

INFORMATION SERIES 23

RESULTS OF A SEARCH FOR FELT REPORTS
FOR SELECTED COLORADO EARTHQUAKES

by

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1.0 INTRODUCTION

This study was undertaken to discover new felt reports for earthquakes that have occurred in Colorado. The project's main goal was the collection of felt reports for five earthquakes which were thought to have occurred [local time] on or about September 16, 1880, November 7, 1882, December, 1891, November 15, 1901, and September 8, 1944. The investigation included field trips to local and private historical collections in many towns in northwestern Colorado. Records at City and County offices, businesses, and churches were also evaluated for earthquake data. Historical documents and other sources were checked at state research libraries and repositories, and at regional and national federal archives, including the National Archives in Washington, D.C., the Federal Records Service, Region 8 in the Denver Federal Center, the research library at the Colorado Historical Society, the Western History collection at the Denver Public Library, the State of Colorado Library and Archives, the University of Colorado Western Historical Collection, and Colorado State University's Special Collection.

Historic records were searched for several weeks after each date for late reports on the initial shock and for aftershock reports. While searching for felt reports of the November 15, 1901 earthquake at Buena Vista, Colorado, numerous accounts were discovered for earthquakes on November 13 and 14, 1901 which had epicenters in Utah but were felt in Colorado. These accounts are included in this report to help distinguish the Utah events from the November 15 tremor at Buena Vista.

In addition to these five earthquakes, felt reports for other earthquakes were investigated in towns near their previously estimated epicenters. These events were not investigated with the same type of systematic searches at every location. These earthquakes include the following:

| | |
|---------------------------------|----------------------|
| November 9, 1871 | Georgetown |
| November 10, 1882 | Gunnison |
| August 5, 1894 | Georgetown |
| March 22, 1895 | Steamboat Springs |
| December 28, 1901 | Denver |
| February 28, 1915 | Grand Junction |
| December 29 & 30, 1920 | New Castle |
| April 8, 1940 | Aspen |
| February 13, 21, 27, & 28, 1941 | Aspen |
| October 5, 1944 | Aspen |
| January 31, 1946 | Glenwood Springs |
| April 3, 1946 | Sweetwater |
| October 3, 1948 | Walden |
| January 17, 1950 | Soldier Summit, Utah |
| February 21, 1954 | Rangely |
| February 10, 1955 | Steamboat Springs |

Other studied events included the Rulison Explosion on September 10, 1969 and the Rio Blanco Explosion on May 17, 1973. The Denver-Derby earthquakes of 1967 (specifically November 27, 1967) were also checked although these events were not investigated as thoroughly as the five major events mentioned previously in this introduction.

While investigating the events listed above, other earthquakes were "discovered" in historical sources. Information on those events also is included in this report.

Primary documentary evidence was sought during this project. Sources such as diaries, journals (including scientific journals), scrapbooks, recollections and reminiscences, meeting notes, county records such as commissioners' reports, survey or road records, ditch records, hotel registers, church records, weather observers records, U.S. Army military post records and the like were consulted. Newspapers were checked for all locations. Oral history projects were consulted and some new interviews were conducted during the project. Community resource people were contacted during this project, especially those familiar with not only the history of the area, but the actual historical sources in the towns visited. Some local newspaper editors included short articles calling for earthquake information from the citizens in their communities.

Secondary literature also was consulted. Unpublished local histories, public and university oral and written history projects, and published histories (including histories written in 1880's, etc.) were checked for earthquake information.

The data located in Colorado during this investigation are organized by town in Section 2.0. In that section felt reports for each earthquake are described in each town section. The accounts are described verbatim and are printed in a different type size for easy recognition. Items enclosed in brackets have been added by the authors. A series of dots indicates illegible text in the original source. Question marks enclosed in brackets indicate uncertainty in the original source. Earthquake events are arranged chronologically under each town listing.

Section 3.0 includes the information obtained from records at the National Archives in Washington, D.C. Since information was discovered not only for Colorado, but also for Kansas, Nebraska, New Mexico, Idaho, Montana, Wyoming, South Dakota, and Utah, it is organized in this report by the type of Record Group from which it was transcribed. Verbatim transcriptions are printed in a different size of type and are indented.

Some of the information presented in Sections 2.0 and 3.0 is negative, meaning no felt data were found at those locations. The absence of felt data may result from one or more of the following reasons:

- I. Historic documentary sources did not exist.
 - A. Settlement occurred after the earthquake in question.
 - B. Historic information has been lost or destroyed. In the case of Steamboat Springs, for instance, The Steamboat Pilot began publication in 1885, however, due to a disastrous fire in 1913 all issues in the newspaper morgue prior to 1897 were destroyed. Repeated attempts were made to track down those missing issues at other locations. In another case, a letter located at the Eagle Public Library which was written by the editor of the Redcliff paper during the 1880's to a local Eagle historian mentioned that the old issues of his paper had been taken to Grand Junction when he sold his interest in the Eagle paper to a Grand Junction publisher. Extensive searches were

conducted for those old issues in Grand Junction at the public library, museum, and newspaper office, however, none were located.

- II. Historic sources existed but did not yield any information.
 - A. Meteorological factors occurring at the time of an earthquake may have interfered with an observer's ability to experience an earthquake. For instance, at Steamboat Springs Perry Burgess' diary mentions severe winds in early December 1891, but does not describe the earthquake that occurred at that time. (Burgess' diary does include a felt report for the November 7, 1882 earthquake.) Some meteorological observers' reports from the Signal Corps and Weather Service mentioned severe blizzards or other storms during the dates of the earthquakes investigated for this report.
 - B. The personal bias of the recorder or specific nature of the document may have contributed to the lack of a felt report.
 1. It is generally accepted by historians of the American West that "boosterism" played an important part in the neglect of news by some newspapers. Events not conducive to a good town image were not publicized. These events included mining strikes, indian trouble, or natural events which were thought to be detrimental to the growth and development of the town.
 2. Some historic records were not "fine tuned" enough to include earthquake information. For instance, although the meteorological observers for the U.S. Army and later the Weather Service were required to list any earthquake occurrences, the U.S. Army Post Returns did not require such information.

Section 4.0 contains reprints of two published accounts of Colorado earthquakes. They are included in this report because of the fact that they are not readily accessible.

The field trips to northwest Colorado towns, state research libraries and repositories, and regional and national federal archives, during which the majority of data presented in this report was collected, were conducted by Ms. Oaks. Mr. Kirkham supplied newspaper accounts for several additional earthquakes and led efforts to prepare this report for publication.

This investigation was supported in part by U.S. Geological Survey Grant No. 14-08-0001-G975 and Requisition No. 1-9500-7130/Project No. 1-9500-01301. The assistance and guidance of William P. Rogers, Colorado Geological Survey, was essential for the completion of this project. We thank Paul Carrara, U.S. Geological Survey, for his cooperation leading us to the accounts for the Telluride earthquakes during 1894 and 1897. Chris Avila, Betty Jones and Brenda Richardson provided the typing for the manuscript and Lois Kirkham assisted with editing.

2.0 DATA COLLECTED AT SOURCES IN COLORADO

2.1 ASPEN

Locations visited in Aspen include the Aspen Historical Society, Aspen Historical Museum, and Public Library, and the data described below was discovered.

- September 16, 1880 - newspaper not located in Aspen or at other repositories
- November 7, 1882 - refer to Dames and Moore (1981) for felt reports
- December, 1891 - newspapers located but no felt reports
- November 13 & 14, 1901 - located in this report
- November 15, 1901 - located in this report
- April 8, 1940 - located in this report
- February 13,21,27,28, 1941 - located in this report
- October 3, 1944 - newspapers located but no felt reports

Ms. Ramona Markalunas, President of the Aspen Historical Society was interviewed. She mentioned a 1956 Earthquake at Aspen, but did not give any details about the event other than the fact that she remembered the event.

2.1.1 September 16, 1880 Earthquake

THE DENVER TRIBUNE, September 21, 1880, Vol. XIV, p.2, col. 1

AN EARTHQUAKE

Visits Aspen and Gives It's Denizens the Shake.

From the Leadville Chronicle.

Aspen is in the minds of it benighted denizens a peg ahead of Leadville now. It has had an earthquake! A regular genuine no-doubt-about-it earthquake, and they swell with honest pride when they tell about it.

On Thursday night, just as the clock struck 12, the e.q. happened around. The peaceful villagers, wrapt in blankets and the arms of Morpheus, were awakened by a sudden lurch of all stable things, and hastily got out of bed and looked in their boots for snakes. They had misinterpreted the sublime phenomena, but after waiting a few moments, and seeing no animals, they concluded that it wasn't the James preserves after all, and rushed out to see what was up anyhow. Just at this juncture, another shock that loosened their teeth and dislocated their locomotion came along, and threw the camp into the wildest confusion. Many thought the last day had come, and essayed to pray while they waited for the last trump. There were four shocks in all, each one adding to their dismay, and occurring at intervals of about half a minute. At each shock the earth seemed moved about three or four feet out of place, and a low, rumbling noise to be compared to nothing save the rolling of distant thunder, was heard. All was then still, and after waiting fearfully for a repetition of the phenomena, the people finally went again to their beds. The terrible force of the shock, however, can be best judged by what followed. Aspen Mountain is a long massive section of the range rising just back of the town site. The highest elevation is a ragged peak, which rises some 300 feet above the rocky mass. At about 8 o'clock this highest turret of the mountains

quivered from its base, slowly and majestically swaying forward, crashed loose, and with a deafening roar fell towards the camp, and breaking to a million pieces, rushed as an avalanche down the hill. The mountain top which had so abruptly vanished from the face of the earth had bristled with the stakes of prospectors and contained over 100 claims. Down in the valley the thunderstruck owners, with open mouths, watched their earthly possessions dissolve and disappear, and were inclined to swear that the earthquake had been a put up job on them. The only man who was physically damaged was Mr. Hallam, one of the owners of the Smuggler mine. He was quietly asleep in his cabin when the shock came, and the bunk directly above him, loosened by the concussion, tumbled down. A 200-pound man on top of it did not make the smash any pleasanter. He was not, however, seriously hurt.

Rizzari (1959) dismissed the September 16, 1880 Aspen event as a hoax [see Section 4.2]. Unfortunately, no newspapers published in Aspen in 1880 have survived. In addition, the September, 1880 issues of the LEADVILLE CHRONICLE have not been located either. The above report from THE DENVER TRIBUNE is all that remains. It is interesting to note that a Salt Lake City weather observer (John Craig) noted an earthquake on September 16, 1880 at 10:27 Salt Lake City time. It may be possible that the Aspen event is related to that earthquake. Unfortunately, the lack of information from 1880 has made the investigation of this event difficult.

2.1.2 November 13 & 14, 1901 Earthquakes

ASPEN DAILY TIMES, November 15, 1901, Vol. XVII, No. 264, p.1, col. 5

Mormons Terrified.

Salt Lake Nov. 14 - The southern and southwestern part of Utah was visited by a severe earthquake this morning and at Beaver City a number of buildings were thrown down. The Mormon temple, the academy and the courthouse were practically ruined. No lives were lost, but a few persons were slightly injured.

In other cities the shock was felt with equal severity. It was distinctly felt in this city but no damage was done beyond the alarming of a number of people who rushed out into the streets.

Durango Shaken.

Durango, Nov.14 - a severe earthquake shock frightened the people of La Plata county this morning shortly before sunrise. The windows rattled and a few chimneys were toppled over, but no serious damage was done.

Grand Junction Earthquake.

Grand Junction Nov. 14 - An earthquake shock roused the people of this city from their slumbers this morning. The shock was in horizontal waves and lasted 20 seconds. No damage was done.

ASPEN DEMOCRAT, November 15, 1901, Vol. 2, No. 86, p.1, col. 3

A Shock At Grand Junction.

Grand Junction, Nov. 14 - At precisely 4:34 o'clock last evening this city experienced a severe earthquake shock. The shock was horizontal and fluctuated in waves all over the city. While no damage was done, everyone was greatly frightened at the loud rattling of the windows. There was only one disturbance, which lasted 15 seconds, but today it is the one topic of conversation.

ASPEN DEMOCRAT, November 15, 1901, Vol. 2, No. 86, p.1, col. 7

Durango, November 14th - At 10:45 o'clock last night an earthquake was distinctly felt in this city. No damage was done beyond awakening people from their sleep. It lasted several seconds and is supposed to be the same one that was felt in Utah last night.

2.1.3 November 15, 1901 Earthquake

ASPEN DAILY TIMES, November 16, 1901, Vol. XVII, No. 265, p.1, col. 5

Buena Vista Shocked.

Buena Vista, Nov. 15 - At 3 o'clock this morning this city experienced an earthquake shock that lasted for a period of about 6 seconds. The large plate glass in one of the saloons collapsed and was crushed. The windows and the brick buildings were badly shaken. The people rushed out of doors in terror as they believed that their homes were about to fall down on them.

ASPEN DEMOCRAT, November 16, 1901, Vol. 2, No. 87, p.1, col. 3

Buena Vista Has A Shake.

Citizens Trotted Around Only in Night Shirts.

Buena Vista, Nov. 15 - At 3 o'clock this morning this city and surrounding country experienced an earthquake which lasted for several seconds. Many people rushed from their residences in night attire, fearing their homes would be demolished. A large plate glass window in a saloon was cracked. It is reported here that the waters of Cottonwood Lake rose considerably. Many large boulders on Mt. Princeton and Mt. Harvard rolled down the side of the mountain. The trembling seemed to travel from the southwest to the northeast and lasted about 6 seconds. This is the first earthquake felt in Buena Vista and this morning is the general topic of conversation.

ASPEN DEMOCRAT, November 17, 1901, Vol. 2, No. 88, p.2, col. 1

That earthquake seems to have skipped Aspen. Possibly nature didn't care to compete with the two high school teams.*

[*This appears to be a reference to a game between Aspen and Leadville.]

2.1.4 April 8, 1940 Earthquake

THE ASPEN TIMES, April 11, 1940, Vol. 59, No. 15, p.1, col. 6

Earthquake Here. Not to be outdone by the other towns that have reported tremors lately, Aspen had a earthquake all her own Monday morning about 10:00 o'clock. The quake was not severe and those who happened to be outside at the time did not notice it, but there was a distinct shock noticeable to citizens who were in or near buildings.

The shock lasted but a few seconds and some heard or felt it without realizing what it was. Most old timers agree it was that Castle creek fault slipping again.

2.1.5 February 13, 1941 Earthquake

ASPEN TIMES, February 20, 1941, Vol. 60, No. 8, p.1, col. 6

QUAKE SHOOK VALLEY

This area of the western slope experienced a distinct tremor early last Thursday morning between three and four o'clock. The quake, which was reported felt as far down the valley as the Snowmass store, was quite severe, causing houses to shake and windows to rattle, although no damage was reported. Old timers always used to say such earthquakes were caused by the Castle creek fault slipping, but nowadays they usually blame it on to some wild skier coming down the course. However, coming at that hour of the morning, it is very likely it was the fault rather than any skier this time.

ASPEN TIMES, February 20, 1941, Vol. 60, No. 8, p.8, col. 2

WOODY CREEK by Mrs. J. R. Bogue, phone 68R3

About 4:30 Thursday morning a hard earthquake shock awakened our community and in about 5 minutes another not so severe. Several have been felt since then and several were felt before that. Let's hope they don't continue.

2.1.6 February 21, 1941 Earthquake

ASPEN TIMES, February 27, 1941, Vol. 60, No. 9, p.1, col. 1

ANOTHER EARTHQUAKE

Quite a severe earthquake shock, which lasted several seconds, bounced this part of the state around considerably last Friday afternoon at 2:22 o'clock. Windows rattled and buildings were shaken but no damage was reported except to the nerves of some jittery people. Residents are undecided whether to get used to the tremors which are occurring quite frequently lately, or to get alarmed over the situation and take it up with the government.

ASPEN TIMES, February 27, 1941, Vol. 60, No. 9, p.1, col. 1 & p.5, col. 1

Woody Creek by Mrs. J.R. Bogue, phone 68R3

Friday afternoon between 2:30 and 3:00 o'clock we had another "shaking up". We were wondering if these "shake ups" are going to continue.

2.1.7 February 27, 1941 Earthquake

ASPEN TIMES, March 6, 1941, Vol. 60, No. 10, p.6, col. 2

Another Earthquake Shakes the Valley

A series of earthquakes which has been shaking up this part of the state quite frequently visited this area once more last Thursday night shortly before 11:30 o'clock. The tremors only last a few seconds and no damage has been reported from them but they have been severe enough to rattle doors and windows, shake buildings and wake up a good many people when they come in the middle of the night.

One Aspen man, who had just fallen asleep when the shock came Thursday night, is reported to have been rudely awakened by the quake. He jumped from the bed, ran around the room, shook his fists and belligerently told his wife, "Something will have to be done about this!" It was not learned whether he had any suggestions.

Local geologists believe the quakes, which are sometimes felt as far down the valley as Glenwood, are caused by the Roaring Fork fault slipping.

ASPEN TIMES, March 6, 1941, Vol. 60, No. 10, p.6, col. 2

FRYING PAN NEWS by Mrs. Roy Lee Williams

You Aspen folks do not have a corner on the earthquake situation as we have had several severe shocks in this district in the past three weeks. The last one occurred at 11:30 last Thursday night and was accompanied by a loud rumbling noise which awoke a number of residents from their slumber.

2.1.8 Miscellaneous Information

ASPEN TIMES, March 13, 1941, Vol. 60, No. 11, p.1, col. 2

Quakes Felt In Denver

Those who believed the earthquakes felt here during the past few weeks were just minor shifts of some fault or cave in of a mining shaft in the locality, will be interested to know they were much more far-reaching in their scope.

An inquiry was sent to Regis college in Denver where a seismograph is used, asking if any tremors had been recorded at that place. The reply came back that during the latter part of February and the first of March constant microseisms were recorded. These coincided with the time the quakes were felt at Aspen and the surround territory so it is generally conceded the same vibrations which were felt here extended as far away as Denver, although they were very slight at that place.

ASPEN TIMES, March 13, 1941, Vol. 60, No. 11, p.4, col. 3 & 4

With the recent earthquakes presenting a serious threat to the cracked walls of our old building the fact is more than ever brought home that a new building must be forthcoming and the best thing we can do is get it while there is still chance of a federal project.

2.2 BASALT

The Public Library in Basalt was visited and the following data were collected.

- September 16, 1880 - newspapers not published in Basalt during that period
- November 7, 1882 - newspapers not published in Basalt during that period
- December, 1891 - newspapers not in Basalt or at other repositories
- November 13 to 15, 1901 - newspapers not in Basalt or at other repositories
- September 8, 1944 - newspapers not published in Basalt during that period

2.3 BUENA VISTA

2.3.1 November 14, 1901 Earthquake

Although a field trip was not conducted to the Buena Vista area, newspapers were checked in other locations for the 1901 earthquake. Unfortunately, issues of the published newspapers from Buena Vista in 1901 are not located in any major repositories in Colorado. Other newspapers were consulted for information. Notations of the 1901 Buena Vista earthquake were contained in news articles in several towns. They included THE SALIDA MAIL, ASPEN DAILY TIMES, ASPEN DEMOCRAT, THE CRAIG COURIER, THE DENVER TIMES, THE DENVER REPUBLICAN, LEADVILLE HERALD DEMOCRAT, THE EAGLE COUNTY BLADE, and THE STEAMBOAT PILOT.

2.4 CRAIG

The Moffat County Museum and Public Library in Craig were visited, and the following information was obtained.

- October, 1871 - see Section 2.4.1
- September 16, 1880 - newspapers not published in Craig during that period
- November 7, 1882 - newspapers not published in Craig during that period
- December, 1891 - the December issues were missing; later issues were located, but contained no felt reports; other information in this report
- November 13 to 15, 1901 - the mid-November issues were missing; later issues contained information located in this report
- September 8, 1944 - accounts located in this report

Ms. Louise Miller, curator of the Moffat County Museum, was interviewed. She indicated that she had been in Craig since 1931 and had never felt an earthquake.

Mr. Sinclair St. Louis, whose family has lived in the Baggs, Wyoming area since 1900, remembered the distinct shock of an earthquake two years after the passage of Halley's Comet.

2.4.1 October, 1871 Earthquake

The following information is excerpted from FitzPatrick (1974, p. 26-27). Newspapers were not available for verification of this earthquake.

The "hunters' moon" of early October [1871] had come and waned. This night was as dark as a shotgun barrel plugged at both ends. Wallihan set by his fire, a fire he had to have for warmth, yet was half scared to keep going for fear the Indians would see it and find him. The silence was that silence that only a canyon knows, a silence so profound that the gurgle of the river sounds clear and liquid. Suddenly, this deep silence was shattered by the most deafening roar, and rumble, and hiss and bellow that mortal ears ever heard. At the same moment the earth beneath shuddered, heaved, rose, fell as if in mortal agony. The towering cliffs of the canyon walls sent loosened boulders in torrents. The spot where the terrified man crouched, a tiny atom of life in the midst of the awful powers of the upheaval of nature, was in the path of the devastating avalanche of rock, yet the man was unharmed and presently the final rolling stone came to a stop and the silence following the earthquake closed in like some physical thing pressing from all sides. Not knowing what moment another shock might come, Wallihan endured the night that seemed as long as eternity.

Telling of this experience later, Wallihan said he went through the days that followed as if in a trance.

2.4.2 January 15, 1889 Earthquake

The following excerpt is believed to be from THE CRAIG EMPIRE COURIER on February 27, 1952:

Earth Tremors Felt In Moffat County On Three Occasions

Earth tremors felt in Northwestern Colorado? They certainly have been on at least three occasions.

The question was raised in an item of news in The Empire-Courier of last week through reprinting of a news item from the Littleton Independent of February 8, 1889,

Mrs. Ossa Cooper remembers the event distinctly. She reports that the dishes in their house a half mile east of what is now Craig were rattled noticeably. The Haughey boys (her brothers) felt the shock in the barn and thought it was due to the horses kicking until they learned from the house that the dishes had been rattled.

Mrs. Robert Ratcliff remembers distinctly the talk about the earth tremor of 1889. She says that her family, the Deal family, were then living on what is now the Ralph Reeve ranch on Williams Fork and that they distinctly felt the earth shocks of that tremor.

See Sections 2.4.7 and 2.18.1 for accounts of other earthquakes in this article.

2.4.3 December, 1891 Earthquake

The following excerpt is from FitzPatrick (1974, p.149-151).

So that makes three earthquakes shocks for the county. But the BIG one, and the one that is impressed indelibly on my memory, was the earthquake of December 1890. [This actually refers to the 1891 earthquake, see Section 2.27.4.] No experience of my lifetime impressed me more. Nor has any earth shock since then come even near to equaling that in violence.

In September 1886 our family had arrived in this county, to the new homestead at the foot of the rocky eminence later known as FitzPatrick Cliff. That cliff, the only such one in a vast territory, formed the western boundary of our ranch.

Each winter, in order to have cash with which to improve the homestead, our father went to Aspen, where he worked in the mines. Mother, a small, gentle girl, who grew to young womanhood in the heart of London, then the world's largest city, "held down the ranch" with us kids. Mail in those days came once a week to the post office at Lay. We usually got mail once a week, either by Emerson, our nearest neighbor, or by Mother and our sister Eva walking the five and a half miles to the post office.

On this particular bright December day, they were on one of those trips. Our sister Hortense and I were at home. Many who read this knew Hortense well. She passed away in Craig July 23, 1959.

The time was about three. Already the fingers of dark shadow of the 600 foot cliff westward from the house were feeling their way across the narrow valley. Hortense put more fuel in the cook stove, then came back to the bed on which we were playing games that a four-year-old and his ten-year-old sister could enjoy. Christmas was only a fortnight away so we were diligently making paper chains. You didn't buy Christmas decorations those days. You made them. So, while Hortense cut strips of colored paper, saved throughout the year, and cut them to two inch lengths, I applied flour and water paste to the ends, forming them into rings. These would later be joined to make the "chains" that festooned the room and Christmas tree later. The only sounds were our subdued but excited talk as we worked and viewed the results of our efforts, and the singing of the teakettle on the stove.

I cannot describe the sound that broke that silence. It was as if a hundred-mile wind had struck with a roar and a seething hiss, while some stupendous power had hurled tons of loose earth against the side of the house. The sibilant, terrifying sound came from everywhere and filled all space.

Then shuddering at first as we had seen rabbits, chickens and other dying animals shudder, the house began to move. Calendars and pictures on the walls began to oscillate, dishes to clatter in the cupboard, the lids on the iron cookstove to give forth sound and under it all the earth itself rolled and vibrated.

Without a word Hortense grabbed my hand and leaped from the bed. We raced from the house, instinct alone prompting us to get in the clear. As we rounded the corner of the house we saw old Maggie, the cow, go down. The

gentle old thing had been standing in the lee of the house out of the wind and where she could enjoy the rays of the lowering sun. The shuddering and heaving of the earth were too much for her and just as we saw her, she toppled against the house.

That first grating, seething sound endured for perhaps fifteen seconds. Then all other sounds were drowned by a thundering, booming, deafening bellow beyond human ears to absorb. My own shrieks were unheard in this overpowering ocean of sound.

Hortense, the seemingly timid child, then, as always showed the iron that coursed in her blood. With feet braced, and head thrown back as if defying this menace, she stood with arm tightly around my shoulder, waiting, as she afterward said, "for the earth to open and swallow us."

I can remember vividly seeing the house door banging first open then closed, but its sound could not be heard.

Across the narrow valley, a quarter-mile from us, the towering cliffs were now shrouded in billows of dust. It seemed to us that the cliff itself was plunging into the valley. Through the cloud of dust could be seen flashes of light as boulder crashed against boulder. From beneath the lower part of the dust cloud came hurtling thousands of tons of boulders, some of them the size of small houses, to come to a stop where they may still be seen.

As suddenly as it had begun to heave, the earth came to rest. For perhaps a half-minute after that, the thunder of rolling boulders continued. Then came the most terrifying thing of all. Silence! Dead silence. Silence so deep, and complete, that we could hear our own heartbeats.

The shrill cry of a pinon squawker, high aloft, startled us back to reality. The earthquake was over.

Yes, Routt County's most severe earthquake had passed. Soon came our mother and sister. They had been a mile from home when the temblor struck. They had run that long mile and now we were together. Their presence lessened the terror. But even the years have not erased that indescribable feeling that seized you when the solid, dependable old earth beneath your feet trembles and the grumbling roar of an earthquake drowns out all other sounds.

The lofty FitzPatrick cliff is the result of the earth crust breaking and part of it slipping downward. Geologists and seismologists believe that it is when this settling part "slips another inch," that an earthquake in this area results. This is a theory much more believable than the theory that Juniper mountain is a hollow hemisphere and that earth tremors are caused when boulders fall from its "roof." Since nothing in nature is static, it is only reasonable to suppose that the break or "fault" that caused FitzPatrick cliff to appear may slip a bit from time to time. In time, we may forget the theory, but we'll never forget the sights and sounds of this county's most violent earthquake.

2.4.4 1899 Earthquake

The following excerpt is from FitzPatrick (1974, p.149).

Our other brother, Vernon, was quite young when the 1899 earthquake occurred in the county. This tremor occurred about 7:30 in the evening. We were living on the Haley place where Highway 40 now crosses Lay Creek. At that time there was a hugh seven-room house, barn, corrals and seven big cottonwood trees near the house. The earthquake shook the house, made dishes rattle and lasted for about fifteen seconds. There being no cliffs near, we do not know whether rocks rolled or not. We did not notice any rock displacement at the high cliff at our upper ranch, five miles north.

2.4.5 November 15, 1901 Earthquake

THE CRAIG COURIER, November 23, 1901, Vol. 7, No. 23, p.2, col. 2

Earthquake at Buena Vista, Colorado

Buena Vista, Col. Nov. 16 - At three o'clock yesterday morning this town and surrounding country experienced an earthquake shock which lasted for several seconds. Plate glass windows were cracked. Many huge boulders [sic] on Mount Princeton and Mount Harvard were dislodged and rolled down the sides of the mountain.

2.4.6 Summer, 1924 Earthquake

The following is excerpted from FitzPatrick (1974, p. 148-149)

Art recalled the story when in the summer of 1924 he witnessed the effects of a milder quake felt in Craig.

On that occasion Art and Ed Carnes, of Oak Creek, were sitting that quiet Sunday afternoon on the sidewalk near where the Barrett store is now located. Art noticed that an automobile on the other side of the street was gently rolling back and forth a few inches. Seeing no one near the car, he glanced to the right to see if another car was pushing the moving one. That car too was oscillating, as were all the others lined up along the curb. He called this to Carnes' attention. The tremor was not heard nor felt but it continued for perhaps a half minute.

2.4.7 July 23, 1942 Earthquake

The following report was located in Craig. It is not clear which issue of which newspaper this article came from, however, it is included in this report for general information. It is believed to be from THE CRAIG EMPIRE COURIER on July 27 or 29, 1942. This is the same earthquake referred to in the STEAMBOAT PILOT on August 13, 1942.

Earth Tremor Shakes Western Moffat County

An earth tremor shook Western Moffat county and the territory in Utah around Vernal early last Thursday morning.

A number of persons in the area from Elk Springs to Vernal reported that the quake rattled dishes, shook houses and was so pronounced as to be unmistakably a small quake.

Sam Steele at this Massadona tourist camp was working near the porch of one of his cabins. He said that at about 12:40 a.m. July 23 as near as he could fix the time the earth began to shake. He said that the vibration was so great that he thought it might shake loose the porch supports. It lasted as near as he could guess about 30 seconds.

Small tremors of this kind have previously been felt in the Moffat country but there never has been a quake of damaging proportions here since man settled the area some 60 to 70 years ago.

Few people in Craig felt the tremor, but Mrs. Ola Cook told friends the following morning that she had felt an earthquake and they would scarcely believe her. However, she says she was in bed reading when the room began to shake with a sort of sideways motion. She said that there were several tremors lasting for a full minute. She said she was so terrified that she did not think to look at the clock for some time but that it was 1:35 in the morning when she did look.

The following excerpt recounts the previous, original description by Mr. Steele. Although this article says the event occurred in 1943, the description is for the July 23, 1942 earthquake (please see preceding article).

THE CRAIG EMPIRE COURIER, February 27, 1952

Earth Tremors Felt in Moffat County on Three Occasions

As recently as 1943, Mr. and Mrs. Sam Steele report that they distinctly observed an earth tremor. They were then living at Massadona, 70 miles west of Craig. It was about 1 o'clock in the morning when they felt the earth shake for about 30 seconds. It was so severe that Sam noticed the next morning the earth around some of the cabins had been shaken away from the foundations.

2.4.8 Earthquakes in 1944

THE CRAIG EMPIRE COURIER, September 20, 1944, Vol. 54, No. 24, p.9, col. 4

So that's what's happened to California's earthquakes, which of late have been conspicuous by their absence. They've popped up a couple of time on the Atlantic Coast, then, -- of all places, Western Colorado!

2.5 CRESTED BUTTE

Although a field trip was not conducted to Crested Butte, the newspapers for that town were read for the five major dates investigated in this report.

- September 16, 1880 - newspapers not published in Crested Butte during that period
- November 7, 1882 - newspapers located at the Kansas Historical Society, Topeka (see Dames & Moore, 1981)
- December, 1891 - newspapers located but no felt reports
- November 13 & 14, 1901 - located in this report
- November 15, 1901 - newspapers located but no felt reports
- September 8, 1944 - newspapers located but no felt reports

2.5.1 November 13 & 14, 1901 Earthquakes

THE ELK MOUNTAIN PILOT, November 19, 1901, Vol. XXII, No. 25, p.2, col. 3 & 4

SERIOUS EARTHQUAKE SHOCKS SCARE THE PEOPLE OF UTAH

Salt Lake, Nov. 15 - Fully half a million dollars damage has been done in Utah by a series of earthquakes beginning Wednesday night and lasting until Thursday afternoon. Buildings were wrecked and in one place a chasm was opened in the earth and a number of persons had narrow escapes from death, although no fatalities have been so far reported.

The first shocks felt in Salt Lake were slight and small attention was paid to them. During the early morning and forenoon the state was again shaken and great damage is reported from the south and central part of the state.

In the town of Richfield alone the damage is estimated at \$100,000. In Sevier county, of which Richfield is the county seat, twenty distinct shocks were felt, the first being at 9:20 o'clock last night and the last at 1:10 o'clock this afternoon. Buildings rocked back and forth, glass was broken, walls fell and several structures were completely wrecked. The Mormon tabernacle there was severely damaged, the front of the building collapsing. A majority of the houses in the town were more or less damaged. Two children of O.K. Salisbury had a miraculous escape. They were asleep in a bedroom when the side wall fell and the roof was brought down. Heavy timbers, bricks and plaster fell on all sides of them and their bed was covered. The children escaped unhurt.

At Elsinore every brick, stone or adobe house in town was more or less damaged. Windows were broken, ditches smashed and one house collapsed. On the summit of Mounts Belknap and Baldy several miners' cabins were wrecked. The shock there was unusually severe and an entire big crag was torn off and started down the mountain, causing a serious slide.

At Monroe the large residence of Bishop Orson Bagley was ruined, as were many other buildings. There are several hot springs at this place. One of them ceased entirely to flow, while the flow of others was increased. Choir practice was in progress at a meeting house, and a panic ensued. It was thought that the building would collapse, and there was a break for doors and windows. Several women were hurt in the crush and other in leaping through windows. The town council broke up in disorder with a scene as bad.

At Elsinore the principal hotel, the Jensen house, was partially wrecked and will have to be rebuilt. The guests escaped unhurt except for the shock to their nerves.

The schools were in session when some of the worst shocks occurred in the forenoon, and there was another panic there. The children attempted to break for safety, but the teachers managed to prevent a serious stampede.

At Joseph the same situation developed. None of the children were hurt. Mrs. Russell Kelly had a narrow escape from a falling rock. She was standing beside the stone house where she resides when the building collapsed. The debris fell on all sides of her, and a rock knocked her hat off and grazed the side of her face, falling at her side.

At the Annie Laurie mine on Gold mountain the miners felt the earth shake and heard rocks begin to fall in various portions of the mine. There were several minor caves, but the men reached the surface without sustaining any injuries.

At Kimberley there was a landslide down the mountain which wrecked some dwellings.

The Clear Creek road was blocked by another landslide. Still another came down over the Rio Grande Western tracks near Marysvale breaking rails and stopping traffic. Telephone poles were broken and communication with the outside world was interrupted.

In Beaver the court house, Mormon meeting house, Beaver Branch Academy and scores of other buildings were either seriously damaged or completely wrecked.

Fillmore was badly shaken up but no buildings were wrecked. People ran into the streets in the early morning without waiting to dress.

Parowan, Cedar City and numerous other towns over the state report more or less damages. Salt Lake felt the shock, but no great damage was done.

At Marysvale the entire population left their homes after the first shock, built bonfires in the streets, and camped out all night.

In many parts of the country landslides have occurred blocking roads.

2.6 DELTA

The Delta County Historical Society was contacted during this investigation and the following data were collected.

- September 16, 1880 - newspapers were not published in Delta during that period
- November 7, 1882 - newspapers were not published in Delta during that period
- December, 1891 - the December & January issues were missing
- November 13 to 15, 1901 - the November & December issues were missing in the major paper; other newspapers were located but contained no felt reports
- September 8, 1944 - located in this report

Due to illness on the part of the curator, the historical collection of the Delta County Historical Society was not available for inspection during this investigation. During a telephone discussion with the curator the subject of earthquakes was discussed. He did not remember any specific information in the collection that pertained to earthquakes.

2.6.1 September 8, 1944 Earthquake

DELTA COUNTY INDEPENDENT, September 14, 1944, Vol. LIII, No. 37, p.8, col. 2

by Leo R.B.

Much has been said concerning the recent "earthquake" which occurred last Friday evening in the Montrose and Delta regions. Several admit feeling a slight tremor around 10:30 o'clock, but mostly no one noticed it. To those who fear that we all might be living in an earthquake area, we wish to quote old timers of our community, who state that such a tremor occurred some 30 years or so ago. Not very alarming, is it?

[They may be referring to the 1913 events that occurred near Ouray.]

DELTA COUNTY INDEPENDENT, September 14, 1944, Vol. LIII, No. 37, p.12, col. 4

Cory. Some people of the Cory community felt the earthquake last Friday night about 10:30. The hardest shake was in Montrose County.

2.7 DENVER

2.7.1 November 9, 1871 Earthquake

ROCKY MOUNTAIN NEWS, November 10, 1871, p. 1, col. 5

An earthquake is reported from the mountains. It is said to have made things "get up and stand around" for a few minutes.

ROCKY MOUNTAIN NEWS, November 17, 1871, p. 1, col. 4

The Georgetown Miner speaks as follows of the late earthquake in that section:

A queer trembling, vibratory motion of the solid earth itself caused buildings and their contents to quiver in a peculiar manner. Many rushed out in the streets to ascertain the cause, if possible, of the unaccountable galvanized feeling they experienced. Some said a powder magazine had gone where the ... twineth. Some thought that a blast of more than usual power had been exploded in Burleigh or Marshall tunnels. Some thought that the devil was to pay generally. Crockery and hardware, types in cases, even our heavy Taylor power press seemed to have taken a sudden fit of St. Vitus' dancing proclivities. The regulator in Wright's and Greenleaf's jewelery and watch stores refused to do duty. For a very brief space of time, five minutes, the inhabitants of Georgetown enjoyed a first-class sensation. The feelings of quite a number experienced an unusual glow of excitement, but there was no property damage.

2.7.2 September 16, 1880 Earthquake

Please refer to section 2.1.1 on Aspen for the text of THE DENVER TRIBUNE article for this earthquake.

2.7.3 November 7, 1882 Earthquake

Please refer to Hadsell (1968) and Dames & Moore (1981) for transcripts of this event from the Denver newspapers. See also Section 3.0 of this report for other information.

2.7.4 March 22, 1895 Earthquake

Please refer to Section 2.26.5 for a description of the ROCKY MOUNTAIN NEWS article on this earthquake.

2.7.5 November 13 and 14, 1901 Earthquakes

ROCKY MOUNTAIN NEWS, November 14, 1901, Vol. XLII, No. 318, p.1, col. 1 & 2

EARTHQUAKE IN UTAH

Salt Lake, Utah, Nov. 13 - Special to the Herald from various points in Southern Utah give meager accounts of a severe earthquake shock which occurred shortly after 9:30 o'clock to-night. The shock, which lasted fully thirty seconds in someplaces, created general consternation among the inhabitants. The vibrations were northeast to southwest. Telegraphic communications to the district affected is very limited, and full details will not be known until to-morrow. So far as reported, no loss of life and comparatively little damage to property resulted.

At Oasis, in Millard county, the people rushed into the streets, expecting their homes to collapse.

At Beaver, in Beaver county, the shock damaged the county courthouse and a number of other residences.

A slight shock was felt in this city at 9:37 p.m., but was not severe enough to be generally noticeable.

ROCKY MOUNTAIN NEWS, November 15, 1901, Vol. XLII, No. 319, p.3, col. 3

REMOTE TOWNS SEVERELY SHAKEN BY EARTHQUAKE

Reports of Damage to Large Buildings at Beaver and Throughout Southern Utah

SALT LAKE, Nov. 14 - Advices received today from the more remote sections of southern and southwestern Utah show that last night's earthquake [sic] shock was very heavy in some localities and considerable damage was done, especially at Beaver City, where the mormon meeting house, the courthouse, and the Beaver academy were badly damaged.

Hardly a house in the town escaped damage, many of them being badly cracked. No fatalities are reported. Another slight shock was felt at Beaver this morning. At Cedar City, Kanab, and Parowan the shock is reported as being very severe. Plastering was shaken from walls and brick buildings were cracked.

ROCKY MOUNTAIN NEWS, November 15, 1901, Vol. XLII, No. 319, p.2, col. 2 & 3

SHATTERED BY EARTHQUAKE

SALT LAKE, Utah, Nov. 14 - Herald specials from Richfield, Sevier county, state that the damage to property in that county from last night's earthquake will amount to almost \$100,000 [?]. Scarcely a building escaped damage of some kind. The Mormon tabernacle at Richfield was damaged to the extent of \$2,000. The members of the choir were in the structure at the time of the shock and fled, terrified, out into the street.

At Marysvale the entire population left their homes after the first shock, built bon-fires in the streets and camped out all night.

In many parts of the county landslides have occurred, blocking roads, changing streams and causing general disorder.

THE DENVER TIMES, November 14, 1901, p.10, col. 6

DURANGO SEVERELY SHOCKED
Earthquake Felt in Southern Colorado -- Utah Town Damaged

Durango, Colo. Nov. 14 - (Special) - Last night at 10:25 o'clock quite a severe earthquake shock was felt in Durango and vicinity. It created sufficient disturbance to awaken people from sound sleep and lasted for several seconds. No damage, however, resulted.

UTAH TOWN SHAKEN BY EARTHQUAKE AND GREAT DAMAGE DONE

Salt Lake, Utah, Nov. 14 - (Associated Press) - Last night's earthquake shock was very heavy in some localities of southern and southwestern Utah, and considerable damage was done.

The shock was apparently the heaviest at Beaver City where the Mormon meeting house, the courthouse and the Beaver academy were badly damaged, especially the latter building, whose walls show great cracks as a result of the shock. Chimneys were toppled over and plate glass all over town was shattered. Hardly a house in the town escaped damage, many of them being badly cracked. Another slight shock was felt at Beaver this morning.

At Cedar City, Kanab and Parowan the shock is reported as being very severe, plastering was shaken from walls and brick buildings were cracked.

THE DENVER TIMES, November 15, 1901, p.10, col. 3

UTAH'S BIG EARTHQUAKE
GREAT DAMAGE DONE AND MANY NARROW ESCAPES NOTED

Richfield Visited by Twenty Shocks - Choir and Council Frightened at Monroe - Many Places Suffer More or Less.

Salt Lake, Nov. 15 - Reports from Richfield, which seems to have been the center of Wednesday night's earthquake, are that there were twenty shocks in all. Great damage was done and there were many narrow escapes. At Elsinore there was great damage. A crag was broken off.

At Monroe choir practice was in progress at a meeting house, and a panic ensued. It was thought that the building would collapse, and there was a break for doors and windows. Several women were hurt in the crush and others in leaping through windows. The town council broke up in disorder with a scene as bad.

At Kimberley there was a landslide down the mountain which wrecked some dwellings. The Cedar Creek road was blocked by another landslide [sic] Still another came down over the Rio Grande Western tracks near Marysville, breaking rails and stopping traffic. Telephone poles were broken and communication with the outside world was interrupted.

In Beaver the courthouse, Mormon meeting house, Beaver Branch academy and scores of other buildings were either seriously damaged or completely wrecked.

Filmore was badly shaken up, but no buildings were wrecked. People ran into the streets in the early morning without waiting to dress.

Parowan, Cedar City and numerous other towns over the state report more or less damage. Salt Lake felt the shocks, but no great damage was done.

Near Moab it is reported that a chasm opened in the earth. This was not close to any habitation, and no great damage was done.

At Marysvale the entire population left their homes after the first shock, built bonfires in the streets and camped out all night.

In many parts of the county landslides have occurred, blocking roads, changing streams and causing general disorder.

THE DENVER REPUBLICAN, November 14, 1901, Vol. XXIII, No. 218, p.1, col. 5

UTAH SHAKEN BY AN EARTHQUAKE

People in the southern part of state are greatly alarmed by a sharp shock.

article identical to that in ROCKY MOUNTAIN NEWS, November 14, 1901, Vol. XLII, No.318, p. 1, col. 1 & 2 (see Section 2.7.5)

THE DENVER REPUBLICAN, November 15, 1901, Vol. XXIII, No. 219, p.1, col. 1 & 2

UTAH JARRED BY SEISMIC SHOCK

SHARP CONVULSIONS OF THE EARTH CAUSE HEAVY PROPERTY DAMAGE AND CREATE PANIC AMONG PEOPLE.

RICHFIELD AND SEVIER COUNTY THE GREATEST SUFFERS - SCHOOLS AND CHOIR PRACTICE BROKEN UP AND CITY FATHERS ADJOURN IN HASTE - LANDSLIDES BLOCK RAIL AND WAGON ROADS AND CHANGE THE COURSE OF STREAMS - COLORADO TOWNS FELT IT.

SALT LAKE, Nov. 14 -(Special)- Fully half a million dollars' worth of damage has been done in Utah by a series of earthquakes beginning last night and lasting until this afternoon. Buildings were wrecked and in one place a chasm was opened in the earth and a number of persons had narrow escapes from death, although no fatalities have been so far reported.

FIRST SHOCKS WERE LIGHT, BUT THE LATER ONES CAUSED DAMAGE

SALT LAKE, Nov. 14 -(Special)- The first shocks felt in Salt Lake were slight and small attention was paid to them. During the early morning and forenoon the state was again shaken and great damage is reported from the south and central part of the state.

In the town of Richfield alone the damage is estimated at \$100,000. In Sevier county, of which Richfield is the county seat, 20 distinct shocks were felt, the first being at 9:30 o'clock last night and the last at 1:10 o'clock this afternoon. Buildings rocked back and forth, glass was broken, walls fell and several structures were completely wrecked. The Mormon tabernacle there

was severely damaged, the front of the building collapsing. A majority of the houses in town were more or less damaged. Two children of O.K. Salisbury had a miraculous escape. There [sic] were asleep in a bedroom when the sidewall fell and the roof was brought down. Heavy timbers, bricks and plaster fell on all sides of them and their bed was covered. The children escaped unhurt.

DAMAGE AT ELSINORE

At Elsinore every brick, stone, or adobe house in town was more or less damaged. Windows were broken, dishes smashed and one house collapsed. On the summits of Mount Belnap and Baldy several miners' cabins were wrecked. The shock there was unusually severe and an entire big crag was torn off and started down the mountain, causing a serious slide.

At Monroe the large residence of Bishop Orson Bagley was ruined, as were many other buildings. There are several hot springs at this place. One of them ceased entirely to flow, while the flow of others was increased. Choir practice was in progress at a meeting house, and a panic ensued. It was thought that the building would collapse, and there was a break for doors and windows. Several women were hurt in the crush, and others in leaping through windows. The town council broke up in disorder with a scene as bad.

At Elsinore the principal hotel, the Jensen house, was partially wrecked and will have to be rebuilt. The guests escaped unhurt except for the shock to their nerves.

PANIC IN SCHOOLS

The schools were in session when some of the worst shocks occurred in the forenoon, and there was another panic there. The children attempted to break for safety, but the teachers managed to prevent a serious stampede.

At Joseph the same situation developed. None of the children was hurt. Mrs. Russell Kelly had a narrow escape from a falling rock. She was standing beside the stone house where she resides when the building collapsed. The debris fell on all sides of her, and a rock knocked her hat off and grazed the side of her face, falling at her side.

At the Annie Laurie mine on Gold mountain the miners felt the earth shake and heard rocks begin to fall in various portions of the mine. There were several minor caves, but the men reached the surface without sustaining any injuries.

CAUSES LANDSLIDES

At Kimberley there was a landslide down the mountain which wrecked some dwellings.

The Clear Creek road was blocked by another landslide. Still another came down over the Rio Grande Western tracks near Marysvale breaking rails and stopping traffic. Telephone poles were broken and communication with the outside world was interrupted.

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At Marysvale the entire population left their homes after the first shock, built bonfires in the street and camped out all night.

In many parts of the county landslides have occurred; blocking roads, changing streams and causing general disorder.

COLORADO CITIES FEEL IT

DURANGO, Nov. 14 -(Special)- A distinct but not severe shock of earthquake was felt here at 10:25 o'clock last night. It awakened many sleepers, lasted for several seconds and caused some alarm, but did no damage.

GRAND JUNCTION, Nov. 14 -(Special)- Quite a severe shock of earthquake was felt here at 9:30 o'clock last night. It was horizontal and was described by close observers as coming in waves. People were much frightened by the loud rattling of windows and many experienced a feeling of nausea for sometime afterward. The vibrations lasted about 15 seconds.

2.7.6 November 15, 1901 Earthquake

THE DENVER TIMES, November 15, 1901, p.1, col. 5

COLORADO TOWN VISITED BY EARTHQUAKE SHOCKS

Buena Vista, Nov. 15 -(Special)- This morning at 3 o'clock a severe earthquake was felt at this place, lasting for about six seconds. The shock awakened many people and a large plate glass in the saloon of Malkmiss & Halbic was cracked.

THE DENVER REPUBLICAN, November 16, 1901, Vol. XXIII, No. 220, p.1, col. 2

SEVERE SHOCK IN BUENA VISTA

People Seriously Alarmed by First Earthquake Ever Experienced There.

Buena Vista, Colo., Nov. 15 -(Special)- Considerable excitement was occasioned here early this morning by the peculiar quivering action of the earth which proved to a [sic] slight earthquake, the first ever felt in this section. The shock came on shortly after 3 a.m. lasting for about 15 seconds, during which time and for hours afterward people who had been awakened from sleep rushed excitedly about the streets wondering what was coming next. No damage to amount to anything was done in the city with the exception of the cracking of a large window glass in the Metropole saloon, the damage being about \$40. [?]

2.7.7 December 28, 1901 Earthquake

THE DENVER TIMES, December 30, 1901, p.2, col. 4

DID DENVER HAVE A REAL EARTHQUAKE SATURDAY NIGHT

Was it an earthquake?

That is the question many Denver citizens are asking. There was some sort of a disturbance Saturday night, shortly before midnight, that rattled windows and dishes. It was accompanied by a loud report like the firing of a cannon and the rumbling sound continued for two or three seconds. The belief that it was some seismic disturbance is strengthened by the fact that the sound and sensation are described as identical at points miles apart.

Professor Howe of the University of Denver is convinced from descriptions received from various sources that it was an earthquake. He declares that a detonating meteor might cause the report heard and the rattling of windows to lead one to suppose that the earth was quaking. This he does not think probable from the fact that no one witnessed a vagrant star shooting across the heavens.

Major S. K. Hooper, general passenger agent of the Denver & Rio Grande, was awakened from a sound sleep. The report and shaking of the house that followed impressed him as that of exploding gas in the furnace of his residence. But he remembered that just before retiring he had visited the furnace and left the drafts open so that such a thing could not happen. He sat up in bed and listened to the rattling of the windows and felt the sensation of the bed being jarred. His next thought was that some one had entered the house and fell over a chair. He listened intently for a minute or two. He decided that it must have been an earthquake.

The shock was distinctly felt in Montclair and also out on Sand creek and in South Denver. If it were an earthquake it was the first ever felt in Denver. Frequent shocks have been felt on the Western slope, in the Elk Mountains and the San Juan, though none have been severe.

2.7.8 September 8, 1944 Earthquake

THE DENVER POST, FINAL EDITION, September 9, 1944, Vol. 53, No. 38, p.1, col. 7 & 8 and p.4, col. 2

SLIGHT EARTHQUAKE FELT IN SOUTHWEST PART OF COLORADO

Dishes and windows rattled and beds shook in Montrose, Colo., at 10:30 p.m. Friday as a slight earth tremor was felt there and in several other southwestern Colorado communities, according to a press dispatch received here Saturday.

No damage or injury was reported. The temblor lasted about a minute in Montrose, and a few residents rushed into the streets.

The earth movement also was felt at Delta, twenty-two miles northwest of Montrose; at Olathe, and at Ridgeway, twenty miles south of Montrose. Reports Saturday from representatives of the Public Service Company of Colorado stated

slight tremors were felt at Bigelow and Ruedi on the Frying Pan river. A similar temblor was felt at Montrose thirty years ago. That time, dishes were broken, pictures shaken off walls.

The Rev. A. W. Forstall, seismologist at Regis college here, Saturday reported a slight tremor was recorded at about 10:30 p.m. on the seismograph. The movements came from the general direction of Montrose. The college received several long distance calls from persons seeking to learn if there really had be a slight quake.

EVERGREEN WOMAN SAYS DISHES BROKEN

One woman, whose name was not learned, said dishes were broken in her cabin at Evergreen, Colo., but no other reports from the Evergreen district were received, and officials at Evergreen Saturday said no other residents there had felt tremors.

2.8 EAGLE

The Public Library in Eagle was visited and the following information was collected.

| | |
|-------------------------|--|
| September 16, 1880 | - newspapers not published in Eagle during that period |
| November 7, 1882 | - newspapers not published in Eagle during that period |
| December, 1891 | - newspapers not published in Eagle during that period |
| November 13 to 15, 1901 | - newspapers located but no felt reports |
| September 8, 1944 | - information located in this report |

2.8.1 September 8, 1944 Earthquake

THE EAGLE VALLEY ENTERPRISE, September 15, 1944, Vol. XLVI, No. 45, p.1, col. 3

EARTHQUAKE SHOCK FELT IN EAGLE FRIDAY

Residents in this section of the country were more than mentally shaken last Friday evening, when an earthquake tremor originating in the Wasatch mountains in Utah was felt.

The slight quake, which occurred shortly after 10 p.m. Friday evening, according to all reports was felt throughout Eagle county. Reports from the southern end of the county near Ruedi and Basalt, indicate that the tremor was more severe than in the vicinity of Eagle, Minturn and Gilman. Residents of Basalt reported that plastered walls were cracked and that some light fixtures were loosened.

According to information received from out over the state the quake was more severe in the Montrose country, which is in direct line with the southern part of Eagle county.

MINTURN NEWS. Many people felt the earthquake shock in Minturn last Friday night and expressed different ideas of experiences and causes. No damage was done here.

BASALT NEWS. An earthquake caused much excitement Friday night. It happened about 10 o'clock. Several homes were shaken and articles fell from the shelves.

2.9 GEORGETOWN

2.9.1 November 9, 1871 Earthquake

THE COLORADO MINER, November 16, 1871, p.1, col. 7

From the COLORADO HERALD (Central City) of November 9, 1871:

About 10:30 this morning a slight shock of earthquake was plainly felt in Central. No damage done, but the sensation was similar to that experienced when a large amount of snow falls from the roof of a building to the ground.

2.9.2 August 5, 1894 Earthquake

GEORGETOWN COURIER, August 11, 1894, p.3, col. 1

Georgetown received a mild shake from a passing earthquake about five o'clock Sunday morning. It came from the north and was accompanied by a low rumbling sound. This is the third shake in about twenty-three years. The first one caused rattling of dishes, and a few insecure chimneys tumbled down. The second one, which occurred just after dark thirteen years ago, rocked the buildings like a boat on rolling water. The rocking was so great that in a single step on a floor in the direction of the downward tilt it caused one some effort to regain their balance.

2.10 GLENWOOD SPRINGS

Locations checked in Glenwood Springs include the Glenwood Historical Society, Frontier Museum, and Public Library. The following data were obtained for Glenwood Springs.

| | |
|------------------------|--|
| September 16, 1880 | - newspapers were not published in Glenwood Springs during that period |
| November 7, 1882 | - newspapers were not published in Glenwood Springs during that period |
| January 15, 1889 | - located in this report |
| December, 1891 | - newspapers located but no felt reports |
| November 13 & 14, 1901 | - located in this report |
| November 15, 1901 | - newspapers located but no felt reports |
| December 28, 1920 | - information located no felt reports |
| September 8, 1944 | - newspapers located but no felt reports |
| January 31, 1946 | - newspapers located but no felt reports |

Ms. Anna Johnson, President of the Glenwood Springs Historical Society, was interviewed. While she had some suggestion for research in the Glenwood Springs area, she did not know of any specific information about earthquakes.

2.10.1 January 15, 1889 Earthquake

The following account is contained in Rizzari (1959). The original copy of the newspaper article has not been located for verification.

COLORADO TOPICS, February 8, 1889, Vol. 3, No. 45, p.2, col. 2

The earthquake shocks last week which were so plainly felt in Routt County were also felt at Glenwood. The water in the big spring boiled and bubbled furiously for a few moments and was several degrees warmer than ever before.

2.10.2 November 13, 1901 Earthquake

THE AVALANCHE ECHO, November 14, 1901, Vol. XVI, No. 82, p.3, col. 8

EARTHQUAKE IN UTAH. Salt Lake. Nov. 14. - Southern Utah was visited last night by an earthquake. The disturbance lasted thirty seconds, the vibrations running from northeast to southwest. No loss of life is reported, and no great amount of property damaged, but the shocks were severe enough to badly frighten the people.

Grand Junction. Nov. 14. - The earthquake which last night visited Utah was distinctly felt here. Several shocks strong enough to rattle the windows in the buildings were felt, and reports were received from other towns nearby to the same effect.

2.10.3 December 28, 1920 Earthquake

THE GLENWOOD POST, January 1, 1921, Vol. XXX, No. 8, p.1, col. 1 & 2

THIS COUNTRY FEELS SLIGHT EARTHQUAKE

Extended From Rifle to Cardiff But it Was Most Severe in New Castle-Silt-Antlers Districts

APPARENTLY UNNOTICED HERE

Did you feel the earthquake shock. When the reporter informed the people on the streets of Glenwood Wednesday morning that Garfield County was putting on California airs, having been visited by an earthquake the previous evening, he was received with expressions of astonishment, and those who shook their heads and turned away silently did it in a way which indicated that they wanted to say "bugs."

The vibration lasted but a few seconds, and occurred about 8 o'clock Tuesday evening. Between here and New Castle, in the Tibetts neighborhood, and all along Canon Creek, the vibrations were so distinct as to leave no doubt of their character, and in some instances jarred the houses so that the dishes rattled in the cupboards, the noise in some instances being heard distinctly in an adjoining room.

At the J.T. Bowles ranch on Canon Creek there was a distinct tremor, and the folks say there was a noise accompanying the same, and they thought it was the accumulated snow sliding off the roof of the house. At the Boland ranch

the shock was so pronounced that Mrs. Boland and the children rushed out into the snow fearing the house would fall down. At the Wood, the Wolverton, the Blackman, the Roby and other nearby ranches the tremor was distinctly noticed, while at New Castle it was felt plainer than anywhere in this county.

The disturbance extended below Rifle, and some say as far down the river as Palisade, while it was noticed at the West Elk Creek ranch and on the south side of the Grand River in the Mamm Creek country. It was also felt at South Canon and at Cardiff, indicating that the disturbance followed the coal belt.

So far as Glenwood is concerned, we have not found anyone in the noticed the tremor, although E.E. Westhafer says he felt a slight jar soon after he retired. At the A.E. Moore ranch west of town quite a tremor was felt, and some people noticed it at Cardiff. Later in the night, some say about 3 a.m. Wednesday morning, another quaver was felt by some, although apparently this was not as distinct as the first one.

2.11 GRAND JUNCTION

The Mesa College Library, Mesa County Library, the Historical Museum and Institute of Western Colorado, Mesa County Historical Society, and Colorado National Monument were visited during this study. These sources, along with miscellaneous personal interviews, provided the data recorded in this section.

| | |
|------------------------|---|
| September 16, 1880 | - newspapers were not published in Grand Junction during that period |
| November 7, 1882 | - refer to Dames & Moore (1981) for felt reports; additional information located in this report |
| December, 1891 | - newspapers located but no felt reports. |
| November 13 & 14, 1901 | - information located in this report |
| November 15, 1901 | - newspapers located but no felt reports |
| February 28, 1915 | - information located in this report |
| September 8, 1944 | - information located in this report |

Mr. Al Look, who was identified by everyone in Grand Junction as most knowledgeable about the Grand Junction area history, was interviewed. Mr. Look is some 90 years old and remarked that his memory for exact dates is not what it used to be a few years ago. He has, however, published articles, a book, newspaper articles, etc. in the past. Those were consulted as well. During the interview, Mr. Look shared two major stories about earthquakes. He came to Grand Junction from Durango in the early 1900's. "Old timers" told him (then in his teens) that the 1882 earthquake had caused a rockslide in DeBeque Canyon near the place that I-70 now intersects it. Mr. Look also maintains that the 1944 earthquake caused a fracture in the Highline Canal near Palisade. Other citizens in Grand Junction had heard about the Highline Canal episode, however, that information has so far not been verified in newspaper reports. According to Mr. Look, the local authorities hired an engineer to redesign and repair the canal. This information has not yet been verified.

2.11.1 November 7, 1882 Earthquake

J. Armitage Hall came to Grand Junction in the Spring of 1882. He kept a diary (which seems to have since disappeared) which became the basis for the History of Mesa County, edited and published by Charles W. Haskell in 1886. It was reprinted by THE DAILY SENTINEL in 1912. The following is excerpted from this source:

The election passed off quietly, with a majority in favor of the local Republican ticket. It was on this day of election that a perceptible earthquake shock was felt throughout the valley, and, indeed, through the entire state. A party camped on Douglas Creek, stated that they saw large rocks tumble down the mountain side during the shock, and afterwards saw large volumes of smoke, with a sulphurous [sic] smell, emerge from crevices newly opened in the ground.

The recollections of Attorney Samuel G. McMillin mention the following: "on election day 1882 there was an earthquake".

SUNDAY MAGAZINE OF THE DAILY SENTINEL, July 11, 1976, p.6 (written by Al Look)

A "perceptible" earthquake shock was felt throughout the valley on the first general election day. The 1882 shock dumped large rocks down canyon walls and was said to be felt as far distant as Denver. Highway I-70 cuts across the bottom of an escarpment made by this quake in DeBeque Canyon. It was called Hogback Canyon in 1882. Minor quakes have been felt on a few occasions since.

2.11.2 November 13 & 14, 1901 Earthquakes

THE EVENING SUN, November 14, 1901, Vol. 269, p.1, col. 3

AT DELTA.

Delta, Nov. 14 - Special - A distinct shock of earthquake was experienced here last night shortly before 10 o'clock. In one residence in town a lamp was knocked from a table, but there was no damage in this case, nor in any instance this far reported.

Never Touched DeBeque.

DeBeque, Nov. 14 - Special - There was no shock felt here last night by anybody, and no one has been found in this section that knew there was anything doing in the earthquake line.

THE EVENING SUN, November 14, 1901, Vol. 269, p.1, col. 4

Shake, Fruita.

Fruita, Nov. 14 - Special - A shock of earthquake was plainly felt here last night just before 10 o'clock; and some alarm was at first entertained for the foundations of buildings. In the drug stores the bottles on the shelves danced and tables were in some cases turned over. No particular damage has thus far been reported.

Utah Felt Shock. Southern Part of Sister State Badly Shaken Up
No Lives Lost But Property Damaged.

Salt Lake City - Nov. 14 - Special - Reports received here late last night and early this morning from different towns in southern Utah show that a severe shock of earthquake was experienced about half past 9 o'clock. The vibrations lasted in most cases 30 seconds and traveled from northeast to southwest. Telegraphic communication with many of the places is very poor and

full details have not been procured. There is no loss of life reported, and the damage to property is considerable, so far as is known. At Olathe in Millard County the people rushed into the streets thinking their homes were about to fall over them. At Beaver in Beaver County, the shock was very severe and badly damaged the foundation of the county courthouse. In this city a slight shock was felt at 9:37.

THE EVENING SUN, November 14, 1901, Vol. 269, p.4, col. 3

Seismic Jars.

The earthquake last night was very perceptible at the depot. It rattled windows and knocked a row of books from a shelf -- among the number being a Bible belonging to J.A. Silco. It tipped over a table at the residence of Assessor Dowden in the 3rd Ward.

Several persons who felt the jolt at 9:34 had several jars afterwards.

Charles H. Arthur was at home when the seismic disturbance occurred. He thought the house was about to tumble down over his head. The windows rattled, the windows weights bumped, knockings were heard and other spiritualistic manifestations took place. He was much relieved to learn that it was just a plain earthquake, and not a visitation from the other world.

The Earth Shook

It Was a Very Tame Affair and Didn't Hurt Anybody

At exactly 9:34 last night a mild earthquake, if such a thing may be called mild, was perceptible here. It lasted not longer than 16 seconds, yet it was strong enough to rouse persons who were wrapped in sleep; it made windows rattle and caused big buildings to vibrate. A few guilty persons shivered, thinking that possibly they were about to be brought to book, but the sensation was soon over. The motion of the shock was evidently horizontal undulation and not at all violent.

THE EVENING SUN, November 14, 1901, Vol. 269, p.4, col. 2

The earthquake last night made the windows go rattle te bang [sic] in the Parson's residence in the Third Ward. Mrs. Parsons thinking burglars were around fired two shots from a revolver at the earthquake and was not disturbed again during the night.

THE EVENING SUN, November 15, 1901, Vol. 270, p.2, col. 4

From to-day's [sic] telegraphic reports it seems that the earthquake in Utah was much more severe than supposed. Thousands of dollars worth of property are said to represent the damage done.

THE EVENING SUN, November 15, 1901, Vol. 270, p.4, col. 3 & 4

Durango. Nov. 14. - Last night at 10:25 o'clock quite an earthquake shock was experienced here, the disturbance being sufficient to awaken people from sound sleep and lasting for several seconds. No serious damage was occasioned.

THE EVENING NEWS, November 15, 1901, Vol. 270, p.4, col. 3 & 4

Made Temples Rock

Seismic Disturbance Damaged Many Utah Buildings. Some Cave-Ins and Chasms Occurred. Denver, Nov. 14.

Please refer to Section 2.7.4 for the full transcript of this article. The Grand Junction article is a reprint from THE DENVER REPUBLICAN.

GRAND JUNCTION NEWS, November 16, 1901, Vol. XX, No. 10, p.5, col. 3

A slight earthquake shock was felt in this valley Wednesday night at 9:34 o'clock. Many did not understand what the rocking meant but were fully conscious that something unusual was happening. At the home of the writer a vase of flowers sitting on the piano rocked back and forth, very near falling over. The shock was felt more noticeably in Utah.

THE DAILY SENTINEL, November 14, 1901, Vol. 8, p.1, col. 1 & 2

EARTH TREMBLED

A Distinct and Forceful Seismic Disturbance Felt Throughout the Valley Last Night--Many People Scared.

There was a complete and distinct seismic disturbance or earthquake last night experienced in this city, the time being 9:36 as taken by the watch of William B. Leshner[?], who has a stop watch and who at the time of the undulating movement of the earth's surface took note of the time, as did the writer of this also.

The condition of the atmosphere at the time of the quake was very calm. There was no wind stirring at all. The sky was clear and the stars shining brightly. Had there been a heavy wind doubtless few would have observed the movement; but as it was perfectly calm and the shock was so distinct, everyone almost knew or felt at once that there was a disturbance of the earth.

The wave of the earth's surface seemed to come from the west and moved toward the east. The writer of this article was sitting at home at the time, conversing, when he felt the wave of the earth as distinctly as if he would have seen a carpet undulate on a floor when wind found its way under.

A very peculiar feeling came over him, as it does over persons, so it is said, in oriental countries when they first experience an earthquake shock--a feeling of sickness or faintness.

Many people in the city heard the sound and experienced the movement. Mrs. A.E. Parsons was alone at the time in her home on Grand avenue and she imagined that burglars were attempting to gain an entrance into her home. She threw open a window and shot a revolver twice to call someone to her rescue. T.C. Hickman and T.S. Ramey went over from Mr. Hickman's home and explained to her what caused her fright.

In all parts of the city there was experienced the same undulating movement. At first many did not know what to think of the movement that they

had experienced, but many came to the conclusion at once that it was an earthquake shock.

There can be no question about the matter. So many people felt it that it is bound to be true. The same conditions prevailed all over the city.

Word was received in this city early this morning that the quake was felt very plainly at Fruita. Telegrams were also received at the depot saying that the shock was very heavy at Lehi and Provo, Utah.

According to some of the old pioneers this is not the first earthquake shock which has been felt in this valley. About ten years ago and also about sixteen years ago there were experienced slight shocks, although not nearly so distinct as the one last night.

When Arthur P. Cook was clerk of the district court in this city, he came running down from the second story one night and said to a crowd outside that he had experienced an earthquake shock. They gave him the laugh and nothing more was said about the matter.

It is not a question of a joke regarding last night's disturbance. Hundreds of people felt the undulating movement and immediately said to themselves that there had been an earthquake.

Earthquake Notes.

A house in Montrose is reported to have been moved from its foundation.

Dr. G.W. Cowles felt the shock at his home north of the city very distinctly.

The operator at Fruita, it is said was thrown from his chair by the disturbance.

Rocks tumbled in great number along the line of the Western through the mountain.

Telephones were kept busy this morning answering questions regarding the seismic disturbance last night.

It is said that the Grand river at Ruby churned and foamed for some length of time after the passage of the quake.

The great storms along the coast of the entire British isles and along the coast of western America may have had some connection with the disturbance felt in this city and elsewhere.

Dr. Beard, the astronomer, of Fruita, reports that there were no meteoric showers accompanying the disturbance at that point, other than the regular November fall of meteors.

The wind was blowing from the south east, [sic] very light last night when the seismic disturbance took place. About one mile an hour.

A whole lot of people in this city thought it was Joe Swan's gas and oil well that had been blowing off, as the cause of the earthquake.

Many people in the city never experienced any movement or disturbance whatever. A far greater number felt the earth tremble very plainly.

Observer Stewart, of the weather bureau, says that there was no material change in the barometer or on the wind gauge at the time of the disturbance.

Many people were afraid to mention their fears that the undulating movement of the earth last night was an earthquake. They feared to be ridiculed.

The disturbance was felt probably a little harder in the eastern part of the city than in the west, although the movement was from the west and south.

Many people experienced a very queer sensation last night at the time of the occurrence. It is said that in the Orient it makes those who are not used to the disturbance very sick at their stomach, much on the order of sea sickness.

THE DAILY SENTINEL, November 14, 1901, Vol. 8, p.4, col. 3

The topic of conversation today on the streets has been the earthquake.

THE DAILY SENTINEL, November 15, 1901, Vol. 8, p.2, col. 3

SHOCKED SAINTS

Earthquake in Utah Did Great Damage in Several Quarters
Felt in this State Also.

Denver, Nov. 14 - A special from Salt Lake, says:

article contains same information as THE DENVER REPUBLICAN, November 15, 1901, Vol. XXIII, No. 219, p.1, col. 1 & 2 (see Section 2.7.4)

THE DAILY SENTINEL, November 16, 1901, Vol. 8, p.1, col. 2 & 3

Salida Mail: An earthquake was experienced in eastern Utah at 9:30 Wednesday evening. Conductor Evans was in Grand Junction that night and he states that the quake was very noticeable in that city. He was in bed and noted a swaying to and fro which could not be accounted for at the time. Grand Junction water, it is said, has no evil effect upon the user [?]. It creates no unreasonable imaginations, and what Evans says is accepted as nothing but the truth.

Aspen Democrat: Grand Junction had an earthquake shock last evening and the sugar beets were shaken to their roots. We had one up here a week or more ago caused by the dull thud of the republican party.

THE DAILY SENTINEL, November 16, 1901, Vol. 8, p.4, col. 3

From the fact that very many people did not experience the earthquake shock a few days ago, the inference is made that our people are early to bed and early to rise. The shock occurred at 9:36 o'clock in the evening and this a very seasonable hour to have retired.

2.11.3 February 28, 1915 Earthquake

THE DAILY SENTINEL, March 1, 1915, Vol. XXII, No. 84, p.2, col. 5

Palisade News.

While we note that an earthquake tremor was felt in our sister city Grand Junction Sunday morning those who were up at that hour state that nothing of that character was felt in Palisade, and we can hardly understand how our neighbors could draw on their imagination to such an extent, as they have a strictly temperance town.

*THE DAILY SENTINEL was the major Grand Junction newspaper at this time. There was no issue on February 28th. Other issues were checked after February 28, however, no felt reports for Grand Junction could be located.

2.11.4 September 8, 1944 Earthquake

THE DAILY SENTINEL, September 9, 1944, Vol. LI, No. 291, p.1, col. 5

Earth Tremor Felt on Western Slope Late Last Evening

Montrose, Sept. 9 (AP) - An earth tremor, lasting almost a minute, was felt in Montrose and several other southwestern Colorado communities about 10:30 o'clock last night.

A few frightened Montrose residents rushed into the streets. Residents said that beds shook, and dishes and windows rattled. No damage or injuries were reported.

The earth movement also was felt at Delta, 22 miles northwest of here; at Olathe, 11 miles northwest, and Ridgway, 20 miles south.

Record Tremor

At Denver, the Rev. A. W. Forstall said the seismograph at Regis college recorded a slight tremor last night, but that he did not know the exact time. The instrument indicated the movement was in "the general Montrose area."

Excitement created by the tremor was the greater because approximately 30 years had elapsed since an earthquake occurred in this part of Colorado. The shock then was heavier, and, altho [sic] no one was hurt, pictures were shaken off walls and dishes were broken.

James Ashe, Montrose newspaper man, said the quake left residents "somewhat confused and wondering when the next one will come."

Regis college reported many telephone calls about the tremor were received and that one unidentified woman declared dishes were broken in a cupboard in a cabin at Evergreen, about 35 miles west of Denver, in north central Colorado. The woman said that, in fear, her daughter and family drove into Denver immediately.

A number of Grand Junction residents this morning reported feeling the earthquake which was plainly felt over the Montrose district. Reports were

received early this morning at The Sentinel from local residents who had felt the earth tremors.

No damage whatever has been reported here, but it was reported that dishes and windows rattled and other evidences of the quake were experienced.

2.12 GUNNISON

Western State College and Gunnison County Pioneer Museum in Gunnison, along with numerous personal interviews provided the following information.

| | |
|-------------------------|--|
| September 16, 1880 | - newspapers located but no felt reports |
| November 7, 1882 | - see Dames and Moore (1981) |
| November 10, 1882 | - discussed in this report |
| December, 1891 | - newspapers located but no felt reports |
| November 13 to 15, 1901 | - newspapers located but no felt reports |
| September 8, 1944 | - newspapers located but no felt reports |

An earthquake has been reported in several sources as having occurred in Gunnison on November 10, 1882. The date has been listed in reports since 1968, but it apparently resulted from a research error. Gunnison did not feel the November 7, 1882 earthquake and an earthquake did not occur in that city on November 10, 1882. Please refer to Dames and Moore (1981; Appendix H) for an explanation.

Dr. Duane Vandebusch, Professor of History at Western State College, was interviewed. Dr. Vandebusch has conducted extensive research in the Gunnison area on its general history. In addition, he co-authored a book on the Western Slope of Colorado (A Land Alone: Colorado's Western Slope, Pruett Press, 1981). During his research he has not uncovered any information concerning earthquakes.

Vererelle Esty, a long time resident of Gunnison, was interviewed and remembered an earthquake in the 1950's which dried up the springs in Lost Canyon.

Extensive searching was conducted into the special collections at Western State College. No earthquake information was located in the Hurst, Lois Borland, Gunnison County Memorabilia, or Jensen Local History collections.

2.13 GRAND LAKE

The Grand Lake Area Historical Society, Kaufman House Museum, and Public Library in Grand Lake yielded the following earthquake data.

| | |
|-------------------------|---|
| September 16, 1880 | - newspapers not published in Grand Lake during that period |
| November 7, 1882 | - newspapers not located in Grand Lake or at other repositories |
| December, 1891 | - newspapers not published in Grand Lake during that period |
| November 13 to 15, 1901 | - newspapers not published in Grand Lake during that period |
| September 8, 1944 | - newspapers not published in Grand Lake during that period |

Ms. Patience Kemp, President of the Historical Society and long time resident of the Grand Lake area, was interviewed. She stated that Ms. Kaufman who lived in the house that now serves as the museum (in the old town part of Grand Lake) reportedly saw a seiche on Grand Lake after an earthquake in the early 1900's. This story was corroborated by other citizens in the area, however, no specific information was gathered during the discussions. Ms. Kemp stated that she felt one of the 1967 Denver earthquakes in Grand Lake. Though she could not remember the exact date she thought it was probably in the late summer. This may have been the August 9, 1967 earthquake.

2.14 HAYDEN

The Public Library in Hayden was visited and the following information was obtained.

- September 16, 1880 - newspapers were not published in Hayden during that period
- November 7, 1882 - newspapers were not published in Hayden during that period
- December, 1891 - newspapers were not published in Hayden during that period
- November 13 to 15, 1901- newspapers were not published in Hayden during that period
- September 8, 1944 - newspapers located but no felt reports

2.15 HOT SULPHUR SPRINGS

Locations checked in Hot Sulphur Springs include the Grand County Historical Association, Grand County Pioneer Museum, and Public Library. The following data were procured at these sources.

- September 16, 1880 - newspapers not located in Hot Sulphur Springs or at other repositories
- November 7, 1882 - newspapers not located in Hot Sulphur Springs or at other repositories
- December, 1891 - newspapers not located in Hot Sulphur Springs or at other repositories
- November 13 to 15, 1901- newspapers not located in Hot Sulphur Springs or at other repositories
- September 8, 1944 - newspapers not published in Hot Sulphur Springs during that period

Thought extensive searching was conducted in the Grand County Museum, the manuscript collections did not yield any earthquake information.

2.16 KREMMLING

Only the Public Library in Kremmling was visited.

- September 16, 1880 - newspapers were not published in Kremmling during that period
- November 7, 1882 - newspapers were not published in Kremmling during that period
- December, 1891 - newspapers were not published in Kremmling during that period

November 13 to 15, 1901- newspapers were not published in Kremmling during that period
September 8, 1944 - newspapers located but no felt reports

2.17 LEADVILLE

The Leadville Historical Association, Heritage Museum, and Public Library in Leadville provided the following data:

September 16, 1880 - newspapers located but no felt reports
November 7, 1882 - newspapers located but no felt reports; see also Dames and Moore (1981)
December, 1891 - newspapers located but no felt reports
November 13 & 15, 1901 - information located in this report
September 8, 1944 - information located in this report

2.17.1 November 13 & 14, 1901 Earthquakes

LEADVILLE HERALD DEMOCRAT, November 14, 1901, Twenty-Third Year, p.1, col. 7

EARTHQUAKE IN UTAH

Shock Lasted Half a Minute - The Damage to Property.

article is identical to that in Rocky Mountain News, November 14, 1901, Vol. XLII, No. 318, p.1, col. 1 & 2 (see Section 2.7.4)

LEADVILLE HERALD DEMOCRAT, November 15, 1901, Twenty-Third Year, p.1, col. 4

SHOCKED SAINTS

Earthquake in Utah Did Great Damage in Several Quarters

TREMOR IN THIS STATE

article contains same information as THE DENVER REPUBLICAN, November 15, 1901, Vol. XXIII, No. 219, p.1, col. 1 & 2 (see Section 2.7.4)

2.17.2 November 15, 1901 Earthquake

LEADVILLE HERALD DEMOCRAT, November 16, 1901, Twenty-Third Year, p.8, col. 3

BUENA [sic] VISTA HAD EARTHQUAKE SHOCK

Buena Vista, Nov. 15. - At 3 o'clock this morning this city and surrounding country experienced quite an earthquake shock. It aroused the sleeping inhabitants, who rushed from their homes in their night clothes fearing that their houses would come falling about them. No very serious damage was done. A large plate glass window in a saloon was broken, the water in Cottonwood creek rose suddenly, and many huge boulders on Mt. Princeton and Mt. Harvard were dislodged and rolled, rumbling down the mountain sides. The trembling traveled from southwest to northeast, and lasted about six seconds. This is the first experience of the kind Buena Vista has had.

2.17.3 September 8, 1944 Earthquake

LEADVILLE HERALD DEMOCRAT, September 9, 1944, Sixty-Sixth Year, p.1, col. 1

Earth Tremor Felt In Montrose, Delta

MONTROSE, Colo., Sept. 9 -(AP) - An earth tremor lasting almost a minute was felt in Montrose and several other southwestern Colorado communities about 10:30 o'clock (mountain war time) last night.

A few frightened Montrose residents rushed into the streets. Residents said that beds shook, and dishes and windows rattled. No damage or injuries were reported.

The earthquake movement also was felt at Delta, 22 miles northwest of Montrose, at Olathe, 11 miles northwest, and Ridgway, 20 miles north.

At Denver the Rev. A.W. Forstall said the seismograph at Regis College recorded a slight tremor last night, but that he did not know the exact time. The instrument indicated the movement was in "the general Montrose area."

Excitement created by the tremor was the greater because approximately 30 years had elapsed since an earthquake occurred in this part of Colorado. The shock then was heavier and although no one was hurt, pictures were shaken off walls and dishes broken.

2.18 MAYBELL

The Maybell Public Library was visited and the following information was collected.

- September 16, 1880 - newspapers not published in Maybell during that period
- November 7, 1882 - newspapers not published in Maybell during that period
- December, 1891 - newspapers not published in Maybell during that period
- November 13 to 15, 1901- newspapers not published in Maybell during that period
- 1906 - information located in this section
- September 8, 1944 - newspapers not published in Maybell during that period

Ms. Katy Buffham who came to the Maybell area in 1916 related the following story. Though she could not remember the exact date (she thought it might have been in the 1920's), an earthquake near Cross Mountain sent an iron skillet full of gravy across the top of a woodburning stove to the floor.

2.18.1 1906 Earthquake

The following excerpt refers to an earthquake felt near Maybell and on the Little Snake River in 1906. The exact date of the event is unknown, but is said to have been around the time of the great San Francisco earthquake on April 18th. Please refer to sections 2.4.2 and 2.4.7 for accounts of other earthquakes in this same article.

Earth Tremors Felt in Moffat County on Three Occasions

But there have been other tremors felt in this area. One of these was a tremor which shook the area in 1906 at the time of the great San Francisco earthquake and fire.

Roy Templeton describes the experience of that event. Here is the way he remembers it: "My cousin, Earl Templeton, and I were just getting out of a boat on the Yampa river west of our place below Maybell. I was on the bank and he was still in the boat when the earth started to tremble. It shook dirt from the bank near me and the water of the river was agitated. We saw a stick of wood about an inch in diameter and two feet long pushed out of the water and up on the bank.

"We secured the boat and went up to the house. My mother said that the pans in a pantry which was built out from our log house, rattled and clattered and one was shaken from the shelf. She said it was so bad that she thought we kids were pounding on the pantry wall and ran out of the house to stop us, only to find that we were still down on the river."

"We learned afterwards that Mrs. Patterson, who was living on a ranch below the Two Bar on the Little Snake river, was sitting in a chair with her feet up on a box reading when the tremor struck. She said she was so startled that she tipped over backward in her chair but was not hurt.

"We certainly felt that shock all over Northwestern Colorado."

2.19 MEEKER

Locations visited in Meeker include the Rio Blanco County Historical Society, White River Museum, and Public Library. These sources provided the following data.

- September 16, 1880 - newspapers were not published in Meeker during that period
- November 7, 1882 - newspapers were not published in Meeker during that period
- December, 1891 - newspapers located but no felt reports
- November 13 to 15, 1901 - newspapers located but no felt reports
- September 8, 1944 - information located in this report

Ms. Dorothy Kehrberger, Sybil Joslin, Mr. and Margaret Isaac, Virginia Shepard, Julia Tabor, and Iva Kindell were interviewed. All of these people are active in the Historical Society and White River Museum, and all are long time residents of the area. Ms. Isaac has published some scholarly pieces on the history of the area. Mr. and Ms. Isaac remember feeling an earthquake sometime during the 1940's.

2.19.1 September 8, 1944 Earthquake

THE MEEKER HERALD, September 14, 1944, Vol. LX, No. 6, p.3, col. 3

Montrose people were excited last Saturday night when an earth tremor shook the city, lasting for a little over a minute. While no damage was done,

the tremor shook the houses, rattling the dishes and windows. Many were already in bed and they got up and ran into the streets. The earth tremor recorded on the seismograph at Regis College at Denver indicated the center of the tremor was somewhere in Western Colorado. Montrose experienced another such tremor ten years ago, but slightly more severe than this one.

2.20 MONTROSE

The Montrose Regional Library yielded the following earthquake-related information.

- September 16, 1880 - newspapers were not published in Montrose during that period
- November 7, 1882 - refer to Dames and Moore (1981)
- December, 1891 - newspapers not located in Montrose or at other repositories; see also Section 3.1
- November 13 to 15, 1901 - information located in this report
- September 8, 1944 - information located in this report
- September 10, 1969 - Rulison explosion located in this report

Ms. C. Kinkel, Director of the Montrose Regional Library and director of the oral history project completed in Montrose County a few years ago was interviewed. She has lived in the area since the 1950's. Her only earthquake experience had to do with Project Rulison. Ms. Kinkel stated that the newly constructed Montrose Regional Library (the same building which currently houses the library) suffered some structural damage to its cinder block walls during the Rulison shot. The cracks were replastered and repainted according to Ms. Kinkel.

2.20.1 November 13 & 14, 1901 Earthquakes

THE MONTROSE PRESS, November 15, 1901, Vol. XVIII, No. 46, p.3, col. 4

An Earthquake.

Was there an Earthquake last Wednesday night? A number of people in Montrose declare that they felt the shock distinctly. Among these are Mr. and Mrs. O. Spencer, Mrs. E.H. Garrett [?], Mrs. H.M. McCafferty, Mr. and Mrs. O.H. Hall and parties at the Smith Central. The Spencers had retired but were still awake when the disturbance occurred about ten o'clock. They felt a very strong swaying of the bed, while Miss Spencer was awakened from a sound sleep by the motion of her bed. In another house dishes were heard to rattle in the cupboard. These things all go to indicate that something very unusual occurred as these places and parties were a considerable distance apart.

MONTROSE ENTERPRISE, November 21, 1901, Vol. XIII, No. 43, p.1, col. 6

Shook Here Too.

Earthquake felt in Montrose.

From over the western part of the state, and as far west as Salt Lake, and down to Durango, come reports of a a [sic] slight earthquake shock, which was felt by a few people.

Here in Montrose several people noticed the slight rocking of the crust of the earth.

From what we are able to glean, only those who were in bed noticed the shock, but several have reported that at 10:30 in the evening they, being in bed, felt the disturbance. It wasn't much of an earthquake, to be sure, but it must have taken tremendous [sic] force to rock these great mountains, even in ever so slight a degree. This is the first shock of the kind noticed in the section for years.

2.20.2 November 11, 1913 Earthquake

The following excerpt from an article is believed to refer to the three earthquakes on November 11, 1913 felt in southwest Colorado. Please refer to section 2.20.3 for the complete text of this article.

MONTROSE DAILY PRESS, September 9, 1944, Vol. 37, No. 56, p.1, col. 3 & 4

Former Temblors Recalled

Older residents recall the three temblors that rocked Montrose, Ridgway and adjacent points some 30 years ago. No one was injured at that time, but some damage was done. Ridgway was reported hardest hit at that time, although the quake centered in the Portland area, six miles south of Ridgway. Pictures fell from walls, dishes were broken, and damage to the Ridgway school ceiling were reported, among other damage of a similar nature over a wide area.

Some experts have offered their belief that the hot water and mineral springs in the Ridgway area indicate what is known as a fault in the earth that could result in occasional temblors of moderate intensity.

2.20.3 September 8, 1944 Earthquake

MONTROSE DAILY PRESS, September 9, 1944, Vol. 37, No. 56, p.1, col. 3 & 4

Hundreds Here Feel Quake Friday Night; Damage Nil

An earthquake of moderate intensity rocked Montrose and surrounding areas for almost a minute at about 10:30 o'clock Friday night.

No one was injured and no damage is reported in the first temblor to be felt here in some 30 years.

Hundreds of residents are said to have felt the quake, which, they said, shook chairs, beds, rattled dishes and moved pictures hanging on walls. Several residents of Delta, Olathe, and Ridgway also reported feeling the quake.

Seismograph Records Quake

The Daily Press this morning called Regis college at Denver to determine if the tremor had been registered on the school's seismograph. Speaking for Father Armond W. Forstall, who has charge of the seismograph (the delicate instrument that records the slightest movement of the earth), his secretary confirmed that the instrument had recorded a temblor in the general area of Montrose and that it had lasted almost a minute. Father Forstall, through his secretary, said that he had not determined the exact time of the quake; otherwise, however, there is no doubt whatever that the tremor did occur in this area.

Former Temblors Recalled

Older residents recall the three temblors that rocked Montrose, Ridgway and adjacent points some 30 years ago. No one was injured at that time, but some damage was done. Ridgway was reported hardest hit at that time, although the quake centered in the Portland area, six miles south of Ridgway. Pictures fell from walls, dishes were broken, and damage to the Ridgway school ceiling were reported, among other damage of a similar nature over a wide area.

Some experts have offered their belief that the hot water and mineral springs in the Ridgway area indicate what is known as a fault in the earth that could result in occasional temblors of moderate intensity.

MONTROSE DAILY PRESS, September 11, 1944, Vol. 37, No. 57, p.1, col. 1 and p.4, col. 1

Echoes From That Montrose Quake

As several indignant residents of Montrose point out skeptics sometimes only emphasize their innocence.

There were-and are-for instance, those who jeered at the news that a temblor had rocked the Montrose area Friday night, despite the fact that an internationally famed seismographist [sic] at Regis College, Denver, confirmed that a quake had occurred in this region. Skeptics in this instance show their innocence by questioning the seismograph, the delicate instrument that never fails to record a tremor of the earth's surface, an instrument that also shows the approximate spot of the disturbance.

Reports are now coming in from responsible sources that cracks were noted in the walls of several local residences and at least one Montrose business building following the Friday quake. And for the benefit of the skeptics or "wiseacres," it is stressed in the reports that those cracks were not on the walls in question before the temblor.

Harping, so to speak, on those skeptics, they might talk to the head nurse at St. Luke's hospital. She, the head nurse, reports that during an operation at about 10:30 o'clock Friday night a pus bowl on the operating table was hurtled to the floor. No, no human hand was near the pus bowl and no human foot either (this last for the benefit of those "so-wise" skeptics).

And, of course, hundreds of residents in Montrose and many miles from Montrose, even in Grand Junction, we learn now, definitely felt the quake.

But, naturally, they all imagined it according to the "wise boys and girls".

It is even said that the earthquake served to "convert" a few of the boys. Anyhow a few wags report that they noticed a heavier attendance at the local churches Sunday.

2.20.4 September 10, 1969 Rulison Explosion

MONTROSE DAILY PRESS, September 11, 1969, Vol. 62, No. 47, p.1, all col.

Rulison A-Blast Tremor Is Felt in Local Area

by Fran Brownell

The Rulison underground atomic blast to free natural gas trapped in rock formations beneath Battlement Mesa about 65 miles almost directly north of Montrose was "definitely felt" by a number of residents in this area.

The shock was variously described as "a minor tremor" to "a definite vibration" by local residents. Some persons noted that they did not feel any effect of the nuclear explosion which had the equivalent of 40,000 tons of TNT.

Those experiencing the tremor said it occurred "about 30 seconds" after detonation of the bomb at 3 p.m. The first tremor is estimated to have lasted about three seconds, followed by another tremor of about equal length.

The blast apparently had no damaging effect on dams in the Montrose area, according to James Seery, Curecanti project engineer for the Bureau of Reclamation office in Montrose.

"There were no effects on the structure at Silver Jack," he said yesterday afternoon, about 30 minutes after the blast. "If there were going to be any problems with any of the dams, we would probably know it by now," he added.

The tremor was felt at the Curecanti Unit headquarters office, S. 10th St. and Cascade Ave., "but not outside," he said, noting that "I didn't expect to be able to feel it."

No reports of other damage in the area have resulted from the long-delayed explosion.

At the Montrose Regional Library, employe [sic] Mrs. Robert Viator said, "We sure did feel the blast. The stacks shivered back and forth, the tables jiggled. It felt like breaking the sound barrier sounds."

Across the street at the Montrose City Hall, employe [sic] Mrs. James Goodnough said that looking out the window, she noticed the panes of glass in the large front library window "vibrating." Both she and City Hall employe [sic] Stan Worley felt the tremor, she said.

Montrose County Courthouse employes [sic] Richard Newlin and Mrs. Lucille Yarberry said the shock was felt at the courthouse. "It felt like someone was gently shaking your chair," Mrs. Yarberry commented.

Mrs. Ed Durham, Montrose Chamber of Commerce employe [sic] said that she felt "a little tremor, but not very pronounced, while Mrs. Ted Vermillion of 105 Duncan Place called The Press yesterday to say that "it shook all my china to the front of the hutch and woke up my two children who were sleeping-this area really did shake."

Montrose County Commissioner Alford Gray of Olathe, talking with The Press on the phone at the time of the blast said, "Do you feel it? It's still shaking."

Comments of other area residents:

William Marvel, Colorado State Patrol dispatcher: "We saw it more than we felt it, with the way the window shades moved."

Mrs. J.R. Whitfield, bookkeeper for Montrose Equipment Co. north of Montrose: "The fellows thought they felt something, but they weren't conscious of what it was until after it was over."

Mrs. Joe Martin, Montrose: "I heard a loud rumbling noise about 3 p.m. and I thought something had fallen, but I couldn't find anything."

Manuel Zaragoza [?], Montrose: "I was digging in the front yard and the trench shook while I was in it."

Mrs. Jerome Lewis, Spring Creek Mesa: "It shook my sofa and it shook my heavy metal lamp, you could see it swaying back and forth; tell them we don't want any more atomic bombs in Colorado."

Vernon Cornforth, area agriculture agent for the Tri River Extension Service: "I was on the phone to Coal Creek and they said they felt it out there."

Mrs. L.C. Hagen, Uncompahgre: "We were watching for it and tried to see if we would feel anything, but I don't believe we did."

Mrs. Crosby Vandburg, Cimarron: "The house popped, it felt like a big heavy wind hit the house and the floor trembled."

Mrs. Pat Burke, Billy Creek: "My husband said he could feel it, but I was in Montrose at the time and didn't notice any tremor."

Mrs. Ella Braswell, Montrose: "I was sewing and I sure felt the blast. I had company and the other women noticed it too. We finally decided that it must have been the Rulison explosion."

MONTROSE DAILY PRESS, September 11, 1969, Vol. 62, No. 47, p.1, col. 1 & 2

A-Blast Success Will Be Known in 6 Months

by Errol W. King

GRAND VALLEY, Colo. (UPI) - Darrell Seamenns, 85, sat with his 92-year-old wife near the shattered mirror and torn lampshade in his mountain cabin.

The giant nuclear explosion also had torn bricks from the chimney of the cabin.

"We don't like it," Seamenns said, shaking his head. "It doesn't do us a damn bit of good. But we're not going to make a big fuss about the damage."

The postmaster of Grand Valley, Carroll E. Byerrum [sic], was six miles from the blast site. He saw the concussion knock bricks off the facing of the 50-year-old Courthouse.

Project Rulison had finally been detonated Wednesday after several weather delays.

Explosion of the bomb, 15 feet long and 9 inches in diameter, buried 3,442 feet beneath the shale and sandstone of the Rocky Mountains, interrupted telephone service, knocked rocks and chunks of the mountain side off high mesas and blew great clouds of dust into the Colorado air.

Scientists and the Atomic Energy Commission also hoped the blast freed \$1.2 billion in natural gas to be tapped for commercial purposes. They won't know for sure, however, until the cavern shaft is opened in six months. It will take that long, officials said, for underground radiation to dissipate.

The blast came off without a hitch despite court fights, protestors and a year-long delay due to the weather.

The initial tremor registered 5.5 on the Richter Scale at the Colorado School of Mines.

[remaining article deals other aspects]

MONTROSE DAILY PRESS, September 12, 1969, Vol. 62, No. 48, p.1, col. 7 & 8

Damage from Rulison A-Blast Said Minor

GRAND VALLEY, Colo. (UPI) - Life in this quiet Western Slope town in the Colorado Rockies began its slow return to normalcy today after experiencing an underground nuclear blast twice as powerful as the atomic bomb dropped in Hiroshima.

The hundreds of persons who worked on the Project Rulison experiment began heading home Thursday, 24 hours after the 40-kiloton explosive was detonated.

Shock waves caused some minor rock slides and minor damages to area homes, but the damage was not extensive. Scientists said no radioactive material escaped from the blast, which was set off more than a mile-and-a-half underground.

Scientists from the Atomic Energy Commission (AEC) and the Austral Oil Co. of Houston said it would be six months at least before they learned whether the test had been successful.

"We won't have any scientific briefing for some time," an AEC spokesman said. "That is when all the data is assembled-the seismic motion data is gathered from all these sensors scattered over the countryside."

About 30 reports of damage had been filed by Thursday and officials expected more.

"Undoubtedly [sic] there's going to be more," the spokesman said. "Preliminary assessment is that damage is light and most of the claims are going to be minor." Officials of the Austral Oil Co. have estimated there may be \$1.2 billion in natural gas trapped beneath the rugged countryside. Nuclear stimulation is the only way to get at it economically, they said.

2.21 NEW CASTLE

Locations checked in New Castle include the Garfield County Library and New Castle Reading Club. These sources provided the following data.

- September 16, 1880 - newspapers were not published in New Castle during that period
- November 7, 1882 - newspapers were not published in New Castle during that period
- December, 1891 - newspapers not located in New Castle or at other repositories
- November 13 to 15, 1901- the mid-November issues were missing; later issues located but no felt reports
- December 28 & 29, 1920 - newspapers not located in New Castle or at other repositories; other information located in the report, please see Section 2.25.1
- September 8, 1944 - newspapers were not published in New Castle during that period

Mr. and Virginia Anderson of the New Castle Reading Club were contacted. They are active in the local historical endeavors of the community. They did not know of any specific information on earthquakes.

2.22 PAONIA

The only location checked in Paonia was the Public Library, which supplied the data below.

- September 16, 1880 - newspapers not published in Paonia during that period
- November 7, 1882 - newspapers not published in Paonia during that period
- December, 1891 - newspapers not published in Paonia during that period
- November 13 to 15, 1901- newspapers not located in Paonia or at other repositories
- September 8, 1944 - information located in this report

2.22.1 September 8, 1944 Earthquake

THE PAONIAN, September 14, 1944, Thirty-Third Year, No. 37, p.1, col. 2

Earth Tremor Mildly Felt on West Slope

A tremor of the earth which appears to have centered near Montrose was distinctly felt by numbers of people in the Paonia district at 10:30 o'clock Friday evening. While it resulted here only in causing chairs to move slightly and other inconsequential incidents, at Montrose the movement was so pronounced that some frightened residents rushed into the streets, stating that chairs and beds were shaken and windows and dishes rattled.

The seismograph at Regis college, Denver, recorded a slight tremor, indicating that the movement was in the general Montrose area. It was felt at Grand Junction, Delta, Olathe, and Ridgway, as well as at Bigelow and Reudi, on the Frying Pan river. One women at Evergreen, 35 miles west of Denver, declared dishes were broken in a cupboard in a cabin there. That the disturbance must have originated very far below the surface is apparent from the fact that it was transmitted across the Black canyon of the Gunnison river and thru [sic] one or more ranges of the state's highest mountains.

In 1914 a similar tremor struck western Colorado with more force, doing some damage to buildings at Ridgway, center of it greatest severity.

THE PAONIAN, September 21, 1944, Thirty-third year, No. 38, p.1, col. 5

What's California got that western Colorado hasn't got? California can't even have all the earthquakes.

2.23 RANGELY

The Northwest Colorado Community College and Public Library in Rangely, along with miscellaneous interviews, contributed the following information.

- September 16, 1880 - newspapers were not published in Rangely during that period
- November 7, 1882 - newspapers were not published in Rangely during that period, other information located in this report
- December, 1891 - newspapers were not published in Rangely during that period
- November 13 to 15, 1901- newspapers were not published in Rangely during that period
- September 8, 1944 - newspapers were not published in Rangely during that period
- February 21, 1954 - information located in this report
- May 17, 1973 - information located in this report
(Rio Blanco explosion)

Mr. Carl Rector, grandson of one of Rangely's first citizens was interviewed. He did not remember his father or grandfather mentioning earthquakes. He did recall an earthquake in the early 1960's. He thought it occurred in 1962, but he could not remember exactly. He did not feel either the Rio Blanco or Rulison explosions.

2.23.1 November 7, 1882 Earthquake

Diary of Charles Porter Hill reprinted in a local history by the Meeker History Book Committee of the Rio Blanco County Historical Society (1978, p. 253-254).

I have a diary that my father wrote the year that he went to Rangely. There was no town or settlement there then. His brother, Frank, died before he started this diary. He took sick over on Hill Creek and died before they could get a doctor. They thought he must have had appendicitis. The diary was started in November 1882.

It must have been some time in 1881 that the Hill Creek country was made an Indian reservation for the Utes. He told about moving the cattle from the Hill Creek country. I can remember him telling about moving the big bunch of steers to Montana, and the time they had getting them across the Bear River. During the spring and summer of 1882, they were busy gathering all the cows that were left and getting them out of the country. My father had some of his own which he sold. During all these drives, he had been back and forth across the White River, and he thought that he saw a place that he would like to have for his home. He had some money that he had sold the cattle for. He and Joe Studder and a fellow he called Nate bought a load of groceries and some things they thought they might trade to the Indians and started out for this place he had pictured on White River. They came to Baxter Springs and camped. From there, they scouted around on horseback for a road or trail but did not find a very good one. They finally made it to the river and it took them three days to get from Wolf Creek to the place they wanted to stop. When they got there it was late in the day so they made camp and heard the roaring and thundering of some great noise. The ground shook and the trees bent. They said it was an earth tremor. This was November 7, 1882.

2.23.2 February 21, 1954 Earthquake

RANGELY DRILLER, February 26, 1954, Vol. 4, No. 48, p.1, col. 3

EARTH TREMOR FACT OR FICTION

Residents of Rangely discussed the possibility of an earth tremor Sunday afternoon about 2:00 p.m. Most residents comparing notes, or rather "shakes" found agreement. It was slight--dishes rattled in homes, neighbors ran out to see what had happened. The strongest jolt was around Sharpels.

The Grand Junction paper reported a tremor there at 1:22 Sunday afternoon and stated the possibility it was running north and south. Anyway, residents of the Rangely Area are discussing this new phenomena, and are prepared for another at any time.

A check with Regis College in Denver revealed that the high winds around that area Sunday interfered with their Seismograph instruments. However, it did show something around 5:40 p.m. and 6:10 p.m., but they couldn't tell where it was. If there had been an earth tremor around Rangely, it would be a small record at Regis.

When asked if the repressurizing of gas would cause any trouble, the answer was that when the gas breaks through from one cavity to another it would cause a mild explosion.

2.23.3 May 17, 1973 Rio Blanco Explosion

THE RANGELY TIMES, May 17, 1973, Vol. 21, No. 20, p. 1, col. 7 & 8

Project Rio Blanco set to go today

Barring unforeseen delays, the long - awaited Rio Blanco shot will have been detonated by the time this issue of the Times goes on the stands. Only delays that could be expected to hold up the shot scheduled for 10 a.m. today, would have been technical problems or extreme bad weather.

Road blocks were to have been set up on Colo. 13 between Rifle and Nine-Mile Gap, Colo. 64 between Rangely and Meeker, on Douglas Pass, the Piceance Creek road and the northern ends of the Parachute Creek and Roan Creek roads.

Access to the area was closed at 7:30 a.m. and was not to be reopened until up to four hours after the detonation. Observer point for the detonation was located near the Firing Point Control about 12 miles from the emplacement well.

Except for the observer area and roads leading to it, the entire area within a 14.5 mile radius of the well is closed to the public who are residents of the area. The live countdown was to be broadcast from Vernal's radio station.

Claims agents will begin making first-hand damage inspections and completing adjustments for valid claims as soon as possible following detonation. All persons believing their property to be damaged by the shot ar [sic] urged to call collect to the project claims office in Meeker and file a claim by telephone or by mail.

Denver District Judge Henry Santo Monday ruled in favor of the underground detonation of the three nuclear explosives removing the last roadblock to the explosion.

Ground motion triggered by the 900kiloton [sic] explosion may trigger some rock falls along roads and highways within 25 miles of the well which is located 30 miles southeast of Rangely, 30 miles southwest of Meeker and 37 miles northwest of Rifle.

Residents in most of the county, western Garfield and Mesa counties should have felt a tremor at 10 a.m. if the shot went off on schedule. Chances of damage such as cracked plaster and chimneys was estimated at one house in a hundred in Rangely, Rifle or Meeker.

The blast was billed as an experiment, the simultaneous detonation of three explosives in the same well in an effort to tie together with fractures a 1,000-ft. vertical section of gas rich Mesa Verde formation.

THE RANGELY TIMES, May 24, 1973, Vol. 21, No. 21, p.3, col. 1 & 2

Damages slight from Project Rio Blanco

Frank Young, CER Geonuclear, met with some 30 Rangely residents here Tuesday to summarize all known Project Rio Blanco experiments results asplus 2 and later talk to three sixth grade science classesthe project.

Young said there was no indication of damages other than expected.... Sixty contacts relative to problems had been received to date, two from Rangely. He said the shock was felt more in Grand Junction than at sites closer to the blast. Young reported that measurements indicated no release of radio activity.[sic]

Preliminary data indicates the experiment lived up to scientific predictions. It is known that all three explosives detonated and yield was greater than the 43 kilotons of the Rulison shot. Some 50-60 Rangely residents were among the 400 present at the observation site 12 1/2 miles from the detonation site Thursday.

Few here felt more than slight tremors in Rangely and the field. Supt. W.A. Goudeau of Chevron said that little shock was felt in the company headquarters building here and no damage was found at company facilities. Only minor damage was found at the Equity Plant near the site.

Both CER Geonuclear and the AEC expressed satisfaction with the detonation. Seismically, the blast was recorded at 5.3 - 5.5 on the Richter scale at the School of Mines.

Rockfalls were reported at numerous locations on the Piceance Creek road and dirt roads leading to it. No rockfalls occurred on Douglas Pass road or in DeBeque or Glenwood canyons.

No damage was reported to wildlife and vegetation. Several cattle were grazing close to the site but were uninjured.

Seven test wells were drilled near fault zones to determine any effect but no results are currently available. Ten seismic stations were emplaced in Rangely, Meeker, DeBeque, Grand Valley and Rifle and operated successfully with results to be reported after [sic] processing of ground motion tapes and damage claims.

Some delay has been encountered in opening up the chimney but additional steps are being taken to communicate with the chimney.

THE RANGELY TIMES, June 7, 1973, Vol. 21, No. 23, p.1, col. 7 & 8

Oil shale deposits seem undamaged

Preliminary scientific data from the May 17 Project Rio Blanco nuclear detonation indicates that the extent of spall caused by the explosion fell well within predicted limits, and that it did not damage oil shale deposits. Spall is an underground effect caused by the reflection of shock waves traveling upward from the explosion back downward from the ground's surface. Spall has been a major concern of its possible effect on the oil shale lying above the detonation point in the Piceance Basin.

Initial spall measurements were outlined in a "Dt2 Day Report" issued by Dr. Charles Williams, project director of the U.S. Atomic Energy Commission (AEC) and Gerald Luetkehans, project director CER Geonuclear Corporation.

All necessary spall measurement data was received from instruments within one second after the detonation of three, 30-kiloton nuclear explosives more than a mile underground some 30 miles southwest of Meeker. Evaluation of the data will continue to further refine the preliminary spall measurements.

The oil shale layers of primary concern lie between 750 and 900 feet beneath the surface at the Rio Blanco well. Preliminary data indicates that the spall effect at the well extended more than 150 feet but less than 600

feet down, according to the Dt2 Day Report. Further evaluation of data from instruments located at 350 and 450 feet down will refine the range of spall depth, according to project scientist John Toman of the AEC's Lawrence Livermore Laboratory.

Pre-detonation estimates were that spall would extend no deeper than 500 feet and that it would more likely be limited to about 374 feet down at the well.

At 2,600 feet away from the well, the Dt2 Day Report states that spall fell between 280 and 380 feet down, and that it was measured between 107 and 190 feet down at 7,300 feet out from the well.

Claims office at Meeker has received 101 calls regarding possible damage related to the test and has processed 68, according to project officials.

As of Friday, June 1, claims agents had settled 47 claims at a total cost of \$7,600.93. Twenty-one claims will receive no further action, either because investigation showed they were unrelated to the detonation or because damage was so minor that it could be repaired without monetary compensation.

Project officials remain confident that total related damage will be much less than even the minimum predictions prior to the test.

The claims office will remain open in the Valley Motel on the main highway through Meeker for the next four weeks and will then be moved to the Grand Junction project office.

THE RANGELY TIMES, June 21, 1973, Vol. 21, No. 25, p.1, col. 7 & 8

Project Rio Blanco closes Meeker office

The Project Rio Blanco claims and public information office in Meeker, Colorado will close June 29, project officials announced today.

Frank Young, public affairs director for CER Geonuclear Corp., said all claims records in the Meeker office will be transferred to the Grnd [sic] Junction office following the closing. The Grand Junction office was established over two years ago as CER's permanent Colorado headquarters for the project. Th [sic] office will remain the center of project activity.

He said that the Meeker office telephone number (878-5007) will remain in operation after the office closes so nearby citizens can file claims on and obtain prompt information concerning all aspects of the project.

As of today, 125125 [sic] claims had been filed in connection with the May 17 detonation of Project Rio Blanco. Of those, 72 have been settled at a total cost of \$13,426.17. No further action will be taken on 37 claims because investigation has shown they were unrelated to the underground nuclear gas stimulation test, according to project officials. Also, 17 claims are still pending.

Young pointed out that in the past three days one claim was filed.

"We feel we can better coordinate all claims and public information activities through the central office. We want to make it clear that we will

continue to meet our obligation to all citizens concerning all activities related to the project," Young said.

Th [sic] Grand Junction office telephone number is 243-4996. Young said persons nearer Grand Junction are encouraged to call there collect.

2.24 REDCLIFF

An interview with James F. Lamont was conducted in Redcliff. Mr. Lamont has been researching the Redcliff area extensively and is in the process of writing a history of the area. He has not yet located any information concerning earthquakes.

| | |
|-------------------------|---|
| September 16, 1880 | - newspapers not published in Redcliff during this period |
| November 7, 1882 | - newspapers not in Redcliff or at other repositories |
| December, 1891 | - newspapers not in Redcliff or at other repositories |
| November 13 to 15, 1901 | - information located in this report |
| September 8, 1944 | - newspapers not published in Redcliff during this period |

2.24.1 November 13 to 15, 1901 Earthquakes

THE EAGLE COUNTY BLADE, November 21, 1901, Vol. VIII, No. 21, p.2, col. 1

The people of Buena Vista claim to have experienced an earthquake shock one day last week. It must have been a mighty eruption to arouse that sleepily [sic] old place.

[same page, same column]

Nearly every town in Utah and a few in Western Colorado were disturbed by an earthquake shock one day last week. Red Cliff, as usual, is a little slow and it never touched us.

2.25 RIFLE

Locations visited in Rifle include the Rifle Historical Society and Public Library, which contributed the following data.

| | |
|-------------------------|--|
| September 16, 1880 | - newspapers were not published in Rifle during that period |
| November 7, 1882 | - newspapers were not published in Rifle during that period |
| December, 1891 | - newspapers not located in Rifle or any other repositories |
| November 13 to 15, 1901 | - the mid-November issues were missing; later issues located but no felt reports |
| December 28, 1920 | - information located in this report |
| September 8, 1944 | - newspapers located but no felt reports |

2.25.1 December 28, 1920 Earthquake

THE RIFLE TELEGRAM, December 30, 1920, Vol. XVII, No. 49, p.1, col. 5 & 6

Earthquake or Explosion Between Rifle and Glenwood

Shocks were felt in the entire region from Rifle to Glenwood at 8:15 Tuesday night, which resulted in several broken windows in New Castle. The shocks were felt especially plain about five miles west of Glenwood. Glenwood felt the quake, but no damage is reported, where here in Rifle the severest shake took place at the depot. The conditions of the shocks closely resembled those of an earthquake, but as there has never been any such action in this part of the country, the opinion is held by some of the inhabitants that there was a big explosion in some of the old mines in the region of New Castle, but as yet no trace of any such explosion has been found.

THE RIFLE TELEGRAM, December 30, 1920, Vol. XVII, No. 49, p.7, col. 1

Important News Happening of the Week in Glenwood Springs

by C.C. Canady

Earthquake Felt in This City Slightly.

The earthquake which seemed to center near New Castle was felt by parties living within a radius of fifteen to twenty miles, created no alarm in Glenwood, although a few people reported on Wednesday morning their houses shook with the tremblor [sic]. E.E. Westhafer and wife of North Glenwood noticed the shock as did L. DeMerschman and wife, near the south edge of the city. The latter couple were enjoying a game of cards when the table shook, each thought the other had caused the table to move. No damage has been reported from any section feeling the quake. Silt, New Castle, Antlers, Elk Creek, Canon Creek, Cardiff, and local people reported having noted the shock.

[Note: it would seem that the reference to Wednesday morning was the time the earthquake was reported, not the time it was felt.]

2.26 SALIDA

Although Salida was not visited during this investigation, the following data were uncovered at other locations.

2.26.1 November 13, 1901 Earthquake

THE SALIDA MAIL, November 15, 1901, Vol. XXII, No. 47, p.3, col. 5

An earthquake was experienced in eastern Utah at 9:30 Wednesday evening. Conductor Evans was in Grand Junction that night and he states that the quake was very noticable [sic] in that city. He was in bed and noted a swaying to and fro which could not be accounted for at the time...

2.26.2 November 15, 1901 Earthquake

THE SALIDA MAIL, November 19, 1901, Vol. XXII, No. 48, p.2, col. 1

The report is that Buena Vista experienced an earthquake on Friday morning at 3 o'clock. Many people were awakened and several large plate glass windows were fractured.

An earthquake was experienced in Buena Vista at 3 o'clock on last Friday morning, the distrupction being quite enough to rouse many of the people from slumbers. No serious damage resulted excepting the fracture of one or two large plate glass windows in store rooms.

2.27 STEAMBOAT SPRINGS

Locations visited in Steamboat Springs include the Routt County Historical Society, Tread of Pioneers Museum, and Buddy Werner Memorial Library. Information obtained at these sources, along with miscellaneous interviews, provided the following data.

| | |
|--------------------|---|
| October, 1871 | - information located in this report |
| September 16, 1880 | - newspapers not published in Steamboat Springs during that period |
| November 7, 1882 | - newspapers not published in Steamboat Springs during that period; other documentary evidence located in this report |
| January 15, 1889 | - issues destroyed by fire; other information located in this report |
| December, 1891 | - newspapers not located in Steamboat Springs or at other repositories; all issues prior to 1897 destroyed by fire according to Mr. Charles Leckenby, grandson of the original publisher of the STEAMBOAT PILOT and now current publisher of the newspaper; other information included in this report |
| March 22, 1895 | - issues destroyed by fire; other information located in this report |
| November 15, 1901 | - information located in this report |
| August, 1942 | - information located in this report |
| September 8, 1944 | - newspapers located but no felt reports |
| February 10, 1955 | - information located in this report |

The major resource person in Steamboat Springs was Ms. Sureva Towler. Though she did not have any specific experiences of her own she was extremely helpful in suggesting places and people in the Steamboat area.

2.27.1 October, 1871 Earthquake

Please refer to Section 2.4.1 for an account of this earthquake.

2.27.2 November 7, 1882 Earthquake

From the diary of Perry A. Burgess on November 7, 1882

"Am sick nearly all day. Went to election in afternoon. At 7 p.m. we had a distinct shock of earthquake which lasted several seconds."

2.27.3 January 15, 1889 Earthquake

The following account is described by Rizzari (1959). The original copy of the newspaper article has not been located for verification. COLORADO TOPICS, February 1, 1889, Vol. 3, No. 44, p.2

There was a well defined earthquake shock in Routt County on the 15th. Thunder preceded the shocks but there was no rain. A peculiar phenomenon was observed at the Government Bridge. There the shock was productive of great gushes of water and gas. Fully three times as much water and gas was thrown out, and accompanying it was a most sulphurous stench that made people sick and caused birds to drop to the ground. When the convulsion ceased, the water receded and there was sound like the rushing of a great river. The course of the shock was from the south northward.

2.27.4 December, 1891 Earthquake

THE STEAMBOAT PILOT, August 13, 1942

EARTHQUAKE SHAKES MOFFAT COUNTY; EARLY DAY TEBLOR

Distinct earthquake shocks felt by residents of the west end of Moffat county last week reminded oldtimers of similar occurrences in 1891. While the shock last week shook dishes in cupboards and alarmed ranchers, the one in pioneer times assumed the proportions of a real earthquake, says the Moffat County Mirror.

The quake occurred about 4 p.m. on a day in December. The earth was convulsed by "waves" that rolled at intervals of a few seconds, lasting for a minute or more. One of the living witnesses of this occurrence is Miss Hortense Fitzpatrick of Craig. Alone with her little brother, at the ranch house, she heard the rumble and felt the pulsations of the quake. Rushing from the house, they saw the family milk cow, standing near the end of the house, rocked from her feet to fall heavily against the log house. From an 800-foot cliff a half mile from the house rolled thousands of boulders, some of them as large as houses. This continued for a minute. Then fell that most impressive all silences--the silence that follows a temblor.

In Lily park, the same things occurred. The few settlers then scattered over the country noted the quake at widely separated points. Mute evidence in the form of huge boulders still dot the flats at the foot of the cliffs.

Geologists claim the reason for these local earthquakes is the slipping of so-called "faults". These faults are places where the earth's rocky crust has been cracked, and one part of the layer has either raised up or slipped down past the other. Cooling of the earth's interior, leaching away of limestone and other such materials, or the pull of sun or moon causing a "tide" in the earth's crust, or a combination of all these, cause sudden slips. The resulting vibration and jarring is an earthquake.

2.27.5 March 22, 1895 Earthquake

ROCKY MOUNTAIN NEWS, March 24, 1895, Vol. XXXVI, No. 83, p.1, col. 5

Earthquake Felt.

Windows Jarred and Spoons and Dishes Rattled by the Shock -- A Rumbling Noise.

Special to the News. Steamboat Springs, Colo., Mar. 22. To-day [sic] about 1 o'clock a distinct earthquake shock was felt in the Yampa valley from Pleasant valley, about twelve miles south of Steamboat Springs, to Hayden, a

village about twenty-five miles west of the town. The shock was accompanied by a report resembling the discharge of a blast in a mine, which was accompanied by a long, low rumbling sound, which is described by some like the breaking of ice in a river or lake. The sound was accompanied by a distinct vibration of the earth from east to west and violent enough to cause windows to jar and dishes and spoons to dance.

2.27.6 November 15, 1901 Earthquake

THE STEAMBOAT PILOT, November 27, 1901, Vol. 18, No. 7, p.5, col. 1

Buena Vista had an earth quake [sic] shock. Many large boulders were sent rolling down the sides of Mt. Harvard and Mt. Princeton. The inhabitants were badly scared. The shock occurred at 3 o'clock in the morning.

2.27.7 August, 1942 Earthquake

This earthquake and the one on July 23, 1942 described in Section 2.4.7 may be the same events. Please refer to Section 2.27.4 for a complete transcript of the following article.

THE STEAMBOAT PILOT, August 13, 1942

EARTHQUAKE SHAKES MOFFAT COUNTY; EARLY DAY TEMBLOR

Distinct earthquake shocks felt by residents of the west end of Moffat county reminded oldtimers of similar occurrences in 1891. While the shock last week shook dishes in cupboards and alarmed ranchers, the one in pioneer times assumed the proportions of a real earthquake, says the Moffat County Mirror.

2.27.8 February 10, 1955 Earthquake

THE STEAMBOAT PILOT, February 17, 1955, 70th Year, No. 31, p.1, col. 2

Earthquake Does Some Shaking Here Thursday

An earthquake tremor shook Steamboat and most of its residents last Thursday morning as it quivered thru [sic] the town at 10:30 a.m. It left a peculiar pattern, making itself felt in various parts of town but skipping other sections.

Most business houses were affected and nearly everyone on Crawford hill and in the north end of town, but the quake was not noticed in some stores and houses. It did no damage, however, and was limited to a matter of seconds.

The quake was felt in many parts of northwest Colorado, rattling houses and stores at Kremmling, Oak Creek and Hayden. From Rabbit Ears pass it appeared there had been a huge explosion in the Steamboat vicinity but a check by officials disproved this theory. Nearly everyone in Steamboat though [sic] the shaking and tremors due to furnace trouble or blasting.

Some long time citizens recall a similar experience here about 25 years ago especially in the Strawberry Park area, and another minor earthquake many years prior to that time, in the Sidney district.

SIDNEY

Big news in our community this week is of course the earthquake which occurred about ten thirty Thursday morning. Two distinct shocks were felt in this area, accompanied by a loud noise variously described as a roar or similar to the sound of an explosion. No damage was done other than cracking wall paper and shaking things off of shelves, but everyone was startled to say the least. The quake was most noticeable to those inside buildings. The large potato cellar on the Andrew ranch was severely shaken by the shock but thus far no serious damage is apparent. The shock seemed more severe close to the mountains. Mrs. Oscar Millsap reports that there was a single tremor about two thirty Thursday morning which awakened her.

Interviews in Steamboat Springs:

Mr. Door, Civil Defense Coordinator in the County, reported that the earthquake shook his gas station on Main Street. In addition it caused the door of the gas station to swing shut. It was, according to Mr. Door, an otherwise calm day.

Mr. Wayne Light who has reported the weather in the Steamboat Springs area since 1945 and who has lived in the area since 1905 stated that he had never felt an earthquake in Steamboat Springs.

Two other "old timers", Mr. Dude Todd and Mr. Bob Swinehart, did not have any distinct memories to share about earthquakes in the area.

Several people mentioned that U.S. Highway 40 had been cracked during the earthquake, but this could not be substantiated in the road reports of the county.

Ms. Dorothy Wither, longtime resident and local historian whose family has been in the Steamboat area since 1889, remembered the 1955 earthquake. It shook the plate glass windows of her store on Main Street. Her sister also talked about the earthquake. Chandeliers hanging from the ten foot ceiling of her home in downtown Steamboat (the residential section just north of the business area) shook. She ran out of her house because she thought her furnace had blown up.

Ms. Hazel Werner, mother of the famous skier Buddy Werner, remembered that the 1955 earthquake shook buildings. Men on construction platforms near the bottom of Rabbit Ears Pass were shaken from their skaffolds.

Ms. Unis Door, County Clerk, felt the earthquake and thought a truck had backed into the house. She ran out-of-doors.

Ms. Charlene Stees, County Building Department, who has lived in Clark for many years (no exact amount cited) spoke of a flurry of earthquakes in the 1970's. She was not specific about the dates or the intensities.

2.28 SWEETWATER

Sweetwater has never published a newspaper. Newspapers in the Eagle and Glenwood Springs area were read for possible information on the April 3, 1946 earthquake. Newspapers were located, but no felt reports were found.

2.29 TABERNASH

An interview with Dr. Robert C. Black III was conducted in Tabernash. Dr. Black is a professor of history at Denver University, a long-time summer resident of Grand County, and author of Island in the Rockies: The Pioneer Era of Grand County, Colorado (1969). He consulted his files for the book and said that he had not come across any information on earthquakes during the course of his research.

He did mention, however, that he felt the August, 1967 Derby earthquake in Tabernash. Though he could not cite an exact date, he felt it was August. He did not recall feeling any other earthquakes in the Tabernash - Fraser area.

2.30 TELLURIDE

Telluride was not visited during this study, but the following accounts were brought to our attention by Paul Carrara, U.S. Geological Survey.

2.30.1 January 1, 1894 and August 3, 1897 Earthquakes

TELLURIDE JOURNAL, February 20, 1902, p.1, col. 3

Earthquakes - While the earthquakes in the San Juan county since the visits of white men (and before, so far as Indian tradition goes) have been themselves insignificant, yet in all likelihood, they have had indirectly, much influence in the bringing ... as painted out by Mr. Cross - proximately [sic], by the jar of the shocks, and, less immediately, by the liberation, or direction into new channels, of subterranean waters.

The most important earthquake, so far as known, in the San Juan region, occurred Jan. 1, 1894, and was generally observed in the neighborhood of Telluride. In the town from one to three were felt (possibly to the varying comparative ease with which different observers were aroused - although one person, already awake, noticed but two. It is generally agreed that there was shaking of beds, a swinging to and fro of hanging lamps, and other such movements, with a noise like that of a distant stampmill; that the shocks were of two seconds' duration (which is, of course, impossible under the circumstances), and that the second shock was heavier than the third, and came half a minute earlier. One close and very accurate observer, who fortunately chanced to be wide awake, says:

"It was 3 a.m. There were three distinct shocks, very short, following in quick succession, and occupying in all, I should say, less than a minute. The sensation was that of the bed being lifted and shaken. I thought the wave came from a little N. of E. In the second story (of a frame building) the vibratory motion was more perceptible, and the pictures swung about."

The town of Telluride stands on gravel, several hundred feet deep, the adjacent (and probably subjacent) formation being the Dolores series of sandstones, shales, and conglomerates, which is the lowest local member of the Jura-Trias.

In the igneous rocks there were some anomalies; the earthquake does not seem to have been perceived through the "stocks", or manifested to the W. of Telluride; while in the bedded volcanics it was generally observed on the

surface, locally, and also at Red Mountain, 6 miles E., and hence in the direction from which the wave is said to have come. Red Mountain is nearer the supposed former focus of volcanic activity and has been the scene of much solfataric [sic] action.

Underground there were considerable differences of force. At Red Mountain (the altitude of which is 11,000 ft.) miners fled tumultuously [sic] from the workings of the Guston, Yankee Girl and other mines, while on the Telluride side, with one exception, they did not observe the shock, or else paid no attention to it.

In the adit, or lowest surface-level of the Sheridan mine of the Smuggler-Union Company, in Marshall basin, the miners, who were about 2,000 ft. from the mouth, and 600 ft. below the surface, were driven out; while the only other men anywhere near them, in level No. 2, which was 170 ft. higher and nearly overhead, were not disturbed.

It is interesting that this adit level (altitude 11,900 ft.) coincides very nearly with the division between the andesitic tuffs and breccias of the San Juan formation, and a superincumbent massive augite-andesite which forms the lowest member of the "Intermediate Series" of Messrs. Cross and Purington's report.

Several hundred men in other workings of the Smuggler-Union mines, from 100 to 1,000 feet below this adit and from half a mile to a mile further S. noticed nothing of consequence, while a vertical shaft 660 ft. deep, which had recently been completed, was not affected.

In the succeeding summer, and thereafter, it was remarked in Marshall basin that the flow of streams, both surface and subterranean, especially near the Sheridan, was much smaller than it had been before, and the mines were in consequence much inconvenienced; this diminution, however, while unquestionably due in part to the disturbance just described, is also in part a necessary consequence of the deep draining of the talus-mounds.

It is greatly to be regretted that it seems impossible to gain any accurate account of the manifestations of this earthquake at Red Mountain, other than that stated above. This paper has been held back for six months, while a diligent search was made for some competent observer who could furnish further facts, but no such observer has been found. A "full account," rumored to have been published in a newspaper, remains (if it exists at all) buried in some unknown.... The only additional information I have elicited is, that in that region there were slight shocks at the same hour on the two following nights, and ... one person at Ironton, three miles north of Red Mountain, who noticed the occurrence on the third night, says that it came from the E., and is very positive in the curious statement that he heard the swelling rumble approaching from the E. before he felt the shock.

It is likely that slight earthquakes are more common than is generally believed, escaping notice during the day on account of other noises, and not identified at night because mistaken for distant blasts, or else because not then perceived by reason of the heavy slumber general in high altitudes.

One resident of Telluride, temporarily out of health during 1897-8, and therefore easily aroused, noticed during that season three shocks, of which

the first occurred on Tuesday, Aug. 3, 1897, a little after midnight. Of the other two no date is given; they were noticed only by the person referred to, so far as he is aware. The first of the three was noticed by another person in Telluride, and by one in Ouray. At Ridgway, 15 miles N., in an illuvial [sic] valley adjoining the Mancos shale, it was comparatively violent.

According to the Telluride observer first mentioned, who was in the second story of a brick building, the shocks all occurred between 1 and 4 a.m. in summer, and, in connection with each, the same phenomena were observed, namely a sudden startled awaking, with a feeling of great discomfort, and a slight trembling of the whole building, together with a clear, fine ringing sound, apparently local, and very close at hand, the cause of which was not determinable, while repeated attempts to reproduce it were entirely unsuccessful.

The other Telluride observer, who was in a frame house, and the Ouray observer, heard also a roaring, rumbling noise.

At Ridgway, animals were frightened and sought their owners; houses rocked slightly, and small objects were thrown from tables and shelves.

2.31 WALDEN

Locations checked include the North Park Pioneer Museum, Jackson County Public Library, and private collections of Mr. & Ms. John Gresham.

| | |
|--------------------------|--|
| September 16, 1880 | - newspapers were not published in Walden during that period |
| November 7, 1882 | - newspapers were not published in Walden during that period |
| December, 1891 | - newspapers were not published in Walden during that period |
| November 13 to 15, 1901- | newspapers were not published in Walden during that period |
| September 8, 1944 | - newspapers located but no felt reports |
| October 3, 1948 | - newspapers located but no felt reports |

Ms. Gresham was interviewed not only for the information in her private collection, but for any personal remembrances on her part. She and her husband could not recall any earthquakes in the area. Other townspeople at the public library and the county courthouse mentioned that they had never felt an earthquake in Walden.

2.32 WOLCOTT

An interview was conducted with Elsie Pallister in Wolcott. Ms. Pallister's family has lived in the Wolcott area since the late 1880's. She experienced the September 8, 1944 earthquake at Wolcott. Her family's house was noticeably shaken. There have not been any other earthquakes to the best of her knowledge in Wolcott during the past fifty years or so.

Wolcott has never had a published newspaper.

2.33 YAMPA

The Public Library was visited in Yampa and yielded the following data.

- September 16, 1880 - newspapers not published in Yampa during that period
- November 7, 1882 - newspapers not published in Yampa during that period
- December, 1891 - newspapers not published in Yampa during that period
- November 13 to 15, 1901 - newspapers not published in Yampa during that period
- September 8, 1944 - newspapers located but no felt reports

3.0 DATA COLLECTED AT THE NATIONAL ARCHIVES IN WASHINGTON, D.C.

3.1 ABSTRACTS OF DAILY JOURNALS

3.1.1 COLORADO

Colorado Springs

September 16, 1880 - no earthquake information
November 7, 1882 - no records for 1882 to 1886

Denver

September 16, 1880 - no earthquake information
November 7, 1882 - earthquake shocks 7. Light shock of an earthquake felt plainly about 6:20 p.m., plainly perceptible movement of the earth from SW to NE. No sound accompanied the shock, no aurora. Observer F.M. Neal.
December, 1891 - no earthquake information
November 13 to 15, 1901 - no earthquake information

Grand Junction

November 13, 1901 - between 11:35 and 11:36 p.m. three distinct earthquake shocks were felt in this vicinity: the vibrations were apparently from SW to NE. The first shock was about 10" duration, the others slightly less; the total duration including during intervals [sic], slightly less than one minute, probably 50". The buildings in which this office is located vibrated sufficiently to cause two slight cracks in the brick walls, but did not jar enough to affect the self registering instruments. Between 10:56 p.m. and 12 mdt. there was one mile of wind from N.E.; Barometer rose steadily from 5 p.m. to mdt. At 11:35 p.m. the barograph reading was 25.57" and the thermograph 37°. The shock was general over Utah and many points in Western Colorado report slight shock. The shocks were more severe in Eastern Utah than in Western Colorado. Observer O.D. Stewart.

Montrose

December, 1891 - no earthquake information

Pike's Peak

September 16, 1880 - no earthquake information
November 7, 1882 - no earthquake information; gale of 32 mph

Pueblo

November 13 to 15, 1901 - no earthquake information

West Las Animas

November 7, 1882 - no earthquake information; observer F.W. Bradenburg

3.1.2 DAKOTA TERRITORY

Ft. Bennett

November 7, 1882 - no earthquake information

Huron

November 7, 1882 - no earthquake information

Rapid City

November 7, 1882 - no earthquake information

Tabacco Garden

November 7, 1882 - no earthquake information

Wicklów

November 7, 1882 - no earthquake information

Yankton

November 7, 1882 - no earthquake information

3.1.3 IDAHO

Boise City

November 7, 1882 - no earthquake information
November 13 to 15, 1901 - no earthquake information

Eagle Rock

November 7, 1882 - no earthquake information

Ft. Lapwai

November 7, 1882 - no earthquake information

Lewiston

November 7, 1882 - no earthquake information
November 13 to 15, 1901 - no earthquake information

Miner's Camp

November 7, 1882 - no earthquake information

Mission

November 7, 1882 - no earthquake information

Pocatello

November 13 to 15, 1901 - no earthquake information

3.1.4 KANSAS

Dodge City

November 7, 1901 - no earthquake information
December, 1891 - no earthquake information
November 13 to 15, 1901 - no earthquake information

Leavenworth

November 7, 1882 - no earthquake information

3.1.5 MONTANA

Crow's Nest

November 7, 1882 - report missing

Deer Lodge

November 7, 1882 - no earthquake information

Ft. Missoula

November 7, 1882 - no earthquake information

3.1.6 NEBRASKA

Omaha

November 7, 1882 - no earthquake information

3.1.7 NEW MEXICO

Ft. Bayard

November 7, 1882 - no earthquake information

Ft. Craig

November 7, 1882 - report missing

Ft. Cummings

November 7, 1882 - no earthquake information

Ft. Stanton

December, 1891 - no earthquake information

La Mesilla

September 16, 1880 - no earthquake information
November 7, 1882 - station closed

Santa Fe

September 16, 1880 - no earthquake information
November 7, 1882 - no earthquake information
December, 1891 - no earthquake information
November 13 to 15, 1901 - no earthquake information

Silver City

November 7, 1882 - no earthquake information

3.1.8 UTAH

Ft. Duchesne

December, 1891 - station closed September 16, 1891

Modena

November 13, 1901 - Two distinct tremors were felt here tonight.
The 1st at 11:33 p.m. and the second after an interval of about 10 seconds. The OSL Depot is undergoing repairs and is supported by jacks. The building is a mere shell, at best, and jokes regarding its instability are common, so when the tremors occurred, little attention was paid to them, as the explanation that someone has pushed the building seemed plausible and readily suggested itself. However the following was secured

The first tremor 11:33 p.m., could be accurately reproduced in a building of this kind striking a sharp noiseless blow on the N.E. side. The vibrations were rapid and had ceased in about two seconds. The second shock was unlike the first except in duration; the individual waves were much longer, and the general effect more noticeable, being sufficient to sway the building slightly, but not to displace light furnishings. The same motion could be produced by a strong push.

Decided tremor was felt at Lund Utah at 11:32 p.m. This was sufficient to stop the station clock. Lund is about 30 miles N.E. of Modena.

At Milford 66 miles N.E. of Modena, small packages were thrown from the shelves of the general store. No time could be secured.

Tremors were reported from Oasis 132 miles N.E. of Modena at 11:37 p.m. The Bureau is indebted to Mr. Albert Morton agent in charge of OSS Station at Modena for his active interest in this matter. Observer Jas H. Kimball.

Salt Lake City

September 16, 1880 - About 10:27 p.m. a shock of an earthquake was felt here, lasting 15 seconds; the direction being from southwest to northeast. In the southeastern part of the City [sic] its force was such as to be readily felt, in one or two instances it shook dishes from the shelves, and in a number of houses the plaster on the walls cracked. The shock was also felt in various parts of the territory. Observer John Craig

November 7, 1882 - At 6 p.m. a slight shock of an earthquake was felt here, the direction appeared to be the East to West, it lasted about 10 seconds, no damage was done. No aurora.

December, 1891 - no earthquake information

November 13, 1901 - 11:30 p.m. a slight earthquake shock was felt
The vibrations seemed to be from southwest to northeast. Observer L.H. Murdock

November 14, 1901 - Reports received relative to the earthquake of yesterday evening show that to the north and east no tremor was felt, but in the countries to the south and west the shock was, in places, severe, this was particularly so in Sevier, Co. No lives were lost, but in many towns and villages houses were in many instances so badly damaged that they will have to be rebuilt. In Sevier Co. the shocks were felt at interval (sic) during the night and part of today. The damage in the state is estimated at from \$60,000 to \$100,000. Observer L.H. Murdock

Taylor's Ranch near Emery

December, 1891 - no information for December, 1891

3.1.9 WYOMING

Cheyenne

September 16, 1880 - no earthquake information

November 7, 1882 - An earthquake shock occurred in this city at 6:20 p.m. The occupants of 2nd storys in several buildings in town were startled by a distinct and low rumbling noise which shook the floors and walls in a very perceptible manner. Some claim that they felt the disturbance for fully a minute and others say only 10 to 20 seconds. The vibration came from West. No damage of any kind was done here. The weather was clear at the time and the wind S 4 to 5 miles per hour. No aurora. Observer E. McGovern

December, 1891 - no earthquake information

November 13 to 15, 1901 - no earthquake information

Ft. McKinney

December, 1891 - no earthquake information

Ft. Washakie

September 16, 1880 - records not available

November 7, 1882 - Three distinct shocks of an earthquake were experienced at 6:12 p.m. Each shock hardly continued more than two or three seconds and the entire noise ceased almost as soon as it began. The motion seemed to pass from West to East. The lamps and other small articles vibrated from West to East. No damage was done though the calls of nearly every building in the Post were more or less disturbed. No aurora. Observer A.M. (or F.M.?) Ambler

December, 1891 - station closed June 1891, moved to Lander, WY

Lander

November 13 to 15, 1901- no earthquake information

3.2 Letters Received by the United States Geological Survey from 1879 to 1901 and Monthly Reports in 1882 and 1883

The reports from the Denver and Salt Lake City offices were checked for information on the 1882 earthquake, but data of this type were not included and no earthquake information was found. Additionally, letters from S.F. Emmons were searched, but no earthquake data were located.

3.3 United States Geological Survey--Geologists Field Notebooks

The field and office notes of the following were examined for any earthquake information. No data were found.

- E. Jacob - Notes on Geology of Ten Mile Mining District -- 1881 to 1882. Geology of Ten Mile District -- 1882 to 1883.
- S.F. Emmons - Notes on Mines Ten Mile District -- 1881 to 1883. Ten Mile, Gunnison, and Aspen Quadrangles -- 1882.
- Whitman Cross - Silver Cliff and Rosita Hills, Colorado -- 1882 to 1883. Denver Basin -- 1881 to 1885.

3.4 Military Post Returns

The following locations were checked in relation to the 1882 earthquake. No information was found. Post returns did not usually mention natural phenomena but they were checked for possible information.

COLORADO

Ft. Crawford Camp of the White River, Colorado (near Meeker)

UTAH

Ft. Thornburg Lat. 40° 29' 20" and Long. 109° 29' 12"

3.5 Records of Medical History of Post

The medical records of military posts were checked for the November 7, 1882 earthquake. Only at Fort Laramie was the earthquake reported. It should be noted that these medical histories were by no means similar in style. Natural events were not recorded with the type of regularity as with the U.S. Army Signal Corps weather reports. The military surgeons were not required to record such information. The following locations were checked, but no earthquake data were located.

COLORADO

Ft. Garland
Ft. Lyon

NEBRASKA

Ft. Sidney
Ft. Niobrara

KANSAS

Ft. Dodge
Ft. Hall
Ft. Hays
Ft. Wallace

IDAHO

Boise Barracks

MONTANA

Ft. Custer
Ft. Ellis

UTAH

Ft. Thornburg -- Lat. 40° 29' 20"
Long. 109° 26' 12"
Ft. Cameron -- Lat. 38° 16"
Long. 111° 53' 30"

WYOMING

Ft. Bridger
Ft. Fetterman
Ft. Fred Steele
Ft. McKinney
Ft. Sanders

Ft. Laramie, Wyoming Territory, reported the following data for the November 7, 1882 earthquake:

A slight shock of earthquake felt November 7th 6:30 p.m. lasting about a minute shaking lamps and loose articles and rocking buildings without doing any damage. The shock was reported from numerous points in the territory and further south and east, by H.V. Paulding, Asst. Surgeon, Post Surgeon.

3.6 Office of the Chief Signal Officer -- Correspondence

Correspondence received by the Office of the Chief Signal Officer between November 7, 1882 and December 1, 1882 from Weather Observers in Colorado, Wyoming and Utah were checked. These letters did not yield any information on the November 7, 1882 earthquake.

Correspondence received between November 7, 1882 and January 5, 1883 by volunteer Weather Observers were also checked. Likewise, these letters did not yield any information on the November 7, 1882 earthquake.

3.7 Other Weather Records -- Including Signal Corps, Voluntary Observers, Meteorologic Registers, Etc.

3.7.1 COLORADO

Cantonment Pagosa Springs

September 16, 1880 - incomplete report, no earthquake information
November 7, 1882 - no earthquake information

Denver

September 16, 1880 - no earthquake information
November 7, 1882 - War Department/U.S. Signal Office Monthly Meteorological Report

earthquake shocks at 6²⁰ p.m. Observer F.M. Neal

Note: See Section 3.1.1 for additional information.
December, 1891 - no earthquake information

Fort Collins

November 7, 1882 - War Department/U.S. Signal Service. Voluntary
Observer's Meteorological Record

Casual Phenomenon 7th Earthquake 6-28 p.m.
[sic] lasting only a few seconds was felt all
over town shook books from wall shelves in our
house. Observer/Agricultural College

December, 1891 - no earthquake information

Ft. Garland

September 16, 1880 - no earthquake information

November 7, 1882 - no earthquake information

Ft. Lewis

September 16, 1880 - report missing

November 7, 1882 - no earthquake information; form not fully
completed

Ft. Logan

December, 1891 - no earthquake information

Ft. Lyon

September 16, 1880 - no earthquake information

November 7, 1882 - no earthquake information

Hermosa

September 16, 1880 - no earthquake information

Montrose

December, 1891 - no earthquake information

Pike's Peak

September 16, 1880 - no earthquake information

November 7, 1882 - no earthquake information, strong gale reported

December, 1891 - report missing

Pueblo

December, 1891 - no earthquake information

West Las Animas

November 7, 1882 - no earthquake information

3.7.2 KANSAS

The following locations were checked for Kansas. The only positive information pertaining to the November 7, 1882 earthquake was found in the report for Salina.

Atchinson
Bendena
Clay Center (Clay County)
Creswell (Marion County)
Dodge City
Emporia
Ft. Hays
Ft. Leavenworth
Ft. Riley (Davis County)
Ft. Scott (Bourbon County)
Holton (Jackson County)
Independence
Lawrence
Leavenworth
Manhattan (Riley County)
Pretty Prairies (Reno County)
Topeka
Wellington
Yates Center (Woodson County)

Salina

November 7, 1882 - War Department Signal Service U.S. Army
 - Voluntary Observers Meteorological Record

November 1882 - Casual Phenomena 7th.
Earthquake 6:55 p.m. SE to NW waves 3-times not
to exceed 6 seconds. Same feeling noted by 6
persons - in second story of Brick [sic]
building, perceptible rolling motion to a long
table at which was seated Board of Election -
swing Chandelier same as if started by some
person. Observer Ino. H. Gibson - Salina,
Kansas.

3.7.3 NEBRASKA

The following locations were checked for Nebraska. There was no positive information located pertaining to the November 7, 1882 earthquake.

| | |
|-----------------------------|----------------------------|
| Camp Sheridan | Nebraska City |
| De Soto (Washington County) | North Platte |
| Ft. Niobrara | Omaha |
| Fremont (Dodge County) | Ord |
| Genoa (near Platte City) | Utica |
| Lincoln (Lancaster County) | Yutan (Clear Creek County) |

3.7.4 UTAH

Beaver

December, 1891 - no earthquake information

Cisco (Grand County)

December, 1891 - no earthquake information

Ft. Douglas

November 7, 1882 - report missing
December, 1891 - no earthquake information

Green River

December, 1891 - no earthquake information

Grouse Creek (Box Elder County)

December, 1891 - no earthquake information

Lake Park

December, 1891 - no earthquake information

Levan (Juab County)

December, 1891 - no earthquake information

Logan (Cache County)

December, 1891 - no earthquake information

Moab (Grand County)

December, 1891 - no earthquake information

Mt. Carmel (Kane County)

December, 1891 - no earthquake information

Nephi (Juab County)

December, 1891 - no earthquake information

Ogden (Weber County)

December, 1891 - no earthquake information

Park City

December, 1891 - no earthquake information

Parowan

December, 1891 - no earthquake information

Provo

December, 1891 - no earthquake information

Richfield

December, 1891 - no earthquake information

St. George

December, 1891 - no earthquake information

Salt Lake City

September 16, 1880 - no earthquake information

Note: See Section 3.1.8 for other information

November 7, 1882 - Meteorological Register

Earthquake 7th - Observer John Craig

Note: Refer to Section 3.1.8 for other reports

December, 1891 - no earthquake information

Snowville (Box Elder County)

December, 1891 - no earthquake information

Stockton

December, 1891 - no earthquake information

3.7.5 WYOMING

Bitter Creek Station (Sweetwater County)

December, 1891 - no earthquake information

Camp Pilot Butte (near Rock Springs)

December, 1891 - no earthquake information

Casper

December, 1891 - no earthquake information; severe winds and snow reported.

Cheyenne

September 16, 1880 - no earthquake information

November 7, 1882 - War Department/U.S. Signal Office Monthly
Meterological Report

Earthquake Shock at 6²⁰ p.m. Slight.
Observer Edgar McGovern

December, 1891 - no earthquake information

Evanston

December, 1891 - no earthquake information

Ft. Bridger

September 16, 1880 - report missing
November 7, 1882 - no earthquake information

Ft. D.A. Russell

December, 1891 - no earthquake information

Ft. Fetterman

December, 1891 - no earthquake information

Ft. Fred Steele

September 16, 1880 - report missing
November 7, 1882 - report missing

Ft. Laramie

September 16, 1880 - report missing
November 7, 1882 - report missing
Note: See Section 3.5 for other information
December, 1891 - no earthquake information

Ft. McKinney

December, 1891 - no earthquake information

Ft. Sheridan/Ft. Yellowstone

December, 1891 - no earthquake information

Ft. Washakie

November 7, 1882 - Meterological Register

Light earthquake at 6:12 p.m. lasted about
1/2 a minute. Wm. H. Arthur (?) - Asst. Army
Surgeon

Note: Refer to Section 3.1.9 for additional information.

Grandview

December, 1891 - no earthquake information

Lander

December, 1891 - no earthquake information; mentions high winds and storms.

Laramie

December, 1891 - no earthquake information

Lusk (Converse County)

December, 1891 - no earthquake information: reported heavy chinooks

Saratoga (Carbon County)

December, 1891 - no earthquake information

Sundance (Crook County)

December, 1891 - no earthquake information

Wheatland

December, 1891 - no earthquake information

4.0 MISCELLANEOUS INFORMATION

The following two articles are included for their general information on Colorado earthquakes. Information in these articles has been compared with the original sources wherever possible. Some discrepancies were noted, such as the information from the November 11, 1882 GUNNISON DAILY REVIEW - PRESS article concerning the November 7, 1882 earthquake. There may be other transcription errors in these articles.

4.1 "Colorado Earthquakes" by Vernon H. Kurtz (1949)

This article was printed in ROCKY MOUNTAIN LIFE, Vol. 4, No. 4, p.30

COLORADO EARTHQUAKES

Seattle's quake shook buildings apart. Can it happen here in Colorado?

Last April 14, at 11:55 a.m. Pacific coast time, the earth on which the metropolitan areas of Seattle and Tacoma, Washington, are built shook in a brief, but jolting spasm.

Within minutes eight persons were dead, many injured and property damage soared into the millions from one of nature's most awesome upheavals -- an earthquake.

Coloradoans, pouring over the ominous headlines, wondered:

Could it happen here?

Most Coloradoans didn't know they were thinking of a somewhat theoretical question. It has happened here, but only slight temblors, and, Coloradoans, on the best advice, can feel perfectly safe.

It is estimated that more than one million earthquakes occur throughout the world each year, but all but five per cent happen in regularly recognized earthquake belts: California, Japan, New Zealand, India. However, scientists whose business it is to know, add that no part of the world can be considered a "seismic impossibility."

Colorado's most recent quake occurred little more than a year ago. An earthquake centering in the Dalhart-Amarillo area of Texas was felt on March 11, 1948, at Trinchera, where plaster was cracked, and at Kim, where windows rattled. The shock was also felt at Branson, Lamar, Pritchett, Springfield and Tobe. It was felt with lesser intensity at Granada, Hartman, La Junta, Rocky Ford and Uteville.

True, Coloradoans have never been rudely jolted from their beds in the wee hours of the morning to find a Colorado city in the process of complete ruination by an earthquake, as was the case of Californians at the time of the San Francisco disaster, which struck without preamble at 5:13 a.m. on April 18, 1906. Accompanied by fire, the San Francisco earthquake razed more than four square miles. More than 500 persons were dead or missing, and property damage was estimated at 250 to 300 million dollars. It is also true that

Coloradoans have never experienced incessant shocks comparable to those which occurred in New Madrid, Missouri, over a period of more than a year, in 1811-1812--shocks which were felt as far away as the Atlantic seaboard.

But although most of the temblors which have occurred, or have been felt, in Colorado, have been moderate in intensity, some have situated more than a slight shifting of nature's gears. For example, a quake which struck on November 7, 1882, affected an area of 11,000 square miles.

This earthquake was felt along the Union Pacific Railroad's line from Laramie to Cheyenne, Wyoming; to Georgetown and Louisville, Colorado, northwest of Denver. Clocks in Denver stopped and chandeliers vibrated to the quake's rumbling rhythm. In Cheyenne, numerous houses shook, and at some places as many as three shocks were felt.

A QUIVERING of the earth was reported on March 22, 1895, at Steamboat Springs. The shock made itself known from Pleasant Valley, twelve miles south of Steamboat Springs, to Hayden, twenty-five miles to the northwest. Although the quake affected an area of 1,500 square miles, no damage was reported. (It is to be noted that this earthquake was not the Pleasant Valley Earthquake which occurred in Nevada along the Pleasant Valley fault in 1915.)

Local shocks were reported on November 15, 1901, at Buena Vista, where windows cracked, boulders fell on the roads, and the water of Cottonwood Lake in that vicinity was agitated.

Three shocks on November 11, 1913, were felt in southwestern Colorado. Strong shocks were felt at Ouray, Montrose and Telluride. The shocks lasted from eight to ten seconds, and, at Ouray, objects were thrown from shelves, and rocks rolled down from the cliffs.

A series of seismic shocks at Creede were recorded in 1928, and lasted from April 20 to May 10, a period of three weeks. The numerous quakes were felt with considerable intensity, but strangely enough, no damage was reported in the Creede area.

A trembling of the earth was felt at Aspen, on February 13, 1941, and the shocks rumbled down the valley to Snowmass store. During the quake windows rattled, but that was about the extent of it.

Two more tremblors followed shortly in the Aspen area, one on February 21st, the other on February 27th. Although no shocks were felt in the Denver area as a result of the Aspen quakes, telegraph wires went dead for a short time in the city.

On August 29, 1941, an earthquake was felt from Bayfield in the Los Pinos River Valley, to Vallecito Dam, fifteen miles north of Bayfield. In Bayfield dishes tumbled from shelves and furniture jiggled about a bit in the homes of the astonished citizens.

The last quake prior to 1948 affected 3,000 square miles in the Montrose area.

* * *

Fortunately, Colorado is not what is considered a seismic area; rather, it is stable.

However, nature is unpredictable, as indicated by the earthquake which have been recorded in the Mile-High state through the years. They have occurred in the past as recently as one year ago. Whether repeat performances are scheduled for the future is strictly a matter for time and nature to decide. Morbid persons will be interested to know that no place on this earth of ours is more than forty miles above hot water.

But as a native Coloradoan, I am prone to believe that no earthquakes have ever occurred in the state. It's just now and then Colorado shudders when it thinks of the many persons who have never seen its beautiful cities, enjoyed its incomparable climate, or thrilled at the sight of a sunset in its majestic Rocky Mountains.

4.2 "IT CAN'T HAPPEN HERE: A BRIEF HISTORY OF EARTHQUAKES IN COLORADO"
by Francis B. Rizzari, published in THE DENVER WESTERNERS MONTHLY
ROUNDUP in December, 1959, Vol. XV, No. 12, p. 5-15

On August 17, 1959, the area around Hebgen Lake in Montana was struck by a major earthquake which was the largest one in Montana's recorded history. It had a magnitude of 7.1, as compared to 8.25 for the great San Francisco earthquake, and was felt over an area of 550,000 square miles. Shocks were felt in Utah, Nevada, Washington and British Columbia on the west, and Wyoming and North Dakota on the east.

The quake was publicized on both radio and television and naturally brought forth questions as to whether or not it was possible for Colorado to be visited by one of nature's most awesome phenomena.

For years the writer has heard that Colorado has had no major earthquakes. The existence of numerous balanced rocks found throughout the region was cited as proof of this.

After the great California earthquake of 1906, Professor Arthur Lakes of the Colorado School of Mines, wrote an article for the Mining Reporter, which was copied by the Daily Republican (May 27, 1906 p.4 c.1) "Little Chance of Colorado Earthquakes." I quote from various portions:

If, as many geologists think, the recent earthquake in California was due to paroxysmal movement connected with gradual elevation of the young coast range and the adjacent coast region, it may be of interest to consider the evidences of such movements in Colorado, past and comparatively recent.

In the first place, we have as an object lesson the elevation of the mountains themselves as viewed from the plains near Denver and elsewhere. The rocks composing these mountains were certainly once as deep below the sea as they are now above it. Proof of this is in presence of limestone containing fossil sea shells raised to and forming summits of highest peaks. These shellfish may have lived in waters several thousand feet below sea level, so it is safe to say that our mountains represent an elevation of at least 20,000 feet.

The elevations were not accomplished in a day, or by any violent uplift, but by a gradual process-usually with no more perceptible movement than is felt today. At the same time, their upward movements

may have been accentuated by paroxysmal slips and faulting accompanied by earthquakes. The normal elevating movement is a slow bending up of mountain ranges into an arch, or series of arches. When these arches reach an extreme state of tension, the arch breaks as its crown and a slip takes place, called by geologists a fault.

When the first fracture takes place, a violent earthquake may result on the surface; subsequently, the slipping becomes gradual, although at times possibly giving rise to earthquakes.

In some of our mountain ranges like the Mosquito Range between South Park and Leadville and the Arkansas Valley, we can see all the stages from folding into steep arches to abrupt faulting. The Mosquito Range is composed of the same set of strata as the South Park. It was formed by the folding of the rocks on the west edge of the park into a range of mountains. The movement as you approach the range is first indicated by a gentle swell, soon followed by a steep and symmetrical arch, as shown on Sheep Mountain, in Four Mile Canyon, and in Sacramento and other gulches. The arch resulting, together with several parallel arches west of it, on reaching the limit of tension, broke, and the strata on one or both of the fracture sides, slipped, resulting in the series of great parallel faults which traverse the Mosquito Range from north to south, and over whose eroded blocks you descend as by cyclopean steps into the valley of the Arkansas.

The amount of slip in these faults is not measured in hundreds, but in thousands of feet. When we examine the walls of the fissure formed by these faults, we find them polished by the slipping motion and ground or striated by sharp points or irregularities in the opposite walls. Quartz is sometimes ground to a fine powder like salt; feldspar is reduced to clay. Everything shows movement, but there is rarely anything to prove it was sudden or violent, although it may have been so at times.

These mighty fault movements may still be in progress, although we are little aware of it, and the mountains may still be rising. In some mines, like those at Aspen, the movement of the mountain along a fault plane is so great that no amount of timbering can keep pace with it. Stulls two feet in diameter are broken like reeds. In other mines it is impossible to keep shafts plumb or the openings in the drifts symmetrical in shape. Landslides are in constant progress on steep Aspen Mountain and evidence shows this has gone on far into the past. The same occurs at Telluride, in the San Juan. Great cracks are opened along the hillsides in some cases so recent that trees growing along the line of the slip are split from their roots up.

That we are not troubled by paroxysmal movements and shocks as in California, may be due to the fact that these mountains are older than the young coast range and these upward movements are in consequence, less severe and violent.

From the above, I gathered that in times past there must have been some rather large earthquakes in the state, but that the chances now are remote, at least in Prof. Lakes' opinion. Well, let's look at the record.

A publication of the U.S. Coast and Geodetic Survey, Serial No. 609, entitled HISTORY OF EARTHQUAKES, states, "Five moderate earthquakes have been listed for this state, (Colorado), a small number in consideration of its large area of high mountains."

There are several scales for measuring the magnitude and intensities of earthquake shocks. On the Rossi Forel scale, a moderate earthquake is described as one that "is felt generally by everyone, disturbance of furniture, beds, etc., ringing of bells." Its intensity is 5. An intensity of 6 is a fairly strong shock. The five shocks listed by the Coast and Geodetic Survey cover the period from 1882 to 1928. Three have intensities of 6, 1 of 5, and 1 of 4-5.

According to the weekly ROCKY MOUNTAIN NEWS of Nov. 24, 1875 (p.2 c.4) a great earthquake occurred on April 24, 1867 that extended from Colorado to Ohio, swaying the largest buildings to and fro, and precipitating millions of people out of their homes in a hurrying mass. In Colorado, the initial point, and in Western Kansas, the shock was about ten seconds in length, and very violent, but as the wave traveled eastward, it seemed to divide into two distinct waves or decreasing impulses, extending over half a minute with a slight vibratory motion between them. The effects of the earthquake (in Colorado) were alarming but not serious. In all probability, it was not felt in Denver and the mining camps.

A squib in the COLORADO TRANSCRIPT (Golden, Colorado) for December 7, 1870, has this to say:

"Have we had an earthquake? We are informed by two gentlemen of this town that about five o'clock on Sunday morning last, they distinctly felt the shock of an earthquake. They were lying in bed at the time, and the weather was perfectly calm. The shock appeared to commence with a sort of distant rumbling sound, followed by a sensible shaking of the house, lasting two or three seconds. The placidity of our conscience permits us to sleep until a later hour than the one they mention, and we heard nothing of it, but we have no reason to question the asservations [sic] of our informants."

The ROCKY MOUNTAIN NEWS, Dec. 10, 1870, recorded the event with this paragraph: (p.4 c.2):

"The last TRANSCRIPT contained an item intimating that Golden City had been visited by a touch of an earthquake. [Pueblo] CHIEFTAIN now asserts that Pueblo and Ft. Reynolds have been visited with shocks of an earthquake, too, said to have occurred on Sunday morning last. Denver did not feel it, being, we presume, too righteous to be thus warned, as were our neighboring towns."

When the citizens of Central City read about Golden's earthquake they evidently laughed it off, but the DAILY CENTRAL CITY REGISTER of Dec. 11, 1870, has this to say:

"That earthquake reported in the TRANSCRIPT seems to have been a genuine shake. It was distinctly felt at Pueblo-and Fort Reynolds."

A more complete description is found in the Pueblo, Colorado, CHIEFTAIN, for December 8, 1870. I quote:

"On Sunday morning last between four and five o'clock, many citizens of Pueblo were awakened from sleep by a remarkable concussion, which some believe to have been a shock of earthquake. Some describe it as a violent jar, followed by a tremulous motion of the earth and accompanied by a roaring sound, such as that produced by a herd of animals when driven at great speed. One gentleman who has reason to distrust the walls of his cellar, though that they had a last given away, and that his house had fallen into the cavity. The agent on the Express Company arose to receive the morning coach, thinking that the vehicle had thundered up to the door. The landlord of one of the hotels arose to ascertain the cause of the disturbance among his dishes, which jingled right merrily. Some thought that a thunderstorm had broken out--. There is much conflicting testimony as to the duration of the shock, as well as the direction from which it came. Of the shock itself, there can be no doubt, but whether it was the earthquake variety, or due to electrical influence is a question.

A letter from Fort Reynolds gives the following: 'Bottles on my washstand standing about one inch apart were violently knocked together. The shock was accompanied by a rumbling noise and appeared to move from east to west. It was also felt on the opposite side of the (Arkansas) river.'

Things were rather quiet for almost a year, then on November 10, 1871, the ROCKY MOUNTAIN NEWS states (p1 c5):

"An earthquake is reported from the mountains. It is said to have made things 'get up and stand around' for a few minutes."

A week later, the NEWS has this to say: (Nov. 17, 1871 p1 c4)

"The GEORGETOWN MINER speaks as follows of the late earthquake in the section: A queer trembling vibration motion of the solid earth itself caused buildings and their contents to quiver in a peculiar manner. Many rushed out in the streets to ascertain the cause, if possible, of the unaccountable galvanized feeling they experienced. Some said a powder magazine had gone where the woodbine twineth. Some thought that a blast of more than usual power had been exploded in the Burleigh or Marshall tunnels. Some thought the devil was to pay generally. Crockery and hardware, types in cases, even our heavy Taylor power press seemed to have taken a sudden fit of St. Vitus' dancing proclivities. The regulator in Wright's and Greenleaf's Jewelry and watch store refused to do duty. For a very brief space of time, five minutes, the inhabitants of Georgetown enjoyed a first class sensation. The feelings of quite a number experienced an unusual glow of excitement, but there was no property damage"

The shock was also felt in Silver Plume, but only by those who were awake at the time.

Mother Nature quieted down after this for almost nine years. Then in the DENVER TRIBUNE for Sept. 21, 1880, we read a fantastic story, copied from the LEADVILLE CHRONICLE. It could be another one of Orth Stein's mythical fabrications. The headlines read:

AN EARTHQUAKE

Visits Aspen and Gives its Denizens the Shakes

"Aspen is in the minds of its benighted denizens, a peg ahead of Leadville now. It has had an earthquake!

A regular genuine, no-doubt-about-it earthquake, and they swell with honest pride when they tell about it.

On Thursday night, just as the clock struck 12, the earthquake happened around. The peaceful villagers, wrapt in blankets and the arms of Morpheus, were awakened by a sudden lurch of all staple things, and hastily got out of bed, and looked in their boots for snakes. They had misinterpreted the sublime phenomena, but after waiting a few moments, and seeing no animals, they concluded that it wasn't the James Preserves [jim-jams?] after all, and rushed out to see what was up, after all. Just at this juncture another shock that loosened their teeth and dislocated their locomotion came along and threw the camp into the widest confusion. Many thought the last day had come, and essayed to pray while they waited for the last trump. There were four shocks in all and each one added to their dismay, and occurring at intervals of about half a minute. At each shock, the earth seemed moved about three or four feet out of place, and a low rumbling noise to be compared to nothing save the rolling of distant thunder, was heard. All was then still, and after waiting fearfully for a repetition of the phenomena, the people finally went again to their beds. The terrible force of the shock, however, can be best judged by what followed. Aspen mountain is a long massive section of the range rising just back of the town; the highest elevation is a ragged peak, which rises some three hundred feet above the rocky mass. At about 8 o'clock, this highest turret of the mountains quivered from its base, slowly and majestically swaying forward, crashed loose, and with a deafening roar, fell toward the camp, and breaking to a million pieces, rushed as an avalanche down the hill. The mountain top which had so abruptly vanished from the face of the earth, had bristled with the stakes of prospectors and contained over 100 claims. Down in the valley the thunderstruck owners, with open mouths, watched their earthly possessions dissolve and disappear, and were inclined to swear that the quake had been a put-up job."

Don and Jean Griswold, noted Colorado historians, whose specialty is the Leadville area, have told me that right about this time, Mr. Stein reported that Mt. Massive had also caved in and roared toward Leadville, so we must discount this one.

In 1886 another newspaper story again has the ring of the famous Mr. Stein, and with tongue-in-cheek, I quote from the DENVER TRIBUNE-REPUBLICAN of August 8, 1886. One headline and three sub-headlines lead in the story:

SCENE OF THE EARTHQUAKE

The Effect of the Awful Convulsion Described by
Professor Farnham
A Nut for Scientists to Crack
A Lake Uplifted-Two Miles in Area
Covered by the Upheaval-The Valley in Confusion

The account of the earthquake which occurred a few days ago near Cimarron, Colorado, and which was published exclusively in the Tribune-Republican, caused considerable comment. Many Denverites were very skeptical and declared it to be a hoax. That it was no hoax may be learned from the fact that Professor Farnham of the Nebraska State Normal School visited the scene of the upheaval a few days after it occurred. The Professor is at present in Denver. Yesterday, in an interview with a Tribune-Republican reporter, he stated just what he had seen in this strange occurrence. "On the 28th of July, my wife and I were at Cimarron. There was a great deal of talk about an earthquake, which had occurred in the vicinity of Cimarron a few days previous. The place where this eruption had occurred had been visited by a Mr. Armstrong, who gave an interesting account of the wonderful phenomena. His description aroused our curiosity and we determined to visit the scene.

Others Interested

Stopping at our hotel were two Englishmen named Vacker. They were tourists, and were provided with photographic apparatus. They were quite anxious to join our party, which they did. Early in the morning of the 28th, we started out on horseback. It was a hard ride, too. We continued along the right bank of the Cimarron until the ranch of Mr. Samuel Scheldt was reached. Mr. Scheldt was the first person who discovered the earthquake. He became aware of it while making his usual rounds among the foothills in search of his cattle. Well, Mr. Scheldt very kindly conducted us to the scene of the upheaval.

A Tedious Ride

A wearisome ride of some three hours through tangled underbrush and up a very steep mountain path, brought us to the desired locality. Before I describe it, let us tell just about the locality in which it is located. The Cimarron takes its rise at the foot of the Uncompahgre Mountains and flows north through a valley between a tongue mesa on the west and the westernmost arm of the Trident mesa on the east. Its waters dash along over a bed of water-worn boulders until at Cimarron station, they turn to the east, and enter the chasm of the Black Canon of the Gunnison into the Rio Grande.

About two and a half miles from Cimarron station, Cebolla Creek enters the Cimarron from the east. North of this creek the crests of the mountains are composed of eruptive rocks. South of the creek the formation is entirely different. The mountains here terminate in eroded, stratified rocks and table lands, flanked by foothills of water-worn gravel and boulders often cemented into huge masses of conglomerate. These foothills are arranged in several distinct steps or terraces, and furrowed by valleys opening to the river. These hills are called hog-backs and valleys extend from the mountain, or table-land, northwest. The valleys are crossed by transverse hills, forming a great number of small ponds or lakes, which vary in height according to the terraces upon which they are located.

The scene of the present convulsion was at the upper end of these valleys.

A Lake Uplifted

A small lake, situated under the first bench or terrace at the foot of the Trident mesa, seems to have been the center of the upheaving force. This lake, which had a depth of water of about twenty feet, was uplifted so that its bottom now forms a rounded knoll of considerable elevation. The hog-back or hill on the northwest is split in twain through the crest, and a portion uplifted to the height of twenty-five feet above its original level; another portion is depressed several feet below. Both sides of this valley for half a mile are all seamed and furrowed by cracks running in every possible direction, varying in width from a few inches to several feet, and of considerable depth.

Through the valley trickled a little rivulet, bordered by willows and other shrubs. The bed of this stream has been thrown up several feet, the shrubbery uprooted, and the whole surface of the valley thrown into inexorable [sic] confusion. In places the pressure from below has thrust up great columns of black, moist earth, the perpendicular sides of which are smooth as if turned up with a huge plowshare; columns of dry, gravelly earth now stand several feet high with the sage brush undisturbed. The aspens growing in the vicinity of the lake are thrown into such a tangled mass that it is with great difficulty one can pick his way through them.

The Extent

The force was not confined to this one valley, but extended over an area of about two square miles, it being much more marked in the valleys and sides of the hills than on these summits. The sides of some of these hills are timbered by a growth of spruce and other evergreen trees. They now stand at different angles, leaning in different directions, interlacing their tops in great confusion. Scrub oaks and other shrubs standing upon the disrupted land are now standing withered.

Several hundred acres of land which were the favorite pastures for cattle are now so completely shattered as to make it difficult for a man to pick his way over the surface. Several head of Mr. Scheldt's cattle were imprisoned by the upheaval and were rescued with great difficulty.

Before the upheaval, the dead trunks of aspen trees of considerable size stood in the lake. This indicates that the lake itself was of modern origin. These trees must have sunk at a time so recent as to leave the wood in a condition of comparative soundness.

Professor Farnham says that the Englishmen took excellent photographs of the scene, which will be extensively circulated. He expressed much gratitude to Mr. Scheldt for his kindness in guiding them to their destination."

So end the contributions to science, presumed to be from the fertile brain of Mr. Stein. Getting back to reality, it will be recalled that the last previous reliable report was in November, 1871, when the upper Clear Creek area apparently experienced a tremor.

The next occurrence was in Denver itself in November of 1882 and was circumstantially reported in the Denver papers.

The DAILY ROCKY MOUNTAIN NEWS of November 8, 1882, reports it as follows:

TERRA TOTTERS

A Perceptible Earthquake Shock Felt in the City.

The Large Buildings Tremble and Their Contents Shake

Neighboring Points Alarmed by the Rare Phenomenon

About 6:25 o'clock last evening, several residents of the part of Denver north of Larimer Street were startled by a sudden trembling of the earth. There were three different shocks. The first one was decidedly the strongest, oscillating from west to east and backward and forward. The second and third shocks were comparatively light, but clearly perceptible from the upper stories of buildings and caused great consternation among many of the occupants of the rooms there.

A general stampede was caused among the employees of THE NEWS office, especially in the editorial rooms. The editors and reporters were seated, engaged at work, when the floors of the editorial rooms began to tremble violently. The first shock was followed by two lighter shocks, and followed by two lighter shocks, and for a short time it appeared as if the building were about to tumble in. The trembling ceased as suddenly as it began, lasting only a few seconds.

On the streets the strange phenomenon was generally talked of by persons who had felt the shocks and they were generally accredited to a passing earthquake. The most notable effect of the shock was felt at the Windsor, especially in the rooms on the upper stories. A lady named Mrs. Furst, wife of the chief clerk of the hotel was lying in her room on the fifth floor. When the shocks visited the city, Mr. Furst was absent from the room to his supper. He was startled by a hasty call from his wife, and when he reached her room, she related how the walls and floor had trembled in a violent and alarming way, as if the building were about to tumble in. It was at first supposed that Mrs. Furst was delirious, and the the trembling was only a fancy. But other women corroborated her story. Some of the gentlemen who were descending the stairs in the hotel when the shocks were, also corroborated her story and explained how the stair case had shaken violently, making passage on them exceedingly hazardous. Afterward it was discovered that all pendulum clocks, including the large railway timepiece on the office floor, had stopped at 6:25 o'clock. This is one of the strangest coincidences of the phenomenon.

The shocks were also felt by a perceptible trembling on the upper floors of the Tabor Block, (16th at Larimer), especially in the Western Union Telegraph operating room. There the operators were rocked to and fro in their chairs in a manner that alarmed them in no inconsiderable extent. The rocking ceased as suddenly as it began, and they hardly had time to realize what was the matter. All along Larimer Street, the shocks were distinctly felt by occupants of business blocks, but there were no alarming consequences reported.

It seems to have affected the residence of Mr. Birks Cornforth, corner of Holladay and Twenty-Third Streets, more than any place reported last night. His house trembled so violently that the family fled to the street, fearing that it would cave in on their heads. NEWS reporters interviewed numerous person last night about the strange phenomenon, and in every case, the story of its existence was corroborated.

The oscillations of the earthquake appeared to come from the direction of the mountains, travelling almost directly from west to east. The oscillation seemed to pass backward and forward. Interviews with old-timers last night revealed the fact that it is the first time in the history of Denver that earthquake shocks have ever been felt here.

The most peculiar feature of the earthquake is the fact that it was felt only in the northern half of Denver, that is the portion of the city lying north of Larimer Street; on the latter thoroughfare, it was barely perceptible. Interviews with the clerks at the St. James revealed the fact that it did not visit that section of the city at all.

The DENVER REPUBLICAN reports it this way: (Nov. 8, 1882)

AN EARTHQUAKE

Colorado and Wyoming Shaken Up by Some Subterranean Upheaval

At 6:20 o'clock last evening the shock of an earthquake was plainly felt in Denver, the buildings shaking violently. Reports from different portions of the city indicate that it was noticed and felt by hundreds of people. There was no rumbling sound or unusual atmospheric disturbance. The shock was exceedingly well defined in the business portions of the city, it being very severe where the REPUBLICAN building stands. Those within the building, on the upper floors felt the shock so sharply that they scampered for down stairs to reach terra firma. The clock at the Windsor Hotel was stopped, and at several points in the city, buildings rocked to and fro. No serious damage resulted however, so far as heard from. The shock lasted for more than a minute. Old '59ers say this is the first shock of an earthquake ever felt in Colorado.

Telegraphic reports from points outside of Denver indicated that the earthquake extended over quite a large section of the country and was quite severe.

THE SHOCK IN GEORGETOWN

Georgetown, November 7. A slight earthquake shock was felt in various parts of the city at half-past six this evening. In one store the shock was such as to cause the inmates to run out of the building.

LARAMIE CITY'S EXPERIENCE

An earthquake shock was experienced here at 6:30 this evening. It was felt plainly all along the line of the Union Pacific, west as far as Evanston. Plastering fell in buildings at Rawlins, Point-of-Rocks and other points. Trains will be sent with great care as bridges may have been thrown out of place.

LOUISVILLE SHAKEN UP

Three distinct earthquake shocks were felt here at 6:30 this evening.

STATE AT LARGE

The earthquake visited nearly every Colorado town.

BOULDER

About 6:30 this evening an earthquake shook many houses in Boulder. At Louisville the shock was so great that the wall of the depot was badly cracked. The ceilings of the University were stripped of plastering. Considerable damage reported elsewhere.

AT CHEYENNE

The earthquake here was accompanied by an electric flash that lighted up the northern sky. The shock was so violent that chandeliers and queensware in the houses rattled violently.

The GUNNISON DAILY REVIEW-PRESS, Nov. 11, 1882, mentioned it briefly:

"The usually straid and sober character of Mother Earth in this section of the country was disturbed on Tuesday night and again yesterday morning by an earthquake shock. No very great damage was done here, but some people were very much frightened."

The GOLDEN TRANSCRIPT, Nov. 8, 1882, had this to say:

Last Tuesday evening every business house, office and hotel lobby was crowded with excited politicians and interested citizens, who were discussing the probable outcome of the day's fight (election). Suddenly in the midst of all this confusion, came a violent shake. Strong men reeled and tottered an instant, reaching out as if to grasp some support. Those who had experienced the sensation before, pronounced it an earthquake, but many thought it the probable explosion of the powder works at Moorsville, about four miles from Denver, in Platte river. This fear was soon dispelled by dispatches from Denver, northern Colorado and points in Wyoming relating an experience similar to that felt in Golden. In Denver, three distinct shocks were felt, while in Golden there was but one at 6:30. In the larger buildings the effect was the most apparent. In the courthouse, which is situated on higher ground, the shock was felt with alarming distinctiveness. Walls of the building trembled and tottered as though they would crash to the earth. Deputy Sheriff Todd felt the floor tremble, sprang to his feet and rushed into the jail corridor where a scene of wildest confusion ensued. Prisoners had felt the shock and were hammering on their cell doors and calling to be released. Terror had taken complete possession of them and it was some time before the Deputy and his assistant could quiet their fears and restore order. In the lower part of the city, the effect was not so violent, yet the agitation of the larger business blocks was sufficient to cause the occupants to rush out into the street as if to escape the disaster that seemed imminent. This is the second shock that has been experienced in this locality, the first one occurred about seven years ago and is vividly remembered by occupants of the Golden House.

A correspondence in the ROCKY MOUNTAIN NEWS, Nov. 28, 1882, wrote:

"The earthquake on the night of the 7th opened a crater in the Book Plateau Mountains about fifty miles from Grand Junction. So say prospectors who were on the ground at the time, smelled the sulphur, saw the chasm and the smoke issuing from it."

Silverton, probably feeling it had been left out, reported it had felt an earthquake shock on the night of the twenty-third. (ROCKY MOUNTAIN NEWS, Nov. 29, 1882) Thus ended the great earthquake of 1882. It is evident that it was a real earthquake, for which Colorado does not need to apologize. When the final reports were in, it was found that 11,000 square miles had, been affected.

The next shocks are recorded in the COLORADO TOPICS, Hyde, Washington County, October 26, 1888 (p2c1).

"Ranchmen and miners arriving from the foothills of the Cuerno Verde [Greenhorn] range, thirty miles west and southwest of Pueblo, report that a very distinct and quite startling earthquake shock occurred there on Tuesday at 11:40 A.M. Its direction was from northwest to southeast and it lasted nearly three minutes.

The noise was loud and rolling, being unlike any explainable cause. Dishes and light articles in houses were violently rattled, but no harm was done. Persons from points forty miles apart give the same report. They describe the tremor as, "rolling down the mountain."

Again in the same paper for Feb. 1, 1889, we read the following:

"There was a well defined earthquake shock in Routt County on the 15th. Thunder preceded the shocks but there was no rain. A peculiar phenomenon was observed at the Government Bridge. There the shock was productive of great gushes of water and gas. Fully three times as much water and gas was thrown out, and accompanying it was a most sulphurous stench that made people sick and caused birds to drop to the ground. When the convulsion ceased, the water receded and there was a sound like the rushing of a great river. The course of the shock was from the south northward."

The TOPICS for Feb. 8, 1889, reported:

"The shocks were also felt at Glenwood. The water in the big spring boiled and bubbled furiously for a few moments and was several degrees warmer than ever known before."

In December, 1891, according to an article in the STEAMBOAT PILOT, Steamboat Springs, Colo., Aug 18, 1942, an earthquake rattled Moffat County.

"It happened about 4 P.M. The earthquake was convulsed by "waves" that rolled at intervals of a few seconds lasting for a minute or more. One of the living witnesses of the occurrence was Miss Hortense Fitzpatrick of Craig. Alone with her little brother at the ranch, she heard the rumble and felt the pulsations of the quake. Rushing from the house, they saw the family milk cow, standing near the end of the house,

rocked from her feet to fall heavily against the log house. From an 800 foot cliff, a half-mile from the house, rolled thousands of boulders, some of them as large as a house. This continued for a minute. Then fell that most impressive of silences, the silence that follows a temblor.

In Lily Park, the same things occurred. The few settlers then scattered over the country noted the quake at widely separated points. Mute evidence in the form of huge boulders still dot the flats at the foot of the cliffs."

The GEORGETOWN, COURIER for August 11, 1894, stated:

"The mining towns of Georgetown and Silver Plume were visited again in August 1894. It hit about 5 A.M. on a Sunday morning, coming from the north and was accompanied by a low rumbling sound."

The Yampa Valley was visited again on March 22, 1895. (ROCKY MOUNTAIN NEWS, March 24, 1895.) Windows were jarred and spoons and dishes rattled by the shock. It was felt in the valley from the town of Pleasant Valley, about twelve miles south of Steamboat Springs, to Hayden, a village about twenty five miles west Steamboat Springs. It rolled from east to west and was accompanied by a report resembling the discharge of a blast in a mine, and a long low rumbling sound which was described by some like the breaking of ice in a river or lake.

This one seemed to last the state of Colorado for the rest of the 19th Century. It wasn't until November 15, 1901 that it was given another shake. THE DENVER TIMES, November 15, 1901, reported that a shock hit Bunea Vista about three o'clock in the morning, lasting about six seconds and was described as "severe." The large plate glass in the saloon of Malkmiss and Halbic was cracked.

A story in ROCKY MOUNTAIN LIFE, Denver, for June, 1949, stated that there were four more in the next forty years, bringing the total to sixteen, discounting the ones at Aspen and Cimarron. On November 11, 1913, strong shocks were felt in Ouray, Montrose and Telluride. Between April 20 and May 10, 1928, numerous quakes of considerable intensity were felt in Creede. February 13 to 27, 1941, Aspen was visited by shocks strong enough to rattle windows. In August, the same year, a quake was felt from Bayfield to the Vallecito Reservoir, 15 miles north. In Bayfield, dishes were tumbled from shelves and furniture was moved around.

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One phenomenon not fully explained, happened near Flagler, Colorado. It is reported in a clipping in the State Historical Society, from the FLAGLER NEWS, with no date,

STRANGE EARTH DISTURBANCE ON LOMAS BROTHERS FARM

The Lomas brothers' ranch 12 miles north and a mile west of Fagler [sic] has caused much interest among folks living in the neighborhood. The main disturbance occurred about three weeks ago when for some unknown reason, the earth beneath a large lagoon was suddenly erupted in two long ridges, one being some 150 yards in length and the other about a quarter of a mile.

The Lomas folks had heard queer noises beneath the thick ice on the lagoon for some time; and one day they hear a loud booming noise there. Upon investigation, they found the ground had heaved up in long ridges some two feet wide. The ice was broken in large slabs. Since that time, the water in the lagoon has been rapidly draining away so the earth ridges can be plainly seen.

Summarizing, we have the following record (excluding the questionable Leadville yarn of September 1880, and equally doubtful Cimarron report of 1886):

1875(?) (Referred to by the COLORADO TRANSCRIPT in reporting the 1882 quakes)

April 24, 1867 (Eastern Colorado and Western Kansas)

December 7, 1870 (Denver and mountains west of Denver, and in Arkansas Valley)

November 10, 1871 (Georgetown and Silver Plume)

November 7, 1882 (the biggest one recorded, covering some 11,000 square miles in Colorado and Wyoming)

October 26, 1888 (Greenhorn Mountains south and west of Pueblo)

January 15, 1889 (Routt County and Glenwood Springs)

December, 1891 (Moffat County)

August, 1894 (Georgetown and Silver Plume)

March 22, 1895 (Moffat County).

November 15, 1901 (Buena Vista).

November 11, 1913 (Ouray, Montrose and Telluride).

April 20 to May 10, 1928 (Creede).

February 13-27, 1941 (Aspen)

August, 1941 (Bayfield).

As a member of the Topographic Division of the Geological Survey, rather than the Geologic Division, I have not attempted to analyze the earthquakes, but my own personal opinion is that Colorado's TERRA is not as FIRMA as it seems.

5.0 REFERENCES CITED

- FitzPatrick, V.S., 1974, The Last Frontier: Steamboat Pilot, Steamboat Springs, Colorado.
- Hadsell, F.A., 1968, History of earthquake activity in Colorado, in Hollister, J.C., and Weimer, R.J., eds., Geophysical and geological studies of the relationship between the Denver earthquakes and the Rocky Mountain Arsenal well: Colorado School of Mines Quarterly, Vol. 63, No. 1, p. 57-72.
- Kurtz, V.H., 1949, Colorado earthquakes: Rocky Mountain Life, Vol. 4, No. 4, p. 30.
- Meeker History Book Committee of the Rio Blanco County Historical Society (eds.) 1978, This is what I remember - A second volume of history by and about the people of White River Country: Rio Blanco Historical Society, Meeker, Colorado
- Oaks, Sherry D., 1981, Historical data for the November 7, 1882 earthquake in the Rocky Mountain region, in Geologic and seismologic investigations for Rocky Flats Plant: Dames and Moore, Los Angeles, California (DOE contract #DE-AC04-80AL10890)
- Rizzari, F.B., 1959, It can't happen here: A brief history of earthquakes in Colorado: The Denver Westerners Monthly Roundup, Vol. 15, No. 12, p. 5-15.
- See listings in Sections 2.0 and 3.0 for newspapers, interviews, and manuscript sources cited.