

J. A. Udden presented a paper of which the following is an abstract.

OBSERVATIONS ON THE EARTHQUAKE IN THE
UPPER MISSISSIPPI VALLEY, MAY 26, 1909.

Earthquakes are infrequent in this region, and notes on our seismic phenomena are the more desirable. This communication is based mostly on items gathered from forty weekly and ten daily newspapers published in the disturbed area, and includes observations made in more than one hundred different localities. These data are given below, referred to the several localities.*

The area sensibly disturbed by this earthquake extended over the greater part of Illinois, Iowa, Wisconsin, Michigan, Indiana, Missouri, and Minnesota, a region about eight hundred miles in diameter. The mesoseismal area appears to have been triangular in form and unusually large, the greatest violence having been noted near Platteville, in Wisconsin, and in Waukegan and Bloomington, in Illinois, which places probably were separate epicenters. The velocity of the earthquake waves, calculated from the reported observations on time recorded by government observers in Peoria (8:38 A. M.) and in Washington, D. C. (8:41 A. M.), is 3.3 mile per second. While no great reliance can be placed on these figures, as the data are too few and their authenticity uninvestigated, yet the great size of the mesoseismal area is in harmony with the velocity of the wave. Both indicate a great depth of focus. The highest seismic intensity was above seven of the Rossi-Forell scale.

The facts presented in the reports are sufficiently full to indicate approximately the position of the isoseismals. When these

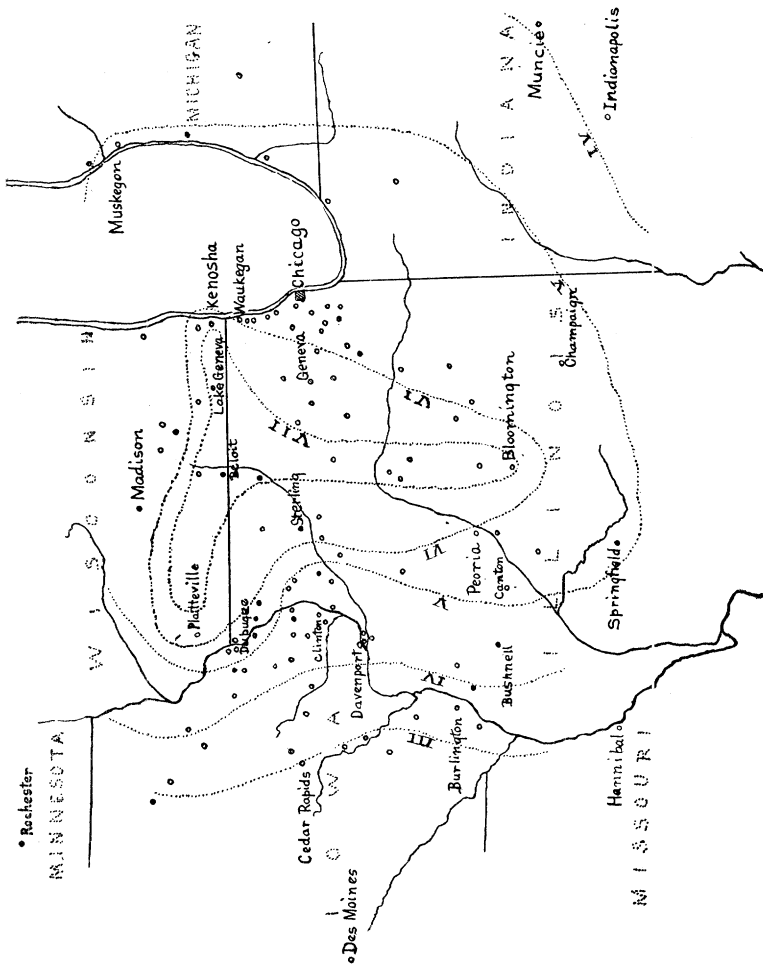


Fig. 9. Map of area disturbed by earthquake May 26, 1909.

are drawn on the basis of the intensities adopted in the Rossi-Forell scale, they run about as indicated on the accompanying map. It will be noticed that they center around one of the oldest lines of disturbance in Illinois, the LaSalle anticline. The parallel flexures in the lines on the west side are presumably due to the northwest center.

Two maxima were noted in the disturbance in the following places: Bushnell, Canton, Champaign, Chicago, Geneva, and Sterling in Illinois; Davenport and Dubuque in Iowa. In Madison, in Wisconsin, Professor W. H. Hobbs is reported having noted three shocks. These may have originated in the three epicentra noted. Observations on the duration of the disturbance sustain this evidence. Estimates on the duration of the quake fall roughly into three groups, which average respectively four seconds (28 observations), thirteen seconds (12 observations), and sixty seconds (6 observations). It appears likely that only one of the shocks was felt in the places where the duration was briefest, and that two shocks, or three, were felt where the quake lasted more than ten seconds. All places where the disturbance lasted for more than a minute are centrally located and may have been affected by all three shocks.

A classification of the senses involved in the observations shows that the general sense of "well being" was concerned in two instances. The sense of equilibrium was affected in several cases in the mesoseismal area. Visible earthquake waves are indicated for one of the epicentral tracts. Earthquake sounds were heard by five observers. The shock was *felt* in many instances.

A classification of the terms used in describing the manner in which various objects were affected by the disturbance is shown in the table below, where the figures in parenthesis indicate the number of times each term occurs in the reports.

Houses and buildings.	Dishes, bottles and tinware.	Ttables, beds, bookcases and stoves.	Windows and doors.
Shook (17) Rocked (7) Trembled (4) Swayed (3) Cracked (2) Were jarred (2) Quivered (2) Creaked (1) Heaved (1)	Rattled (15) Were broken (8) Dashed to the floor (6) Fell (3) Were shaken (3) Were moved (2) Rocked (1) Trembled (1) Wobbled (1) Was disturbed (1)	Shook (8) Were moved (6) Were overturned (3) Swayed (2) Quivered (2) Trembled (2) Broke (1) Were upset (1) Tipped over (1) Rattled (1) Rolled (1) Rocked (1) Heaved (1) Had glass shattered (1)	Rattled (12) Shook (2) Were sprung (1)
Lights and lamps.	Pictures and mirrors.	Chimneys.	Bric-a-brac.
Swayed (4) Heaved (1) Shook (1) Were shaken (1) Were overturned (1) Fell (1) Broke (1) Were knocked down (1) Were shaken out (1)	Swung (3) Were shaken (3) Were thrown (1) Tumbled (1) Fell (1) Jumped (1)	Fell (4) Topped over (2) Were razed (1) Were shaken down (1) Cracked (1)	Were shaken off (1) Were thrown down (6) Were tipped off (1) Fell (1)

In some places in the mesoseismal area the severity of the quake is reported as having frightened women, but no mention is made of fright among men. In a few cases fright was general. It would appear that this difference between the sexes in central inhibitory resistance is most evident in that belt where the intensity of the seismic waves was a little less than seven in the Rossi-Forell scale.

If the intensity of this earthquake had been only a little greater than it was, much damage to buildings would have resulted. Experience has shown that earthquakes are not fre-

quent in this part of the world, but we can not be certain that the late disturbance represents the greatest intensity of future earthquakes.

*NOTE.

The following observations were collected from daily and weekly newspapers published in the disturbed area, and from various personal communications. They are arranged by localities, in alphabetical order:

Aurora, Ill.—Chimneys fell, causing several fires.—A stove was overturned and started a fire.—Many chimneys fell.—Gas mains had connections loosened.—Some fires started the report "Aurora is burning."—Men were excited, women and children frightened.—People filled the streets.—The schools were closed.

Batavia, Ill.—A horse ran away, and the driver's leg broken.

Beloit, Wis.—Buildings were violently rocked.—Houses were jostled out of plumb.—People had difficulty in staying on their feet.

Benton Harbor, Mich.—Chinaware was broken.

Berwyn, Ill.—A vase with flowers was thrown from a mantle.—Dishes were broken.—A book was thrown down from a radiator.—Book cases were shaken.—A building swayed.

Bloomington, Ill.—Cracks were made in the brick walls of the jail. These were as wide as a man's hand.

Braidwood, Ill.—Vibrations were noted.

Burlington, Ia.—The taller buildings were shaken.—plates (dishes) were thrown down.—The shock was felt most in the upper stories of tall buildings.—Rumors of the shock caused people in neighboring towns to inquire about friends in the city over the telephone.—The shock frightened people who were in the upper stories of buildings.—There were perceptible tremors.

Cabery, Ill.—The earthquake was felt by everybody.

Cedar Rapids, Ia.—There was a slight shock.—The earthquake was felt by hundreds of people.—Buildings were slightly jarred.—Doors and dishes rattled.—There was a slight tremor.—Students in the Coe College building rushed down from the fourth floor.—The shock was by some attributed to explosions in a quarry.—Doors rattled in the Masonic library.—Many residents recognized the disturbance as an earthquake.

Chadwick, Ill.—Dishes and tinware rattled.

Champaign, Ill.—Buildings shook.

Chicago, Ill.—"Buildings standing on cassion foundations shook perceptibly, structures on old style floating piles were observed to sway." Benjamin H. Marshall, architect.—Western Union Gas and Electric Company had pipes broken, entailing a loss of several thousand dollars.—The balance of a rain gauge was displaced in the office of the U. S. Weather Bureau.—The earthquake was not felt on the ground floors of large buildings, but more generally in the upper stories.—Several chimneys were shaken down in the suburbs of Chicago.—Lighting fixtures were violently shaken in the federal building.—Office tables were moved in the federal building.—Ornaments were shaken from mantle pieces.—Dishes were broken.—Telephone wires swayed.—A

mirror swung on a wall.—Dishes rattled on a table.—Bric-a-brac fell from a mantle piece.—Telephones were put out of commission.—Heavy safes were jarred from their positions.—Wall decorations were thrown from their fastenings.—Drop lights swayed.—A bed was rolled back and forth, on its castors.—Electric light fixtures swayed alarmingly.—A receiver was knocked off from a telephone hook.—A glass shade on a gas light fell and broke.—Gas fixtures swayed.—A mirror oscillated.—The shock caused some people to run on the streets.—Some Italians, recalling the earthquakes in Italy, quit work for some time and fell down to pray.—Families ran out of their flats, fearing the walls would collapse.—Some people thought an explosion had occurred somewhere.—The falling of a tall chimney on a home for young women, scared the occupants out.—Telephone girls left switchboards.—A domestic was thrown off her feet.—A frightened wife called her husband.—Some people thought an explosion had occurred.—One man reported: "My wife and my sister were frightened and ran to me."—Hundreds of later risers were awakened by the earthquake.—A young woman stenographer, thinking some one had stepped up behind her chair, rocking it, exclaimed: "You stop that."—A man in a bath tub, seeing his image in motion in a swinging mirror, thought he was "verhext."—Many thought the shock due to blasting.—Some residents fled from their homes.—Some people experienced a dizzy feeling due to the motion.—One report says: "There was great excitement along the shore of Lake Michigan."—People feared a tidal wave.

Clinton, Ia.—Dishes were disturbed and broken.—Windows rattled.—The earth trembled as when there is an explosion.—The floor shook, as when there is an explosion.—The floor shook in the upper story of a large building.—Dishes were rattled down from shelves.—A door was sprung so it would not close.—Many people realized that it was an earthquake, and were stricken with fear.—Some thought the wind rattled the windows, or an explosion.—Occupants of large buildings told of feeling an unusual sensation.—Occupants of one building thought the shock was due to some work in progress on the upper floor.—A message, without signature, was received by one of the dailies, announcing the earthquake in a town near the city.—Telephone girls were scared.

Davenport, Ia.—The tremor was most noticeable in large office buildings.—Two shocks were felt.

Des Moines, Ia.—The earthquake was noticed by few people.

Des Plaines, Ill.—Chairs were overturned.—Mirrors were demolished.

DeWitt, Ia.—Buildings shook.—Dishes rattled.

Dixon, Ill.—There was a slight trembling of the earth.—Gas fires were shaken out.

Dubuque, Ia.—Office buildings were shaken.—The shock was felt most in the downtown districts.—Machinery rattled in factories.—Boxes and crates fell in stores.—Two shocks were felt.—Dishes to the value of eight hundred dollars were broken in a crockery store.—The upper part of high buildings swayed.—One-third of the inhabitants knew nothing of the earthquake.—Furniture moved in strange directions.—Furniture trembled.—Some claim they heard a rumbling sound before the shock.—Lamps were shaken from their rests.—Tables heaved.—Houses rocked perceptibly.—Dishes rattled on tables.—Chairs moved on their rockers.—Chandeliers heaved.—Floors heaved.—Win-

dows rattled.—Elevators swayed slightly.—Dishes and silverware moved on tables in hotels.—In the upper story of a hotel a sewing machine was tipped over.—In the upper story of a hotel a servant woman was pitched forward and nearly fell.—A house quivered.—People rushed from windows in terror, and alarm was widespread.—Several hundred people made their exit from a seven-story building, choking the stairways in their haste to escape.—Some people thought th shock was a blast in the stone quarries.—In factories where girls and women worked in upper stories, small panics were narrowly averted.—The women employed in the upper stories in an office building rushed in a panic to the stairs.—Men ran up from below, meeting them and quieting them.—A seamstress was surprised and alarmed when her sewing machine moved.

Eagle Point, Ia.—A high bridge swayed.—Buildings rocked.—Dishes rattled.—Bottles rattled in a drug store.—Bottles moved along a shelf in a drug store.—The shock caused alarm.

East Dubuque, Ill.—Dishes rocked from shelves and dashed on the floor.—Printing type in form, in a newspaper office, was pied.

Elgin, Ill.—Delicate instruments in the Elgin Watch Works were thrown out of gear.

Elizabeth, Ill.—Dishes were shaken and the contents spilled.—Buildings were noticeably jarred.—Windows rattled.—Two men in a store thought sacks of flour, stacked upstairs, had fallen down.

Elkader, Ia.—Windows in stores were shaken.—Articles were shaken from stands and dressers in a bed room.—Excitement was intense.—The earthquake was felt by several persons in town.

Evanston, Ill.—A chair in which the chief of police was seated, shook twice. The top floors in one of the University buildings shook.—Water in a tumbler was tipped.—Windows rattled.—A book case swayed one and one-half inch.—A vacant chair was rocked, hitting a man.—A team of horses were started on a runaway.—Instruction was interrupted in one of the classes in Northwestern University.—Occupants of some residences fled to the streets.—Patients and nurses in a hospital were alarmed.

Fort Madison, Ia.—Dishes and windows rattled.

Freeport, Ill.—Cracks were formed in cement walks.

Geneva, Ill.—A clock was stopped in the court house.

Gordon's Ferry, Ia.—The operators in a railroad depot rushed out.

Hannibal, Mo.—Two shocks were felt, lasting eight and thirty seconds, respectively.

Indianapolis, Ind.—The federal offices quivered.—A heavy iron bed was shaken.—A writing table shook.—The tower of the courthouse shook.—A woman, reclining on a couch, rolled down on the floor.—A man in a chair, resting his legs on a railing in the tower of the court house, felt his legs shake.

Jackson Junction, Ia.—There were heavy tremors.

Joliet, Ill.—Chairs were overturned.—Gas mains were made to leak Kalamazoo, Mich.—The earthquake was noted.

Kenilworth, Ill.—Dishes fell from plate rails and broke.

Kenosha, Wis.—Plaster fell.—Wall paper cracked.—Chimneys top-

pled over.—One man thought the powder mill had exploded.—Some inhabitants “thought the island would sink.”

Kewanee, Ill.—Some windows were broken.

Knox, Ind.—The shock frightened many people.—People rushed from buildings.—Some people thought the shock was an explosion in a distant powder mill.

Lake Forest, Ill.—Young people left the dormitories in Lake Forest University.—One professor dismissed his class.—Professors at the University recognized the earthquake.

Lake Geneva, Wis.—Two shocks were noted.—Water and milk were spilt.

Leonore, Ill.—A number of persons reported having felt the earthquake.

Lone Tree, Ia.—A rheumatic woman felt the vibration keenly, and told others of the disturbance, before it was generally known.

Lowden, Ia.—Buildings rocked.—Dishes were thrown off from a table.—Clocks stopped.

Window sashes were shaken.

Lyons, Ia.—Window sashes were shaken.—Dishes rattled.—Dishes were thrown from shelves.—A tea kettle was shaken from a stove.—There was a severe shaking up of dishes.—Dishes were broken.—Many thought the disturbance was due to the passing of heavy wagons.—On learning that the disturbance was general, an editor says he became convinced that there had been an earthquake.

Madison, Wis.—Some of the solution was spilled from the batteries in a railroad station.—Professor W. H. Hobbs, a prominent geologist and seismologist, is reported as having noted three distinct shocks.

Maquoketa, Ia.—The earthquake was very plainly felt.

Mason City, Ia.—There was a slight shock.

Maywood, Ill.—Plaster was loosened from a wall.

Milan, Ill.—Windows rattled in some buildings.—Dishes trembled in cupboards.—Pictures trembled on walls.—A woman thought she had an attack of heart trouble and sank frightened on a bed.

Monmouth, Ill.—Buildings were badly shaken.

Montague, Mich.—A man felt a swaying motion, while seated in a chair.—The earthquake was felt by several citizens.

Morning Sun, Ia.—Bottles and tinware rattled in a store.—The editor of the News Herald notes that the quake was not sufficiently severe to disturb his print shop.

Morrison, Ill.—A lamp was overturned.—Dishes were knocked off from a table.—Houses were shaken.

Mount Carroll, Ill.—Goods were thrown from shelves in the stores.—Chimneys toppled over.—Stove pipes were shaken out of chimneys.—Water was spilled from pans.—Racks were moved in the court house.—Bars in the jail rattled.—Windows in the jail rattled.—Everybody rushed into the streets.—There was much excitement.

Muncie, Ind.—The shock was variously attributed to blasting operations, to the rolling of heavy wagons, and to the passing of street cars.

Muscatine, Ia.—A quiver was felt by a few people.—Several people

afterward remembered feeling a vibration, and attributing it to the moving of heavy objects in the building.

Muskegon, Mich.—Bric-a-brac fell to the floor.—Pictures swung.

North Chicago, Ill.—Bricks were hurled from a high scaffolding.—Workmen on a high scaffolding nearly fell.

Oak Park, Ill.—A leg was shaken loose from a piano in a school and this caused the piano to fall.—The cornice of an old mansion fell.—A hospital building rocked.—A baby was thrown out of bed.—Pedestrians were scared by falling brick.—A woman was thrown out of a chair.

Ottumwa, Iowa.—Some citizens claimed to have felt the quake.

Paw Paw, Ill.—There was no damage, but many people were frightened.

Peoria, Ill.—Plaster fell in a school building.—Many large buildings were shaken.—The shock was felt more on the bluffs than in the down town districts.—A rumbling sound was noted by a janitor in a school building.—Falling plaster caused a panic among the children in one school.

Peosta, Iowa.—Houses rocked.

Platteville, Wis.—An old building rocked.—A school building was cracked.

Pontiac, Ill.—Windows were shaken.—Articles were shaken from walls.

Princeton, Iowa.—A farm hand, who was standing in a barn, saw some hanging ropes gently vibrate. He also saw an iron support for a receptacle for water on a grindstone vibrate and heard a slight creaking in the building.

Rariton, Ill.—The earthquake caused buildings to creak and tremble.

River Forest, Ill.—A woman, who had been walking on crutches, ran out without them.

Rockford, Ill.—A street car was started down a hill.

Rock Island, Ill.—A man sitting in a chair noticed a dull shock which he referred to as something heavy that might have fallen in the attic.—The jar was distinctly felt in the third story of the main building of Augustana College, where book cases in the library were gently disturbed.—The first part of the disturbance was weakest.—The disturbance was felt by several persons at rest.

Sabula, Iowa.—Chimneys cracked.—Pictures rattled on walls.—Furniture threatened to tumble over.—Heavy machinery in a printing office shook in good shape.—A ferry captain saw a large wave come to the Illinois shore in the Mississippi river.—The shock brought people out of their homes, some with alarm, others with curiosity.

Savanna, Ill.—Operators in a railroad depot rushed out.

Sears, Ill.—A desk rattled.—Goods rattled on the shelves in a store.—A heavy dresser quivered and shook.—Beds shook and quivered.—A lady thought she was affected by heart trouble and sank frightened on a bed.

Sinsinnawa, Ill.—Dishes and windows rattled.—Articles fell from walls.

South Haven, Mich.—Windows rattled violently.—Much china was broken.

Springfield, Ill.—A faint rumble was heard.—Windows rattled.—The earthquake was noted by nearly all people.—Many refused for hours to return to houses from which they had fled.—People rushed from houses.

Sterling, Ill.—Chandeliers were knocked down.—Pictures fell from walls.

Strawberry Point, Iowa.—Buildings were badly shaken.

Sycamore, Ill.—A clock was stopped in the court house.

Waukegan, Ill.—Clocks were stopped.—Pictures were thrown from walls.—Chimneys fell.—Linotype machines swayed violently.—A kitten was thrown across the room.—Two small children jumped out of bed crying, thinking the bed was falling to pieces.—Women fell on their knees and prayed.—People wobbled.—A prisoner in jail thought walls would fall and liberate him.—A woman came near being pitched through a glass door.—One man woke up from the shaking of the bed.—People in upper stories of houses ran down and out on the street.—A janitor in a school house thought a man had fallen from the flag pole, which was being repaired.—Sidewalks were seen to tremble and gently heave.—Tables shook.—Dishes rattled.—A house trembled.—A house gave a distinct raise, then trembled.—Pictures swung out from a wall.—A fern (in a pot) tipped over in one house.—Buildings were shaken.—A bed trembled.—A school house shook for one minute.—Books fell from cases in the court house.—The glass in a book case was shattered.—Chandeliers swayed in stores.—Plaster fell from a ceiling.—Book cases teetered.—Windows rattled.—A heavy safe rolled on timbers on which it rested.—A school (teacher and pupils) was curious, but not alarmed.—Some hands in the Corn Products Company's factory thought some heavy machinery had collapsed.—The city hall employees ran out on the streets.—One man described the sound accompanying the shock as a rush of wind, and said he heard it.—Grain was let out through cracks which were opened in the bins of a feed store.—One man heard a sound "like the rattling of a locked door."

West Union, Ia.—Buildings shook.

Wilmette, Ill.—Bottles rattled on the shelves in a drug store.

Winnetka, Ill.—Falling dishes were broken.

Zion, Ill.—Some Zionists, recalling a prophecy of the coming of the end of the world on the 29th of the month, are reported to have fallen on their knees to pray.
