	05 10	
	L_1	14 04	13 12	
March 9				Origin, 18h 05.7m. Epicenter, 4° S., 85° E. (approximate).
Balboa, Canal Zone:				
18h	e	20	----------	
20h	F	30	----------	
Charlottesville:				
18h	eP′	23 16	----------	
	e	----------	23 21	
	iPR_1	29 20	----------	
	ePS	39 10	39 28	
	eSR_1	----------	47 32	
	iSR_1	47 50	----------	
	L_1	54	----------	
19h	L_1	----------	01	
	M_1	31.5	31	
20h	F	36	30	
Chicago:				
18h	eP′	----------	25 25	No record on N.-S.
	ePR_1	----------	28 22	
	ePS	----------	41 59	
	iSR_1	----------	46 23	
19h	L_1	----------	01.3	
	M_1	----------	14.1	
21h	F	----------	6	
Honolulu:				
18h	iP′	----------	24 43	
	eSR_1	25 55	----------	
	eSR_2	29 37	----------	
	eS_eP_eS	----------	31 45	
	PS	34 33	34 33	
	SR_1	39 40	40 13	
	eSR_2	----------	43 54	
	L_1	50 30	49.5	
20h	F	57	57	
Sitka:				
18h	S	33 15	33 17	
	PS	35 07	35 08	
	e	53	53 19	
19h	L_1	01 01	01 03	
	M_1	11 45	18 21	
	F	39	39	

Instrumental report on principal earthquakes—Continued

International Seismological Centre

Date, station, and hour	Phase	Time component		Remarks
		North	East	
March 9—Continued				
Tucson:		m. s.	m. s.	
18h	P′	24 06		Nothing on E.-W.
	PR_1	28 24		
	eSR_1	47 05		
	eSR_2	52 20		
19h	L	06 25		
March 22				Origin, 4h 17.0m. Epicenter, 14.7° N., 94.2° W.
Balboa, Canal Zone:				
4h	P	21 18		
	S	25		
	L	27 12		
	M	28 01		
5h	F	07		
Charlottesville:				
4h	iP	22 37	22 37	
	e		23 50	
	iPR_1	23 50		
	S		27 24	
	iS	27		
	L	30 54	31	
7h	F	24	24	
Chicago:				
4h	iP	22 42	22 44	Activity too rapid to record well on either component.
	iPR_1		23 16	
	iS		27 17	
	F		6	
Honolulu:				
4h	P	27 07	26 56	
	PR_1		29 24	
	S	35	35 10	
	SR_1	39 16	39	
	SR_2	41 14		
	i		43 17	
	eL_1		44 50	
	L_1	45 40		
6h	F	40	40	
Porto Rico:				
4h	P	24 08	24 06	
	S	27 14	27 28	
	L	29 04	29 30	
	M	36 24	36 30	
	F	36.3	36.3	
Sitka:				
4h	eP	26 07		
	iP		26 09	
	iPR_1		28 25	
	iS	33 32	33 36	
	iSR_1		37 32	
	iL_1		42 35	
	eL_1	42 51		
	M_1	45 48	45 59	
5h	F	56	56	
Tucson:				
4h	iP	21 51		Nothing on E.-W.
	iL	25 55		
April 9				Origin, 17h 34.2m. Epicenter, 4° S., 60.5° W.
Chicago:				
17h	PR_2	47 29		
	eS		51 35	
	S	51 48		
	iSR_1		53 15	
	eSR_1	56 01		
	eL_1		58 15	
18h	eL_1	00.2		
	M_1	05.9	05.3	
19h	F	6	6	
Honolulu:				
18h	ePS		00	
	eL_1	13 57	17 50	
	F	47	47	

Instrumental report on principal earthquakes—Continued

Date, station, and hour	Phase	Time component		Remarks
		North	East	
April 9—Continued				
Tucson:		m. s.	m. s.	
17h	iP	44 21	44 23	
	iPR_1	46 06	----------	
	iPR_2	48 19	----------	
	eS	----------	52 30	
	iS	52 32	----------	
	eSR_1	----------	57 02	
18h	L_1	01.6	00 52	
	M_1	11.6	09.6	
	F	50	50	
April 15				Origin, 23h 15.9m. Epicenter, 12.2° N., 94.0° W.
Balboa, Canal Zone:				
17h	P	39 30	----------	
	S	44	----------	
	L	47 14	----------	
	M	54 21	----------	
18h	F	15	----------	
Charlottesville:				
23h	eP	22	----------	
	iS	26 40	----------	
	i	----------	26 52	
	eL_1	36.5	36	
	M_1	45.6	39	
	F	30	30	
Chicago:				
23h	iP	21 51	21 55	
	e	25 58	----------	
	iS	26 43	26 44	
	L_1	----------	32 50	
	eL_1	32 50	----------	
	M_1	40.9	40.6	
24h	F	54	54	
Tucson:				
23h	iP	21 07	21 06	
	eS	25 09	25 13	
	eSR_1	26 21	----------	
	L_1	----------	27 43	
	eL_1	27 32	----------	
	M_1	29.9	30.1	
24h	F	30	30	
April 17				Origin, 3h 24.1m. Epicenter, 16° N., 95.6° W.
Chicago:				
3h	iP	30 46	30 44	
	iPR_1	31 15	----------	
	iS	34 55	35 08	
	M_1	35 28	36 13	
4h	F	56	56	
Honolulu:				
3h	eP	35 20	----------	
	iS	43 10	----------	
	S	----------	43 20	
4h	F	12	12	
April 18				Origin, 19h 22.7m. Epicenter, 41° N.,25° E. (approximate).
Charlottesville:				
19h	eP	----------	34 36	Nothing on N.–S.
	iS	----------	44 06	
	e	----------	49	
	eL_1	----------	54	
20h	M_1	----------	08.1	
	F	----------	13	
Chicago:				
19h	iP	34 50	----------	E.–W. lost in overlap.
	iS	44 34	----------	
	eSR_2	52 35	----------	
	eL_1	59 14	----------	
20h	M_1	05.9	----------	
21h	F	12	----------	
Honolulu:				
19h	PS	52 34	----------	
	SR_1	58 50	----------	
	eSR_1	----------	59 17	
20h	eL_1	16 50	16.0	
21h	F	6	6	

International Seismological Centre

Instrumental report on principal earthquakes—Continued

International Seismological Centre

Date, station, and hour	Phase	Time component		Remarks
		North	East	
April 18—Continued				
Tucson:		m. s.	m. s.	
19h	iP	36 29		
	P		36 36	
	ePR1	40 15		
	eSePeS	46 56		
	eS		47 44	
	ePS	49		
	eSR1	54 16		
20h	e		03 39	
	eL1		08 44	
	L1	08 46		
	M1	13.2	13.1	
21h	F	14	14	
May 14				Origin, 22h 14.7m. Epicenter, 6.7° S., 81° W.
Balboa, Canal Zone:				
22h	P	18 30	18 30	
	S	21 18	21 22	
	L	22 34	23 14	
	M	24 14	28 56	
	F	08	08	
Charlottesville:				
22h	iP	22 47	23	
	iPR1	24 32		
	e		24 42	
	PR2	25 37		
	iS	29	29 16	
	i		32 30	
	iL1	35	34 30	
	M1	37.8	36.5	
1h	F	36	36	
Chicago:				
22h	iP	23 26	23 29	Activity too rapid to record well.
	iPR1	25 36		
	iS		30 19	
	SR1	33.5		
	M1	36.2	36.6	
1h	F	50	50	
Honolulu:				
22h	P	27 18	27 13	
	PR1		30 20	
	S	37 30	37 27	
	PS	38 07	38 27	
	Lq	49.3	48 50	
	Lr	53 34	53 16	
	M2	58.8	54.0	
1h	F	6	6	
Porto Rico:				
22h	P	19 34	19 33	
	i	22 49	22 52	
	L	24 24	24 27	
	M	34 15	42 05	
23h	F	18	18	
Sitka:				
22h	eP	26 52	26 41	
	iS	36 39	36 39	
	iSR1	41 53	41 03	
	eSR2	45 55	45 47	
	eL1	53 09	52 40	
23h	M1	03 44	03 44	
24h	F	57	57	
Tucson:				
22h	iP	23 31	23 30	
	i	24 18		
	ePR1		25 01	
	iS	30 35	30 32	
	iSR1		34 26	
	eL1	34 27		
	L1		37 44	
	M1	34 50	42.5	
1h	F	30	30	

Instrumental report on principal earthquakes—Continued

International Seismological Centre

Date, station, and hour	Phase	Time component		Remarks
		North	East	
May 27				Origin, 9h 50.6m. Epicenter, 41° N., 142° E.
Charlottesville:		m. s.	m s.	
10h	S	14 28	14 36	
	eSR1	20 40	21	
	eSR2	24 48	24 52	
	L1	27.0	27.2	
	M1	48.5	48.5	
12h	F	18	18	
Chicago:				
10h	eP	03 07	03 07	
	ePR1	06 45	----------	
	iS	13 31	13 33	
	iSR1	19 10	19 28	
	iL1	----------	26 10	
	L1	30.5	----------	
	M1	39 00	47.0	
12h	F	48	48	
Honolulu:				
9h	iP	----------	59 50	
10h	eS	07 10	----------	
	iS	07 20	07 20	
	L1	13.2	14 33	
	M1	17.5	15 44	
12h	F	00	00	
Sitka:				
11h	eP	00 25	----------	Nothing on E.–W.
	iS	07 23	----------	
	iSR1	09 35	----------	
	iSR2	10 49	----------	
	iL1	13 11	----------	
	M1	13 11	----------	
12h	F	13	----------	
Tucson:				
10h	eP	02 40	02 41	
	S	----------	12 41	
	eS	12 43	----------	
	eSR1	17 49	----------	
	eSR2	----------	21 31	
	eL1	24 05	24 29	
	M1	24 40	32.0	
12h	F	05	05	
June 17				Origin, 3h 19.4m. Epicenter, 14° N., 97° W.
Charlottesville:				
3h	iP	25 16	25 16	
	iS	29 56	29 53	
	iSR1	31 16	31 10	
	L1	33.0	32.6	
7h	F	24	42	
Chicago:				
3h	iP	24 44	24 48	Activity too rapid to record well.
	i	34 24	34 48	
7h	F	41	41	
Honolulu:				
3h	iP	29 30	29 29	
	ePR2	32 50	32 40	
	iS	----------	37 30	
	S	37 26	----------	
	SR1	41 50	41 31	
	SR2	43 50	----------	
	L1	46 35	44 46	
	M1	53 12	50.6	
7h	F	48	48	
Tucson:				
3h	iP	24 13	24 13	
	i	----------	24 48	
	iS1	28 06	28 08	
	M1	----------	28 23	
	M2	30 27	----------	
6h	F	15	45	

Instrumental report on principal earthquakes—Continued

Date, station, and hour	Phase	Time component		Remarks
		North	East	
June 21				Origin, 10h 40.2m. Epicenter, 18° S., 178° W.
Chicago:		m. s.	m. s.	
10h	eL	----------	57 40	N.-S. record lost.
11h	M_1	----------	30.1	
12h	F	----------	54	
Honolulu:				
10h	eP	48 17	----------	
	P	----------	48 20	
	S	51 56	54 52	
	eSR_1	----------	57.1	
	SR_1	57 50	----------	
	L_1	58 07	59 20	
11h	M_1	60 40	00 55	
12h	F	36	36	
Tucson:				
10h	P	52 42	52 41	Weak record; amplitudes small, phases not well marked.
	iPR_1	55 49	----------	
11h	eS	02 49	----------	
	eSR_2	----------	12 56	
	eL_1	14 04	27 14	
	F	28	28	
June 21				Origin, 16h 27 2m. Epicenter, 61° N., 149° W.
Balboa, Canal Zone:				
16h	P	----------	48 00	
	S	----------	06 00	
Chicago:				
16h	iP	----------	33 54	N.-S. record lost.
	iPR_1	----------	35 31	
	iS	----------	40 01	
	iSR_1	----------	43 31	
	L_1	----------	46 09	
	M_1	----------	51.6	
19h	F	----------	12	
Honolulu:				
16h	eP	----------	34 33	
	iP	34 43	----------	
	iPR_1	36 27	----------	
	PR_2	----------	37 00	
	iS	40 50	40 50	
	eSR_1	43.4	----------	
	L_1	45 40	43 48	
	M_1	48 40	45 30	
19h	F	12	12	
Porto Rico:				
16h	e	58 02	53 36	
17h	F	58	58	
Sitka:				
16h	iP	28 51	28 55	
	iS	30 10	30 21	
	iL_1	31 02	30 55	
	M_1	33 58	32 59	
17h	F	41	41	
Tucson:				
16h	iP	34 26	34 27	
	iPR_1	35 56	35 58	
	eS	40 14	----------	
	S	----------	40 17	
	eSR_1	42 18	43 09	
	eL_1	44 32	----------	
	L_1	----------	47 20	
	M_1	50 22	48 58	
18h	F	48	48	
July 18				Origin, 19h 04.9m. Epicenter, 6.5° S., 79.5° W.
Balboa, Canal Zone:				
19h	P	----------	08 38	
	S	----------	11 25	
	L	----------	13 05	
	M	----------	14 08	
	F	----------	54	
Charlottesville:				
19h	iP	13 22	----------	E.-W. record lost.
	PR_1	15 06	----------	
	S	19 47	----------	
	L_1	26.0	----------	
	M_1	30.7	----------	
20h	F	12	----------	

International Seismological Centre

Instrumental report on principal earthquakes—Continued

International Seismological Centre

Date, station, and hour	Phase	Time component		Remarks
		North	East	
July 18—Continued				
Chicago:		m. s.	m. s.	
19h	iP	13 22	13 22	
	eS	19 39	----------	
	iS	20 34	20 20	
	iSR_1	23 57	23 18	
	i	----------	23 40	
	iL_1	----------	27 11	
	M_1	33.3	----------	
	M_2	----------	31.1	
22h	F	18	18	
Honolulu:				
19h	iP	17 31	17 30	
	iS	27 53	27 44	
	iPS	----------	28 29	
	iSR_1	----------	32 50	
	L_1	41 30	42 50	
	M_1	42.2	45.7	
21h	F	26	26	
Porto Rico:				
19h	P	10 47	10 48	
	S	15 31	15 34	
	L	21 31	19 48	
	M	20 18	22 40	
	F	53	53	
Sitka:				
19h	eL_1	39 41	----------	
	M_1	40 47	----------	
22h	F	58	----------	
Tucson:				
19h	iP	13 46	13 47	
	i	15 21	----------	
	i	20 13	----------	
	iS	20 43	----------	
	eS	----------	21	
	eL_1	----------	24 35	
	L_1	24 30	----------	
	M_1	28.5	28.6	
21h	F	09	09	
August 4				Origin, 18h 25.9m. Epicenter, 16° N., 98° W.
Balboa, Canal Zone:				
18h	P	30 57	30 48	
	S	34 24	34 36	
	L	34 24	34 36	
	M	34 53	34 50	
19h	F	29	29	
Charlottesville:				
18h	iP	32 05	32 08	Maximum too large to record.
	i	----------	32 40	
	iS	36 46	36 44	
	L_1	39.0	39 40	
20h	F	42	42	
Honolulu:				
18h	eP	36 00	----------	
	iP	----------	36 07	
	iPR_2	----------	40 58	
	iS	43 50	43 50	
	eSR_2	50 10	----------	
	L_1	52.0	51 40	
	M_1	55.4	51.8	
21h	F	20	20	
Sitka:				
18h	eP	35 12	35 07	
	ePR_1	37 08	37 11	
	eS	42 22	42 21	
	SR_1	45 28	----------	
	eSR_2	46 34	47 21	
	eL_1	59 11	50 39	
	M_1	54 20	54 27	
20h	F	13	13	

Instrumental report on principal earthquakes—Continued

Date, station, and hour	Phase	Time component		Remarks
		North	East	
August 4—Continued				
Tucson:		m. s.	m. s.	
18h	iP	30 53	30 51	
	S	34 40	----------	
	iS	----------	34 38	
	eSR1	36 09	----------	
	iL1	36 50	36 34	
	M1	37 29	37	
21h	F	03	03	
September 11				Origin, 12h 36.1m. Epicenter, 42° N., 132° W.
Chicago:				
12h	iP	----------	41 45	N.–S. record lost. Maximum lost in changing traces.
	i	----------	46 06	
	iS	----------	46 39	
	L1	----------	52.5	
14h	F	----------	12	
Honolulu:				
12h	ePR1	44 13	44 18	
	iS	48 29	----------	
	iSR1	----------	49	
	L1	49 57	50	
	M1	53 50	53 48	
15h	F	18	18	
Sitka:				
12h	iP	39 39	---- ----	
	eP	----------	39 40	
	eS	42 45	42 46	
	iSR1	----------	43 23	
	eL1	44 03	44 08	
	M1	44 37	44 38	
13h	F	35	35	
Tucson:				
12h	eP	40 42	40 42	
	iP	40 47	40 47	
	iS	44 16	44 18	
	iL1	44 43	----------	
	M1	47 24	48 32	
14h	F	00	00	
September 22				Origin, 7h 31.0m. Epicenter, 14° S., 164° E.
Chicago:				
7h	eP′	----------	50 01	N.–S. record lost.
	iPS	----------	59 32	
8h	eSR1	----------	05 26	
	L1	----------	24.3	
	M1	----------	29.8	
10h	F	----------	20	
Honolulu:				
7h	iP	40 07	40 10	
	ePR1	----------	42 06	
	ePR2	43 22	----------	
	iS	47 17	47 26	
	iSR1	----------	51 47	
	L1	----------	52 40	
	M1	56 24	56.7	
9h	F	54	54	
Sitka:				
7h	ePS	55 43	55 45	
8h	eSR1	06 41	----------	
	eL1	12 21	----------	
	M1	13 33	----------	
	F	38	----------	
Tucson:				
7h	eP	46 14	45 26	This record is unusual in that scarcely any preliminary phases were recorded while the long waves were of very regular sinusoidal nature.
	ePS	----------	56 40	
8h	eSR1	01 56	01 52	
	eSR2	08 32	----------	
	eL1	13 40	13 34	
	M1	17.5	16.7	
9h	F	20	20	

International Seismological Centre

Instrumental report on principal earthquakes—Continued

International Seismological Centre

Date, station, and hour	Phase	Time component		Remarks
		North	East	
September 27				Origin, 0h 44.0m. Epicenter, 12° N., 59° W.
Balboa, Canal Zone:		m. s.	m. s.	
0h	e	48 38	----------	
	F	55	----------	
Chicago:				
0h	iP	51 03	51 02	
	iPR1	----------	52 26	
	iS	56 52	56 49	
1h	L1	00 49	02.4	
	M1	03.7	01.3	
	F	40	40	
Tucson:				
0h	eP	53 16	53 18	
	ePR1	55 17	55 13	
	ePR2	----------	56 51	
1h	e	00 27	00 34	
	i	----------	03 02	
	eS	06 40	----------	
	F	23	23	
October 0				Origin, 3h 00.9m. Epicenter, 19° N., 99° W.
Balboa, Canal Zone:				
3h	P	05 20	05 27	
	S	09 00	09 00	
	L	09 17	09 09	
	M	09 40	09 37	
4h	F	43	43	
Charlottesville:				
3h	iP	06 53	06 54	Activity too large to record well.
	iS	11 36	11 36	
	SR1	14 00	----------	
	L1	15.9	----------	
6h	F	36	----------	
Chicago:				
3h	iP	06	05 59	
	iPR1	----------	06 30	
	i	07 33	----------	
	iS	10 24	10 35	
	eL1	----------	14.0	
	L1	13 03	----------	
	M1	10.1	22.2	
7h	F	00	00	
Honolulu:				
3h	iP	10 57	11	
	iPR1	12 00	----------	
	ePR2	----------	15 54	
	iS	18 58	19	
	i	----------	20 50	
	eSR1	22 34	----------	
	L1	25.0	26 42	
	M1	31 20	31 20	
6h	F	20	20	
Sitka:				
3h	iP	10 07	----------	
	eP	----------	10 07	
	iPR1	12 07	----------	
	ePR1	----------	12 07	
	iPR2	12 48	----------	
	iS	17 23	17 23	
	iSR1	21 22	21 23	
	eSR2	----------	22 24	
	iL1	26 53	26 51	
	M1	29 08	29 36	
6h	F	33	33	
Tucson:				
3h	iP	05 47	05 47	
	i	06 05	06 36	
	iS	09 32	09 31	
	iL1	11 23	11 26	
	M1	11 54	13.8	
5h	F	37	37	

Instrumental report on principal earthquakes—Continued

International Seismological Centre

Date, station, and hour	Phase	Time component		Remarks
		North	East	
October 25				Origin, 12h 32.8m. Epicenter, 12° N., 86° W.
Balboa, Canal Zone:		m. s.	m. s.	
12h	P	34 58	34 53	
	S	36 24	36 23	
	L	36 52	37 09	
	M	37 56	37 55	
13h	F	01	01	
Charlottesville:				
12h	iP	38 48	----------	
	eS	----------	43 20	
	iS	43 54	----------	
	L_1	48	46.2	
	M_1	51.4	50.2	
13h	F	35	35	
Chicago:				
12h	e	----------	42 09	N.–S. record lost. Finish on E.–W lost in changing traces.
	e	----------	43 53	
	L_1	----------	45 21	
	M_1	----------	47.0	
Honolulu:				
12h	iS	----------	53 10	Nothing on N.–S.
13h	L_1	----------	04 30	
	M_1	----------	10.8	
	F	----------	20	
Tucson:				
12h	eP	39 12	39 14	
	ePR_2	40 06	40 15	
	eS	44 52	44 58	
	e	47 11	----------	
	eL_1	52 06	48 56	
	M_1	52 32	----------	
13h	F	30	----------	
November 1				Origin, 4h 12.6m. Epicenter, 26° N., 106° W.
Balboa, Canal Zone:				
4h	e	21	----------	
	F	46	----------	
Charlottesville:				
4h	eP	18 22	18 20	
	eS	22 42	22 44	
	iS	22 56	22 56	
	eL_1	25.0	24 30	
	M_1	27.0	28.7	
5h	F	22	22	
Chicago:				
4h	iP	17 42	17 42	
	iS	21 29	21 33	
	iSR_1	21 54	----------	
	L_1	23 03	23 17	
	M_1	25.2	23 57	
5h	F	37	37	
Honolulu:				
4h	eL_1	35 20	----------	
	L_1	----------	36 30	
	M_1	37 36	37 24	
	F	57	57	
Tucson:				
4h	iP	14 35	14 34	
	i	14 57	14 57	
	i	15 44	----------	
	iL_1	16 16	16 23	
	M_1	17 44	18 14	
5h	F	03	24	
November 20				Origin, 20h 35.3m. Epicenter, 23° S., 72° W.
Charlottesville:				
20h	iP	45 20	----------	
	eP	----------	45 20	
	iS	53 36	53 38	
	eL_1	05.0	02.0	
	M_1	08.0	08.5	
22h	F	10	10	

Instrumental report on principal earthquakes—Continued

Date, station, and hour	Phase	Time component		Remarks
		North	East	
November 20—Continued				
Chicago:		m. s.	m. s.	
20h	iP	45 47	45 55	
	iS	54 30	54 33	
	iPS	55 49	56 41	
	SR_1	58 38	----------	
21h	L_1	04 44	04 43	
	M_1	14.4	14.4	
	F	00	00	
Honolulu:				
20h	eL_1	----------	59 15	
21h	L_1	19.0	----------	
	M_1	20.5	20.9	
	F	47	47	
Tucson:				
20h	iP	46 05	46 05	"L" phase much weaker on E.–W. than on N.–S.
	i	48 05	47 59	
	ePR_1	----------	49 29	
	iPR_2	50 48	----------	
	iS	54 54	54 59	
	eSR_1	----------	59 50	
21h	eSR_2	02 37	02 44	
	eL_1	08 09	06 43	
	M_1	09.0	----------	
	F	34	34	
December 1				Origin, 4h 06.5m. Epicenter, 35° S., 74° W.
Balboa, Canal Zone:				
4h	P	14 21	14 33	
	S	20 55	21 01	
	L	24 19	24 19	
	M	25 11	25 05	
5h	F	53	53	
Charlottesville:				
4h	e	----------	17 48	
	eP	18 32	----------	
	iP	18 47	----------	
	e	21 30	----------	
	i	----------	27	
	iS	28 08	----------	
	i	----------	31 32	
	SR_1	32 44	----------	
	L_1	36.0	35.8	
	M_1	55.0	49.4	
7h	F	42	36	
Chicago:				
4h	iP	18 10	18 07	
	iPR_1	20 44	----------	
	iPR_2	23 08	23 05	
	iS	28 01	27 50	
	i	32 25	----------	
	i	38 37	----------	
	eL_1	----------	41.3	
	L_1	41.8	----------	
	M_1	52.4	55.2	
7h	F	56	56	
Honolulu:				
4h	iS	----------	30 25	Nothing on N.–S.
	SR_1	----------	37 30	
	eLq	----------	48 13	
	iLr	----------	51 48	
	M_1	----------	54 20	
7h	F	----------	00	
Sitka:				
4h	eS_ePeS	31 20	31 20	
	iPS	----------	33 56	
	ePS	34	----------	
	iSR_1	40 20	40 18	
	iSR_2	44 35	----------	
	eSR_2	----------	44 43	
	L_1	----------	53 30	
	eL_1	53 38	----------	
5h	M_1	09 46	16 03	
6h	F	39	39	

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Instrumental report on principal earthquakes—Continued

International Seismological Centre

Date, station, and hour	Phase	Time component		Remarks
		North	East	
December 1—Continued				
Tucson:		m. s.	m. s.	
4h	iP	18	18 02	Time marks lacking on N.–S.
	iPR1	20 57	----------	
	iS	27 42	27 36	
	i	29 45	----------	
	eSR1	32 51	----------	
	eSR2	35 38	----------	
	e	----------	36 05	
	eL1	----------	42 54	
	M1	----------	45.7	
5h	eL1	08 57	----------	
	M1	09.4	----------	
7h	F	20	16	
December 2				Origin, 4h 20.6m. Epicenter, 35° S., 74° W.
Balboa, Canal Zone:				
4h	P	28 40	----------	
	S	35 12	----------	
	L	38 29	----------	
	M	38 44	----------	
5h	F	27	----------	
Charlottesville:				
4h	eP	31 54	----------	
	S	41 20	41 22	
	i	----------	46 00	
	eL1	50.3	50.0	
	M1	----------	54.0	
5h	M1	00.2	----------	
7h	F	18	18	
Chicago:				
4h	P	32 21	----------	
	iS	42 10	42 12	
	eL1	55.4	51 30	
5h	M1	05.0	02.3	
7h	F	24	24	
Honolulu:				
5h	eL1	07 06	06 23	
	M1	16.7	11.4	
6h	F	10	10	
Tucson:				
4h	iP	32 18	----------	Very weak record on E.–W.
	P	----------	32 20	
	i	----------	32 48	
	ePR1	36 28	----------	
	ePR2	39 16	----------	
	iS	41 58	42 02	
	eSR1	46 58	----------	
	eL	----------	57.9	
	eL1	57 20	----------	
5h	M1	30.6	----------	
6h	F	10	10	
December 19				Origin, 11h 37.2m. Epicenter, 6° N., 124.5° E.
Balboa, Canal Zone:				
12h	e	15	----------	
13h	F	30	----------	
Charlottesville:				
11h	ePR1	59 20	----------	E.–W. record lost by overlap.
12h	PS	09	----------	
	eSR1	16	----------	
	eSR2	21	----------	
	L1	27.5	----------	
13h	M1	04.8	----------	
	F	56	----------	
Chicago:				
12h	e	----------	00.6	N.–S. record lost.
	e	----------	11.8	
	eL1	----------	28 42	
	M1	----------	41.2	
14h	F	----------	12	

Instrumental report on principal earthquakes—Continued

Date, station, and hour	Phase	Time component		Remarks
		North	East	
December 19--Cantinued				
Honolulu:		m. s.	m. s.	
11h	ePR1	----------	52 50	
	eS	58 06	----------	
	iS	58 57	59 11	
12h	eSR1	----------	02 04	
	eL1	08 27	14 50	
	M1	09.6	----------	
	M2	----------	24.5	
13h	F	06	06	
Sitka:				
12h	iS	01 30	01 30	
	iPS	----------	03 06	
	e	----------	10 46	
	eL1	15 04	15 02	
	M1	----------	23 24	
	F	54	----------	
13h	F	----------	20	
Tucson:				
11h	eP	----------	57 17	
	ePR1	57 17	----------	
12h	ePS	06 21	06 16	
	eSR1	12 46	----------	
	eL1	23 49	33.2	
	M1	25.7	34.2	
13h	F	48	48	

MISCELLANEOUS SEISMOLOGICAL ACTIVITY

GEODETIC WORK

During the year covered by this report no new triangulation was executed in the California regions of seismic activity. The line of first-order leveling between Mojave and Barstow in progress at the end of the last year was completed. First-order leveling was extended along the Southern Pacific Railroad between El Centro and Colton, and from Lone Pine along the trail to the top of Mount Whitney.

HYDROGRAPHIC WORK

Vessels engaged in survey work are directed to make reports of visible or felt effects of earthquakes. No reports were received for the period covered by this report.

TIDAL OBSERVATIONS

Tidal records of the bureau were examined for disturbances due to submarine earthquakes with the following result for the shock of June 17 at $3^h\ 19.4^m$, G. C. T.:

	Inches
La Jolla, Calif.:	
First maximum, $22\frac{3}{4}^h$, June 17	6. 0
Second maximum, $4\frac{3}{4}^h$, June 18	4. 5
San Francisco, Calif.:	
First maximum, $00\frac{2}{3}^h$, June 18	
Second maximum, $5\frac{3}{4}^h$, June 18	2. 25
Third maximum, $13\frac{3}{4}^h$, June 18	1. 5

These waves were plainly seismic having a period much too long and regular to be the result of meteorological conditions. The average period of the waves from crest to crest were approximately 15 minutes at La Jolla, Calif., and San Francisco.

International Seismological Centre

PUBLICATION NOTICES

The Coast and Geodetic Survey maintains a mailing list of persons interested in its airway maps, nautical charts, and miscellaneous publications. On the issuance of new or revised editions descriptive circulars are promptly mailed to those interested in the subject matter.

Should you desire to receive such notices please check any of the lists mentioned below, grouped by subject matter, using the form prepared for your convenience.

(Date)----------

The DIRECTOR, U. S. COAST AND GEODETIC SURVEY,
Washington, D. C.

DEAR SIR: I desire that my name be placed on the mailing lists indicated by check below to receive notification of the issuance of airway maps, nautical charts, and miscellaneous publications of the Coast and Geodetic Survey:

(Cut on this line)

- ☐ 109. Astronomic Work.
- ☐ 109–A. Base Lines.
- ☐ 109–B. Coast Pilots.
- ☐ 109–C. Currents.
- ☐ 109–D. Geodesy, or Measurement of the Earth.
- ☐ 109–E. Gravity.
- ☐ 109–F. Hydrography.
- ☐ 109–G. Leveling.
- ☐ 109–H. Nautical Charts.
- ☐ 109–I. Oceanography.
- ☐ 109–J. Precise Traverse.
- ☐ 109–K. Seismology.
- ☐ 109–L. Terrestrial Magnetism.
- ☐ 109–M. Tides.
- ☐ 109–N. Topography.
- ☐ 109–O. Triangulation.
- ☐ 109–P. Cartography.
- ☐ 109–R. Airway Maps.

(Name)----------

(Address)----------

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