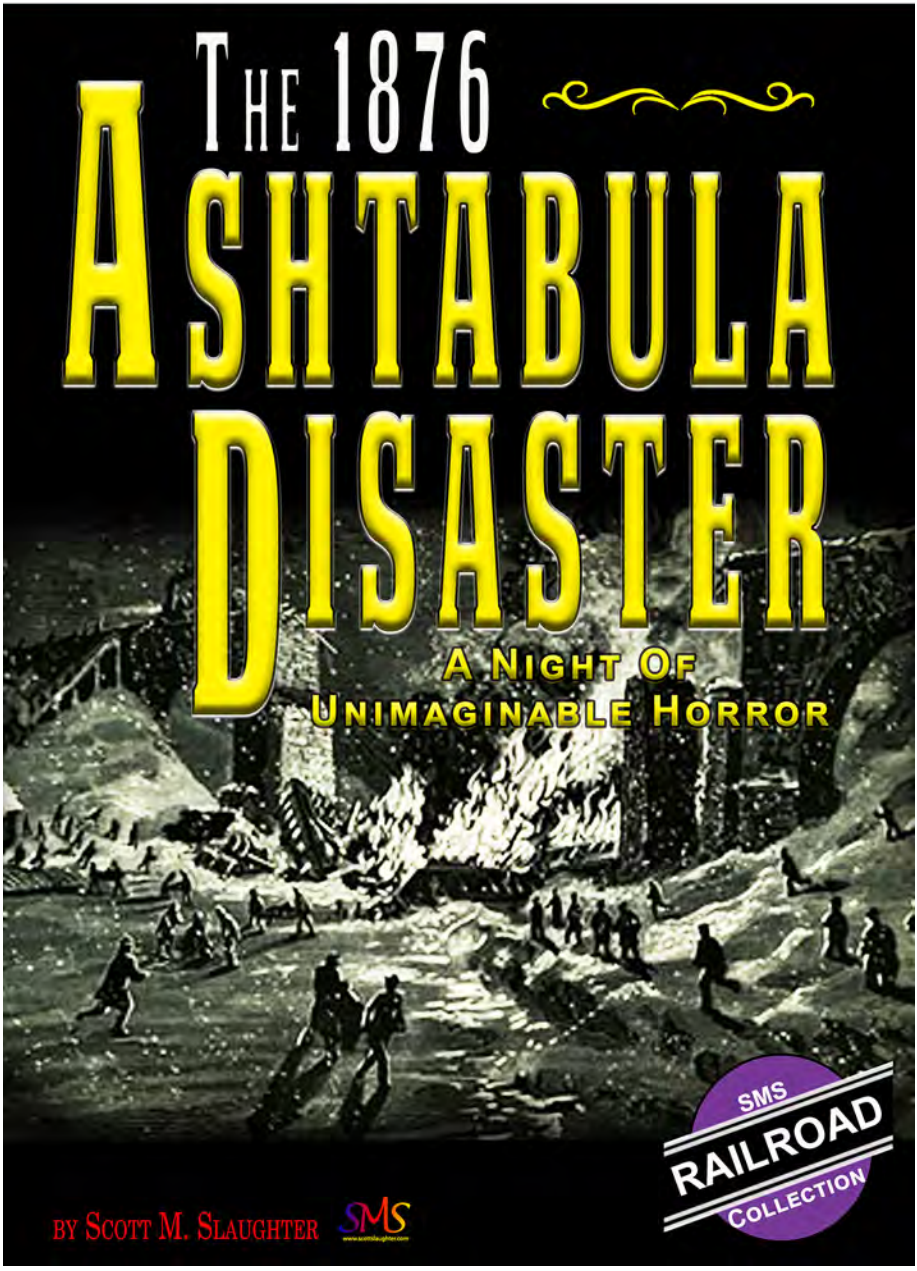
THE EVENTS FROM ONE OF THE DEADLIEST, MOST HORRIFYING RAILROAD DISASTERS IN U.S. HISTORY

THE 1876 ASHTABULA DISASTER

A NIGHT OF UNIMAGINABLE HORROR



SMS RAILROAD COLLECTION

BY SCOTT M. SLAUGHTER SMS

2025 EDITION

Thank you for purchasing *The 1876 Ashtabula Disaster*. I hope you enjoy it and learn more about this tragic, horrifying railroad disaster.

When you have a moment, please visit my website (scottslaughter.com) for information on my other railroad and train books along with other information about railroads.

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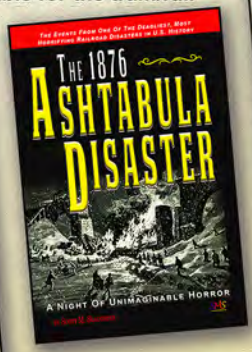
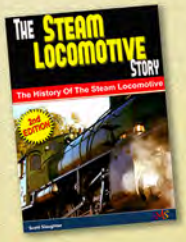
The image on the front cover is based on a wood engraving depicting the moments following the collapse of the Ashtabula Bridge. The artist is unknown, but because it was published in the United States before 1923, it's assumed to be in the Public Domain in the U.S.

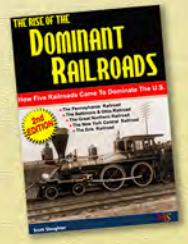
Railroads and Railways

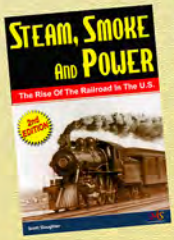
www.scottslaughter.com

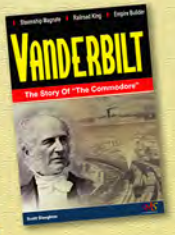
One of my passions is writing about the early days of railroads and railways. This is a list of the titles I have available for the train/railroad enthusiasts.

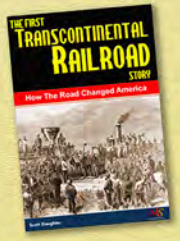












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Author's Note

Keep in mind that *The 1876 Ashtabula Disaster* isn't an exhaustive or a scientific study of the Ashtabula Disaster but instead is what its title suggests — information about the disaster. It nevertheless was a difficult project for me to research, edit, and write. There's very little that is uplifting about accidents, death, and destruction especially considering the possibility the disaster should never have happened. This is even more particularly true considering more passengers, including children, were killed from a grisly array of death, including being crushed to death, drowning, or even worse, being burned to death, than died in the initial fall with the collapsing bridge. I exhausted about all the adjectives I could think of using to describe the disaster and its aftermath.

I also need to acknowledge the work of the Reverend Stephen D. Peet and his book, *The Ashtabula Disaster*, published in 1877.

Formatting Note (Amazon Kindle version):

The book was formatted with the following settings in mind:

- Kindle Fire 10
- Color: White
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Note On Images:

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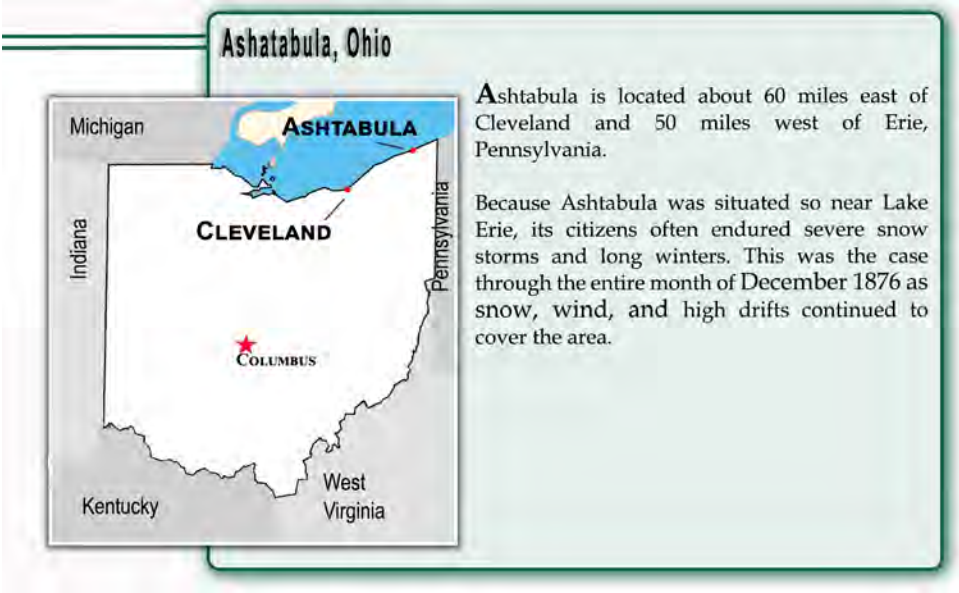
An Overview Of The Disaster

An Overview Of The Disaster

ASHTABULA IS LOCATED IN ASHTABULA County, Ohio, at the mouth of the Ashtabula River on Lake Erie, about 50 miles northeast of Cleveland (see the following map). The name Ashtabula comes from a Leni Lenape word that means, quite optimistically, "always enough fish to be shared around."

Ashtabula was an important stop on the Cleveland, Painesville & Ashtabula Railroad (CP&A) that opened in 1852. The CP&A operated initially from Cleveland, Ohio, to the Ohio-Pennsylvania border and became one of the most profitable railroad lines in the United States in the 1860s, particularly after it was completed between Buffalo, New York, and Chicago, Illinois.

The CPA was also informally known as either the Cleveland & Erie Railroad, the Cleveland & Buffalo Railroad, or the Lake Shore Railroad up to 1868 when the CPA was officially renamed the Lake Shore Railway. It merged with the Michigan Southern & Northern Indiana Railroad in 1869 to form the Lake Shore & Michigan Southern Railroad (LS&SM).



Ashtabula was also important in the years leading up to the U.S. Civil War as a crucial destination on the Underground Railroad in the mid-1800s. The Underground Railroad was a network of secret routes and safe houses used by African-American slaves to escape into free states and Canada. Even though Ohio was a free state before the Civil War, refugee slaves in Ohio were still at risk of being captured by slave catchers so they took boarded ships to cross Lake Erie to freedom in Canada.

About 3,500 residents lived in Ashtabula at the time of the disaster, with another 500 or so other people living in a nearby small village at the mouth of the Ashtabula River.

Many European immigrants, particularly from Finland, Sweden, and Italy, came to the Ashtabula area in the mid-1800s through to the late-1800s looking for work in the many industrial jobs available in the area in the post-Civil War industrial boom occurring in the Great Lakes area.

Several small businesses were operating in Ashtabula at the time of the disaster, including a few saloons and three hotels — the American House, the Culver House, and the Eagle Hotel — that operated near the train station. The Eagle Hotel, in particular, had an important role in the hours following the disaster.

An Overview Of The Disaster

Even though there were other horrifying accidents on railroad bridges or trestles in the 1800s in the U.S., it's unlikely that any of those accidents, such as the Angola Horror (December 18, 1867) and the South Norwalk Disaster (May 6, 1853), combined more elements of sheer horror or created more public outpouring of emotion than what happened on the frozen Ashtabula River in Ashtabula, Ohio, on the evening of Friday, December 29, 1876.

Furthermore, no railroad disaster prior to December 1876 generated more interest across the United States at the time than did the Ashtabula Disaster. The accident was, indeed, so terrible in its scope and so heart-rending in its details, that newspapers across the country replaced their headlines on the other news of the day with stories, articles and updates about the accident in the main headlines of the newspapers at the time.

The news of the Ashtabula Disaster appeared in many newspapers across the country and even shared the headlines with the big national news stories at the time. (Perhaps the most important national story at the time was the growing dispute over the recent presidential election in the United States. The elections in 2008 and 2016 not withstanding, the 1876 presidential election was one of the most disputed in American history. Samuel Tilden of New York won the popular vote, and led with 184 electoral votes to Rutherford B. Hayes' 165, with 20 votes uncounted. The question of who should have been awarded the uncounted electoral votes is the source of the continued controversy concerning the results of the 1876 election. They were eventually given to Rutherford N. Hayes in an agreement known as the Compromise of 1877.)

Because it was the deadliest railroad disaster to that time in the United States, it has been known by various names, including the Ashtabula Train Disaster, Ashtabula Railroad Disaster, the Ashtabula Disaster, or the Ashtabula Horror. While all the names are appropriate, they cannot by themselves fully describe what happened that night.

Although this was the deadliest railroad disaster to that time in the United States, and arguably the most horrible transportation disasters of all time in the U.S., it wasn't just the cold statistics that shocked the country. It was instead how dozens of the passengers perished in the disaster, why did the iron bridge suddenly collapse, questions on how safe the bridge really was, why wasn't the fire put out so that rescue efforts could begin to locate and free several trapped passengers, and other suspicions and all had a strong affect on how Americans thought about transportation, which in the late 1870s meant railroads. It was similar to the affect the sinking of the "unsinkable" RMS *Titanic* had on passenger ships about 36 years later.

The train involved in the Ashtabula Disaster was the Lake Shore & Michigan Southern Railroad (LS&MS) № 5, *Pacific Express*, which was the "crack" passenger train for the LS&MS between New York and Chicago. (A crack train was the fastest express train between two stops.)

The site of the disaster was the LS&MS iron bridge that was erected several years earlier over the Ashtabula River near the Ashtabula station. The nearly 160-foot long bridge was made of wrought iron and based on the pattern of the popular Howe Truss, though it also contained some elements and idygo on New Year's Eve. (Unfortunately, neither Bliss nor his wife survived the disaster.)

Because of a major blizzard striking the area, particularly south and east of Lake Erie, the *Pacific Express* was running more than two hours late when it reached the Ohio-Pennsylvania state line. G. D. Folsom, the engineer aboard the *Columbia*, said "… I think it was the worst storm I ever experienced on the Lake Shore …" when he testified to The Legislature of Ohio Joint Committee Investigation following the disaster.

Indeed, the day of the disaster featured heavy snow, strong winds, and bitterly cold temperatures that had forced Ashtabula businesses to close early and most residents to hunker down next to their fireplaces inside their homes.

A few people were, nevertheless, out and about in Ashtabula despite the weather. These intrepid souls included those who had to be outside, such as railroad employees, but also people making their way to the station to meet relatives and friends arriving home on the *Pacific Express*.

The slow wintery trip had also become a long, gloomy adventure for many of the dozens of passengers aboard the *Pacific Express*. Most passengers found different ways to stay busy to pass the time. Some passengers, for example, played card games as a way to stop thinking about the train being so far behind in its schedule.

Meanwhile, even though they could little more than the wind-driven snow outside their train, other passengers spent their time staring vacantly out the windows. All the passengers, however, must have some level of anxiety or concern over the increasing delays caused by the weather.

Despite the weather conditions, which would certainly make for "white-knuckle excitement" in driving an automobile in similar conditions today, the trip for Dan McGuire, who was the engineer of the lead locomotive, *Socrates*, was actually more routine, if not unexciting, as he cajoled the train through the blinding snow and darkness hour after hour as it slowly made its way west.

The routine, however, changed abruptly just as the *Pacific Express* was crossing over the Ashtabula River at about 7:30 P.M., Dan McGuire, the engineer on the lead locomotive *Socrates* suddenly heard a loud, sharp, sickening crack. He felt a sensation that was so strange he could only explain it by thinking the *Socrates* was "running uphill" even though it was still on the bridge. He, however, soon understood the Ashtabula Bridge was cracking and breaking apart directly below him. He pulled the throttle wide open; the burst of momentum pushed the locomotive onto the west abutment of the collapsing bridge.

McGuire coaxed the *Socrates* to the relative safety of the abutment but the trailing locomotive *Columbia* and the rest of the train fell about 80 feet onto the frozen water.

Despite the darkness and the swirling snow, several people waiting at the station watched in stunned horror as the train simply disappeared into the darkness. Other people in Ashtabula had heard the thunderous crashing sounds echoing through the ravine. But within just a few minutes it all turned much worse when the sky above the ravine began glowing red from fires ignited by overturned potbelly stoves and broken kerosene lamps. Even the howling wind wasn't able to muffle or quiet the screams of trapped passengers who watched the out-of-control flames approach them.

By the time the townspeople reached the bridge, the injured passengers had made their way to either side of the river as the fire continued growing in intensity.

The LS&MS railroad officials emphatically insisted putting water on the fire would be pointless, even though passengers were still trapped in the burning wreckage, while just as emphatically insisting priority should be given to rescuing and removing injured passengers. Ashtabula Fire Department Knapp agreed with the LS&MS officials and the fire engines were returned to their respective stations.

Ashtabula didn't have a hospital in 1876 to care for the injured passengers, though to be fair, any hospital in the area would've soon been overwhelmed with the injured, dying, and those already dead.

Several injured passengers were instead taken to the Eagle Hotel, but the number of injured passengers taken there became so great that soon no more couches, beds, chairs, etc., were available. So virtually anywhere in Ashtabula where there

was enough space for the injured, including the counters of stores, the floors of private houses, and even the saloons, was used. In other words, the entire village of Ashtabula became a hospital.

The Ashtabula Disaster unfortunately brought out the worst in people. For example, robbers, pickpockets, plunderers, and other lowlifes found the disaster scene, and the severely injured, defenseless passengers in particular, were easy targets and they displayed little mercy in stealing what they could.

Although money, jewelry, watches, and similar valuables were favorite items, they weren't all that was taken from injured passengers, most of whom had already lost most of their possessions, if not family members, in the fire. One robber, for example, with no shame or embarrassment, casually removed the boots from an injured passenger and quickly ran away into the darkness with the boots.

The bodies left unguarded at the disaster scene were even easier targets for plunderers and pirates who took what they could carry and quickly disappeared into the darkness.

The Ashtabula Disaster also brought out the best in people. Volunteers from Ashtabula and the area, as well as able-bodied passengers, gathered along the river bank to help remove the injured by sled and sleigh, which must have seemed for them to be an impossible task considering the weather, steep slopes, and the fact they had neither the training nor the proper equipment. Yet it had to be done.

On January 19, 1877, three weeks after the disaster, the people of Ashtabula came together to mourn the victims of the disaster. In a series of memorial services and other honors, the unrecognized remains and body parts were buried in a special area in the Chestnut Grove Cemetery.

It wasn't until early Saturday morning, about twelve hours after the disaster began, that the first light of day allowed people to see the total enormity of the horror. One surviving passenger described the scene succinctly, though perhaps most accurately, "The locomotive, the cars, and the bridge were mixed up in one indistinguishable mass." Furthermore, bodies, and more horrifying, body parts, seemed to be everywhere across the frozen river and ravine.

In addition to the 96 crew and passengers — men, women, and children — who perished in the disaster, two more lives can be attributed, either directly or indirectly, to the Ashtabula Disaster.

The Ravine And The Bridge

The Ravine And The Bridge

TO BETTER UNDERSTAND THE GEOGRAPHY near the disaster scene, this chapter provides information about the ravine, which was formed by the high and steep banks of the Ashtabula River, and that survivors had to climb to escape the carnage despite the deep snow covering the entire area — and many not wearing proper clothing to handle the cold temperatures.

Also to better understand the reasons and causes of the disaster, the chapter also details the history of the bridge itself and in particular, its designer/builder Amasa Stone.

The Ravine

The banks along the valley of the Ashtabula River were, at the time of the disaster high, steep, and featured rocky cliffs. They formed a ravine in the rear, or in a southerly direction from the village, in an area the locals called "the gulf." The ravine widened near the Ashtabula station, and its banks became relatively less steep, although still too sleep, rocky, and covered with brush to climb easily. The Ashtabula River flowed at least 76 feet below the level of the LS&MS bridge, and was often about four feet deep.

Because the area at the bottom of the ravine was often inaccessible, or at least barely accessible, there was seldom a good reason for most people to visit that particular area near the bridge. The only structure near the river in this area of the ravine was an engine house and even though it was a rather nondescript building, the engine house was very important to the people of Ashtabula. A huge boiler and steam engine inside this building were used to pump water from the river to two large cisterns for the water supply of Ashtabula. These cisterns were located above the ravine and on either side of the LS&MS railroad track.

The location of the engine house near the river and near the bridge also became very important during the critical minutes and hours following the December 29, 1876, disaster because it served as a shelter, even a sanctuary, for those who had survived the disaster to that point from the deadly combination of fiery inferno and the cold, snowy weather.

In addition to the engine house at the bottom of the ravine, a second engine house was located near the cisterns on top of the ravine. Even though this engine house also served as a shelter for those who made it to the top of the ravine, it became known more for its part in the enduring controversy about the disaster because it's also where a manual fire engine called the "Lake Erie" was kept and maintained.

The "Lake Erie" and its hose, which officials could have attached to the steam pump in time to save lives, however, weren't used to put out the fire. Instead, the controversial decision was to first help rescue passengers who weren't trapped in the wreckage and not to fight the fires approaching the dozens of passengers who remained trapped in the wreckage.

The investigations following the disaster put the "responsibility for not putting out the fire at the time it first made its appearance in the wreck rests upon those who were the first to arrive at the scene of the disaster, and who seemed to have been so overwhelmed by the fearful calamity that they lost all presence of mind and failed to use the means at hand …" The investigations also concluded that

"nothing should have prevented the chief fireman from making all possible efforts to extinguished what fire then remained. For his failure to do this he is responsible."[1] (See the "Investigations, Allegations, And Denials" chapter for more information.)

It's difficult to imagine an area that was more off the beaten track or one that was in a such god-forsaken spot — particularly in the winter months — than this ravine under the bridge. The only way to reach the bottom of the ravine and get to the river was to climb up/down a long flight of stairs. These stairs, however, weren't necessarily designed for public access, but instead for workers to get to the engine house at the bottom of the ravine. Even though climbing up and down the steep, narrow stairs wasn't easy at any time of the year, the steps were covered under several inches of snow and ice at the time of the disaster and therefore even more perilous for anyone to climb.

The more adventurous way of reaching the river was following a winding, rough, and uneven path, although calling it a path might have redefined the meaning of a path. It was difficult to follow for men and even the best horses in the summer let alone in the cold, windy, deep snow, blizzard-like conditions the survivors and rescuers faced following the Ashtabula Disaster. However, there was no alternative, and the path was at least wide enough for a team of horses to make it down the steep banks to get to the ravine and the river.

Amasa Stone And His Bridge

Amasa Stone (1818-1883) was an American industrialist who is best remembered for beginning a regional railroad empire, which was centered in Ohio, from 1860 until his death in 1883. For example, Stone had by the 1850s become a director of the Cleveland, Columbus & Cincinnati (CCC) Railroad and the Cleveland, Painesville, & Ashtabula (CPA) Railroad. The CPA merged with the Lake Shore & Michigan Southern Railway, of which Stone was appointed director. Stone was also a director or president of several other railroads in Illinois, Indiana, Iowa, Michigan, New York, Ohio, and Pennsylvania.

Amasa Stone (1818-1883)

Amasa Stone was an American industrialist who is best remembered for being director of the Lake Shore & Michigan Southern Railway. He was also a director or president of several railroads in Ohio, New York, Pennsylvania, Indiana, Illinois, Iowa, and Michigan.

Stone is also remembered for building hundreds of bridges in New England in the 1840s, and the LS&MS bridge over the Ashtabula River in the 1860s.director of the Detroit & Pontiac (D&P). He helped secure the financing to build the Oakland & Ottawa Railroad (O&O). He the first president of the new Detroit & Milwaukee Railroad (D&M) which was formed following the merger of the D&P and O&O.

He began working for his brother-in-law, William Howe and his eponymous truss bridges, in 1839. Stone was an important part of a team that in 1840 built a railroad bridge over the Connecticut River in Springfield, Massachusetts. The reason this bridge is so noteworthy was that it was the first Howe truss bridge, which was a new, influential design in railroad bridges. Howe patented the design in 1840.

Stone purchased the rights to Howe's patented bridge design in 1842 and with a Springfield businessman named Azariah Boody formed Boody, Stone & Company, which erected several Howe truss bridges throughout New England.

Stone dissolved the Boody, Stone & Company by early 1847 only to turn around and purchase the Howe Bridge Works (founded in 1840 by his brother-in-law William Howe). This firm continued to construct bridges in Connecticut, Massachusetts, and Rhode Island until 1849.

Stone went on to design and build hundreds of bridges in New England in the 1840s, most of which were of the Howe truss bridge design. He was by 1850 recognized as the most eminent bridge builder and railroad contractor in New England.

The Night Of A Perfect Winter Storm

THE NIGHT OF A PERFECT WINTER STORM

GUSTAVUS D. (G. D.) FOLSOM, the engineer aboard the *Columbia* would later testify to The Legislature of Ohio Joint Committee Investigation that as the *Pacific Express* arrived in Ashtabula, "It was storming very bad. I could not tell precisely when I was on the bridge … I think it was the worst storm I ever experienced on the Lake Shore … " [1]

In today's terms, we might call the evening of Friday, December 29, 1876, as a "perfect storm" for a railroad disaster because everything in Ashtabula seemed to conspire in making the evening a harbinger of doom.

The people who live on the east side and the south side of the Great Lakes, including Ashtabula County in Ohio, are accustomed to dealing with large amounts of snow throughout the winter months and occasional bad snowstorms or blizzards driven by the warmer waters of the Great Lakes. December 1879 was, however, a

little more extreme than other months and years because the people in the Ashtabula area were forced to deal with enormous blizzards and snowstorms each weekend so far that December.

However, the snowstorm on December 29 was more furious than the previous weekend storms that month. The snow started falling early in the morning but the storm by early afternoon had turned into a fearful combination of cold temperatures, strong, fierce winds, and snow — a lot of snow. It only changed in intensity from strong to very strong through the afternoon. The snowfall rate was so great during the day it became futile for anyone to shovel or push the snow from around their houses or attempt to clear the streets.

The blizzard hammered the area from the late afternoon into the early evening with more than 20 inches of new snow and strong winds with gusts as high as 50 miles an hour that created many whiteout conditions in the area.

High, wide, deep drifts filled the streets and a deep blanket of snow covered everything in the area … trees, houses, sheds, businesses, buildings, and fences stood like silent forms in the snowy landscape. It must have been an impressive sight.

Because the area was still covered with snow from the earlier storms that month, the new snow that fell during the December 29 storm only added to the heavy blankets of white snow that already covered the area.

The people living in the area had, for the third time during that month of December, understandably remained safe and warm inside their homes, and couldn't (or simply didn't want to) bother clearing the paths from their front doors to the gates. They chose to remain inside, trying to stay warm and comfortable around their fireplaces. Except for the sound from the gusty, cold winds, an eerie quiet descended upon the area, perhaps another harbinger of doom.

The Train And Its Crew

The Lake Shore & Michigan Southern Railway (LS&MS), which was established in 1833, was a major part of the so-called Water Level Route of the powerful New York Central Railroad from Buffalo, New York, to Chicago, Illinois. It was called the Water Level Route for a good reason: Its route mostly followed

the south shore of Lake Erie (in New York, Pennsylvania and Ohio, with some branches and other lines heading north into Toledo and Michigan) and across northern Indiana into Chicago.

The LS&MS № 5 train, which was called the *Pacific Express*,was known as a crack train, which meant it was the fastest express train between two stops. It was also well-known at the time for its elegance, power, and beauty.

The *Pacific Express*, perhaps ironically named considering the weather conditions through which it was travelling to Chicago, consisted of the following locomotives and railcars as it made its way west through the snowstorm:

- Two locomotives: *Socrates* (leading) and *Columbia* (trailing) and their respective tenders
- Two express cars (Although express cars resembled baggage cars, railroads used them to carry more valuable freight in passenger train consists.)
- Two baggage cars
- One smoking car
- Two day passenger coaches
- Three sleeper cars: the New York sleeper *Palatine*; the Boston sleeper *City of Buffalo*; and the Louisville sleeper *Osceo*.
- One drawing-room car: the *Yokahama*. (The drawing-room car was part of certain passenger train accommodations, designating some of the most spacious and expensive private accommodations available on board a sleeping car or private railroad car.)
- Caboose

The crew of the train included the following men as it made its way to Ashtabula and, ultimately, into railroad history:

- Dar, James (Porter Sleeping Car)
- Folsom, G. D. (Engineer on trailing locomotive *Columbia*)
- Henn, B. (Conductor)
- Karn, Charles (Porter Sleeping Car)
- Lannegan, Lawrence (Expressman)
- Levenbroe, Peter (Fireman on trailing locomotive *Columbia*)

- McGuire, Dan (Engineer on leading locomotive *Socrates*)
- McNeill, Phil (Unknown job)
- Purington, George (Expressman)
- Stewart, Jerry (Porter Sleeping Car)
- Stone, A. L. (Brakeman)
- Vosburgh, W. H. (Brakeman)
- Wagner, Harry (Conductor of Sleeping Cars)
- Webb, James (Porter Drawing Room Car)
- Unnamed Fireman (Fireman on leading locomotive *Socrates*)

Because the LS&MS didn't have an "official" passenger list for the *Pacific Express*, there's no way to know with 100 percent accuracy how many passengers were aboard the train. Most sources believe the number of passengers was 159 but some estimates dramatically increased the number to as high as 250 passengers. Regardless of whether 159 or 250 passengers were aboard the train, or somewhere in-between those numbers, many of its passengers were travelling to enjoy the company of relatives and friends for the holidays.

The Lake Shore & Michigan Southern *Pacific Express*, which had departed New York the night before, had been divided at Albany; a portion of it was plowing through the snowdrifts of the mountains in Vermont, and another portion was struggling just as hard through the snow near the banks of Lake Erie.

The westbound *Pacific Express* departed Buffalo, New York, at about 3:00 P.M. on December 29, 1876, during a blinding northeasterly snowstorm that was driven by high, gusty, and unpredictable winds. The weather was so bad and the snow and drifts so deep on the tracks that four pusher locomotives were needed to help the train out of Buffalo.

The biting wind and several inches of snow, and even higher snowdrifts, that covered the tracks continued to bedevil the *Pacific Express* as it struggled to maintain a speed between 12 to 15 miles an hour to reach its scheduled stop at Erie, Pennsylvania, before making its way to its next stop at Ashtabula, Ohio.

The *Pacific Express* was due in Erie shortly after 12:00 noon, but the snowstorm put the train so far behind schedule it was 2½ hours late. The weather conditions meant it was likely to be even further behind schedule by the time it reached Ashtabula, especially considering it was making its scheduled stops along the line.

A Fiery Hell On The Ice

A Fiery Hell On The Ice

IT WAS OBVIOUS TO EVERYONE who was waiting, whether they were waiting at the station or somewhere in or around Ashtabula for family and friends, that the LS&SM № 5, the *Pacific Express*, was running well behind schedule. It was also obvious to any of the passengers aboard the *Pacific Express* staring out a window or looking at their watches that the reason for their train being late was the weather, though it was also possible other reasons or a combination of reasons were working together to make the train late. But being confident the weather was the likely reason for the delay didn't make it easier for those waiting at the station.

In addition to the people at the station waiting for the *Pacific Express* were LS&MS employees, including telegraph operators, baggage men, and other workers who had their own reasons for waiting for the passengers to arrive.

It's possible that some of the more experienced LS&MS employees, many of whom had gone through several bad winter storms during their careers, began wondering if the *Pacific Express* was delayed due to something other than just the weather. It's also possible that some of the other people waiting at the station, particularly those who rode the trains frequently, began sharing those same concerns.

Nevertheless, most people at the station believed the delay in arriving in Ashtabula was due to the train having to push and pull its way through the deep snow. Yet, they also had the nagging suspicion the delay might be due to something more serious, such as mechanical problems with the locomotive, a derailment, or the *Pacific Express* being buried or stuck in so much snow that it was unable to either move forward or backward.

Those Awful First Moments

The train in the meantime was indeed pushing its way through snow that was falling so fast and blowing so fierce that visibility was less than 50 feet. Its progress was agonizingly slow but it was at least approaching Ashtabula. The *Pacific Express*, with Daniel McGuire as the engineer on the *Socrates*, which was the leading locomotive, finally arrived about 7:30 p.m. at the Ashtabula bridge that was only about 1,000 feet east of the Ashtabula station.

Many things were likely going through McGuire's mind as he slowly moved the *Socrates* across the bridge but at least two concerns were likely at the top of the list:

1. The gale force winds that he'd know would buffet the train as it crossed the open bridge.
2. Getting the train through the two-foot high snow drifts covering the tracks (not to mention the combined weight of the train and the snow on the bridge).

Even with the *Columbia*, which was the trailing locomotive, helping pull the train though the snow, McGuire's experience told him that his lead locomotive would have to provide the extra boost of power needed to pull the train through these high snow drifts and to push against the strong winds. He, therefore, pulled the throttle out in an attempt to increase the speed of the train, which at the time was chugging and puffing along at about 12 to 14 miles an hour.

The 154-foot length of the bridge was just long enough for the *Socrates* and the *Columbia* with their respective tenders and, at most, two of the express cars, to be on the bridge at the same time. (As noted earlier, express cars resembled baggage cars but carried more valuable freight.)

So, when the wheels of the *Socrates* reached the western abutment of the bridge, nine of the eleven cars that made up the train, including all those in which passengers were riding, had yet to reach the eastern end of the bridge.

No one aboard the train, whether crew or passengers, could have imagined that in only a few moments they'd become part of an epic, historic, and absolutely horrifying railroad disaster — a railroad disaster for the ages.

Even though the wind from the winter storm was howling through the ravine and around the bridge, McGuire was still able to hear a loud, sharp, sickening crack at the moment the *Socrates* reached the western abutment of the bridge while most of the cars remained on the tracks east of the bridge. McGuire initially thought the cracking sound might have been an exploding torpedo though he doubted that anyone would've placed a torpedo on the tracks only a few hundred feet from the station.

(Torpedoes, which were called railway detonators in the United Kingdom, were used to warn an approaching train of a unspecified danger ahead on the line. The coin-sized torpedoes exploded with a loud bang as the wheel of a locomotive moved over it. A railroad worker used two straps to secure the torpedo on top of the rail.)

McGuire then felt such a strange sensation that he later could only explain it by thinking the *Socrates* was suddenly "running uphill" even though it was still on the bridge. The reason for the brief, though strange, sensation McGuire felt, unfortunately, became only too obvious when he realized the loud, sharp crack he heard wasn't a torpedo but was, instead, the Ashtabula River bridge buckling, cracking, and splitting apart directly below the *Socrates*.

He realized instinctively it was pointless by that time to put the *Socrates* in reverse so instead he didn't hesitate in opening the throttle valve to give the *Socrates* full steam to drive it forward and hopefully get the train over the bridge that was collapsing behind him. It was his quick thinking that was enough to prevent the *Socrates* and its tender from falling with the collapsing bridge and, furthermore, preventing a derailment when both were put back, more-or-less, onto the track.

Although McGuire coaxed the *Socrates* and its tender to the relative safety of the abutment, the same couldn't be said for the trailing locomotive *Columbia* and the rest of the train. As McGuire was stopping the *Socrates*, the *Columbia* had been

pulled forward by the *Socrates* until it struck the abutment where, for one agonizingly brief moment, only the coupling rod prevented the *Columbia* from falling the 80 or so feet onto the wreckage of the collapsed bridge and the frozen Ashtabula River.

As the name suggests, the coupling rod was used to keep a railcar connected, or coupled, with the railcar behind it. In this case, a coupling rod was connected with the trailing locomotive, the *Columbia*. A coupling rod, however, wasn't designed or intended to prevent a car, let alone something as heavy as a trailing locomotive, from falling off a bridge.

The problem was exacerbated because the rear wheels of the tender didn't get back up on the rails. Only a short time passed before the weight and stress became too great for the coupling rod to handle, and when it was no longer able to hold the *Columbia* to the *Socrates*, it snapped in two.

In a night of horrors that was only beginning, McGuire looked to the back of the train and saw the *Columbia* and the first passenger car to which it was coupled, disappear into darkness along with the collapsing the bridge. The remaining ten cars, each coupled with the one before it, also dropped about 80 feet down, one after another with a sickening, thunderously loud crash, into the deep snow covering the frozen river.

Gustavus D. (G. D.) Folsom, who was the engineer on the *Columbia* and survived the disaster, later testified before The Legislature of Ohio Joint Committee Investigation (the Joint Committee) about the collapsing bridge and the moment his *Columbia* began its long 80-foot fall onto the frozen river: [1]

Gustavus D. (G. D.) Folsom testimony:

> I was on the Columbia, the second engine drawing the train. As near as I could judge I was about two-thirds of the way across the bridge. The bridge began gradually to sink and to swing to the south, and then it recoiled and went to the north... It seemed that when the chord on the south side gave way the north chord recoiled and drew the bridge to the north. It was very sudden—the recoil was at the moment. The first sensation I experienced was the track giving away. I was applying the air brake very lightly. My engine struck the west abutment and seemed to be held a moment by the forward engine until the tender of my engine swung down against the side of the abutment. The iron express car shot under my tender while my engine seemed to be held. My engine fell on top of it. When my engine dropped down, striking the bottom, she turned over to the east endwise. The first I observed was both a settling down and a swinging to the south.

(See the "Investigations, Allegations, And Denials" chapter for additional testimony.)

The Collapse And Fall

Although the large, heavy iron bridge had obviously fallen, its collapse didn't happen all at one time but instead the bridge seemed to hang in the air for a moment until it began falling in a slow, sinking motion that began at the point where the weight and pressure was the greatest, which was the area directly below the *Socrates* and *Columbia* as well as at the west abutment near where the two locomotives had just passed over.

In an awful sound that reverberated throughout the ravine, the bridge crashed to the north side of the ravine onto the ice and the snow covering the river below. What remained of the once proud bridge now lay silent in a ten-foot high pile of iron rods, braces, and other debris across the ravine.

One surviving passenger reported hearing loud cracking sounds, similar to those heard by Daniel McGuire, before he also felt a sudden sinking feeling of weightlessness as the passenger car in which he was riding fell with the collapsing bridge and smashed onto the frozen river 80 or so feet below.

The swirling snow and darkness of the early winter evening prevented McGuire from seeing much of what happened behind him after he pulled the brakes on the other side of the bridge. However, he didn't really need to see anything because he knew the awful, chilling, distinctive sounds of cracking and crashing iron coming from what moments earlier had been the Ashtabula bridge meant only one thing. He may not have wanted to believe it, but he knew immediately what had happened.

Even though the sound of the collapsing bridge was thunderously loud and would seem to cancel out any other noise in the ravine, it wasn't the only sound he heard. He knew the continuing sounds of rumbling, crashing, and splitting wood combined with the thundering crash of steel meant only one thing: All the cars from the *Pacific Express* … including the express cars, baggage cars, sleeper cars passenger coaches, the smoking car, and even the *Columbia* … fell with the bridge into the ravine and onto the frozen Ashtabula River.

Railcars flipped and tumbled down to the frozen river into a tangled, several-foot-high heap of wheels, splintered wood, twisted steel, smashed debris, and broken human bodies. The noises and echoes reverberating through the ravine created by the train and bridge falling and smashing hard onto the frozen river were so loud that they were easily heard by people living at least a half mile away even though their houses were shut tight against the winter weather.

The first passenger coach landed in an upright position in the middle of the frozen river not far from the remains of the collapsed bridge. The second passenger coach was the next to fall, but the force of striking the hard ice turned it around at

an angle, and then it turned again onto its side among the rods and braces of the collapsed bridge and other debris. It was smashed into different-sized pieces from the impact on the frozen river.

When the coupler on both ends of the smoker car broke, the car fell from what remained of the bridge and struck the second passenger car with such a force it smashed deep into the car crushing everyone and everything in the second passenger car.

The palace cars followed, but they dropped clear of the abutment and because they were in a real sense launched out into the air to the left of the bridge with their trucks hurled beneath them, they landed in the center of the ravine.

The *Yokahama*, which was the first drawing-room car in the train, was also, therefore, the first to fall onto the frozen river, and the sleeper *Palatine* was the next to fall as it crashed down on the ice next to the *Yokahama*. Momentum forced the *City of Buffalo* sleeper car off the tracks until it, too, fell from demolished bridge and smashed across the *Yokahama* and the *Palatine*. This series of crashing, twisting, and turning knocked the *Yokahama* onto its side, thereby crushing that side of the car, and virtually everything inside it. The *City of Buffalo* smashed onto the ice on its forward end, with its rear end resting high in air on the *Yokahama* and the *Palatine*.

The other express cars and two baggage cars also fell to the side of the bridge but crashed onto the frozen river in a such a bizarre fashion that they formed an almost bridge-like line across the frozen river and the ravine with the rear baggage against the east abutment.

The first express car struck forward and downward, and landed at the foot of the abutment. The trailing locomotive *Columbia* then crashed onto it, though as noted earlier, it was completely turned around so its headlight was turned towards the train that it had been pulling. Some cars, despite falling such a great distance, landed in an upright position as if they were toys and a giant hand had placed them, though not so gently or compassionately, on top of the frozen Ashtabula River.

In G. D. Folsom's continuing testimony before the Joint Committee, he added more insight into what happened after the bridge collapsed: [2]

Gustavus D. (G. D.) Folsom testimony:

> Soon as my engine turned over I dragged myself out. I was sensible all the time. When I undertook to step I discovered my right leg to be broken. I dragged my self out to near the south corner of the old abutment. Every thing was quiet except the moaning of the wind, and it was dark. When I got half way from my engine to the abutment I called my fireman. At the second call he answered, and said "for God's sake take this off me so I can get up." I told him I could not aid him, but would halloo. I hallood four times, and received no answer. Every thing was still and quiet. I then pulled myself up to the abutment. The next thing I noticed was the fire breaking out near the east abutment on the north side. Up to that time I had neither seen or heard any one

The Immediate Aftermath

THE CITIZENS IN AND AROUND Ashtabula did heroic and remarkable work in the hours and days following such a massive railroad disaster, especially considering the snow, cold temperatures, size, and extent of the unexpected disaster. As noted earlier, the people in Ashtabula fought their way through the deep snow and cold to reach the disaster scene and to offer any help they could. It's likely the death toll would have been much higher if it weren't for the invaluable assistance of these average citizens who worked with limited resources, knowledge, experience, or training in such a hostile, dangerous environment to rescue and care for strangers.

Tending To The Survivors

First responders usually consider the following to be the most important critical steps when they first arrive at a major emergency:

1. Assess the situation
2. Get everything under control
3. Organize rescue efforts

Unfortunately, no one in the critical moments following the Ashtabula Disaster was either willing or able to take charge in starting any of these steps at the disaster scene. The few men who were among the first to arrive at the disaster scene immediately began to do what they could, but as other men arrived to offer help, they needed direction on what to do and how to do it. Furthermore, some people arrived who were far more interested in checking out the disaster scene than in helping but their curiosity only got in the way of those wanting to help. In other words, there was no one there who could assess the situation, get things under control, and get rescue efforts organized.

In the meantime, a much less honorable group also arrived near the disaster scene: Those interested only in robbing and stealing from the dead and injured passengers or plundering and looting from the disaster scene before escaping into the night. (See the "Villains And Looters Arrive" section later in this chapter.)

Although no one was yet taking complete control, one early, quite logical, decision was to remove the injured from the disaster scene to the engine house located on the riverbank; it was, however, a fairly easy decision to make because it was the only building at the bottom of the ravine. (The engine house, as noted earlier, was used to pump water from the Ashtabula River to the village.)

The engine house was turned into what first responders today might call triage room where the severity of the passengers' injuries could be determined so the most seriously injured passengers could be handled first. The small, dingy engine house was, however, far from ideal as a triage room, or staging area, considering the seemingly endless number of severely injured passengers being placed on its cold, stone floor. There was, however, no alternative.

As more people from Ashtabula arrived at the disaster scene, and the engine house in particular, they were shocked not only by the sheer number of injured passengers but perhaps even more so by the severity of some of the ghastly injuries. Only a few injured passengers weren't groaning or screaming from the pain their injuries were causing; even those with much less serious injuries were whimpering in pain while calling out for family members. Regardless of the severity of their

injuries, all were suffering from shock that was made worse by the bitter cold and conditions in the engine house. It was unlike anything the people of Ashtabula had ever seen before.

The injured were laid out on the floor but space had quickly become a premium as a steady supply of injured passengers continued arriving at the door of the engine house. It was obvious that something had to be done before available space completely disappeared so a decision was made to move the passengers with less serious injuries, especially those who could walk on their own, from the engine house to another location in Ashtabula.

Therefore, any injured passengers who could climb the steps to reach the top of the ravine were taken out of the engine house and began climbing the steps to the top of the ravine. However, the more seriously injured passengers, for example those unable to walk, would have to be carried or otherwise helped up the steps to the top of the ravine. These steps were rickety, narrow, and snow covered and definitely not meant for anyone helping or carrying seriously injured passengers out of the ravine. Even the strongest men helping the injured passengers were exhausted by the time they reached the last step at the top of the ravine.

However, access to the disaster scene was even more dangerous, dizzying, and precipitous from the other side of the ravine because there was no path, no stairs or steps leading to the top of the ravine. Instead, the only way to the river on this side of the ravine was walking and climbing through brush, deep snow, and down the steep bank.

It took time to get some semblance of organization and to find enough men but eventually a line of men was formed on both sides of the ravine so the injured passengers could be passed from one man up the ravine to the next man, similar to a human chain or bucket brigade. Any passengers too injured to walk, and there were many, were carried by the people/rescuers up both sides of the ravine. It took time along with an impressive amount of strength, determination, until most of the injured passengers were taken away from the dismal engine house to the top of the ravine.

As the injured and uninjured passengers were making their way up the sides of the ravine, the next decision was where to take them once they reached the top of the ravine. Because Ashtabula didn't have anything resembling a hospital at the time of the disaster, the injured were eventually taken to several businesses in Ashtabula. Several injured passengers, for example, were taken to the Eagle Hotel operated by Patrick Mulligan.

Even though the Eagle Hotel may have been called a hotel, the term was used rather loosely and very inaccurately because while it was deplorable and unsavory before the disaster, it became an appalling place during the hours and days following the disaster.

The uncarpeted bedroom floors and hallways in the Eagle Hotel soon became slippery from the melted snow tracked in from the boots and clothing of the people entering and leaving the hotel. The melted snow, however, wasn't the only thing making the floor dangerously slippery that night — the pools of blood dripping from the arriving injured passengers made the floors even more hazardous for everyone walking through the hotel.

The bedrooms in the Eagle Hotel were, to say the least, tiny, and basic with barely enough space for a small bed and washstand. The rooms didn't have any stoves to provide heat, which certainly was needed, and would have been much appreciated by the injured passengers throughout the night of the disaster. Small rooms and little to no heat were only unpleasant compared to the beds, which consisted of straw ticks, being covered with filthy, disgusting sheets. (Straw ticks weren't a type of bedbug but instead were mattresses made from a coarse cotton material, or shoddy, and usually filled with straw.)

The conditions at the Eagle Hotel were anything but antiseptic and becoming less antiseptic as each minute passed. The injured, who were laid two-by-two on the wretched floor, were cold, covered with blood, frightened, and still wearing their tattered clothing that was also covered in blood and body tissue — though not necessarily their own. Most were in shock, and many were near death as they drifted in and out of consciousness.

Despite its appalling conditions, the Eagle Hotel had one critically important advantage in the minutes and hours following the disaster: It was very close to the railroad tracks, the collapsed bridge, and the disaster scene. Therefore, it could serve as a base of operations where the injured passengers, many still bleeding from serious lacerations and other injuries, others with broken bones, some internal injuries, and all in shock, could be quickly taken.

Several groups of people pushed their way through the narrow halls of the Eagle Hotel throughout that long, dreadful night even though they weren't there to offer help, or to even have a kind word of comfort. They instead were there to walk past room after room and silently stare in morbid curiosity at the injured passengers. On top of everything else that happened to them, the injured passengers, who in addition to their injuries, and anything else that might have happened to them, began losing privacy, even their dignity, at the Eagle Hotel. It's not unreasonable to believe that it was this lack of privacy and dignity that led some injured passengers to lose any remaining hope of survival.

Furthermore, even though some surviving passengers were fortunate to be taken to rooms at better locations, or at least better rooms at the Eagle Hotel, some of them were robbed of the money they had in their pockets by the same men who were in reality only pretending to help them to the better rooms. (See the "Villains And Looters Arrive" section later in this chapter for other similar examples.)

A road of sorts was finally cleared through the snow to an area near where the bridge once stood. Even though it required a great deal of work and effort for both the men and the horses to complete, it had to be done so sleds could then be taken down the ravine to the disaster scene and the more severely injured passengers could be removed from the disaster scene to the top of the ravine. It was a scene that was repeated many times, not just because there were so few sleds, but because there were so many injured survivors waiting to come up from the ravine.

Two small, frightened children who were in a great deal of pain from being badly burned after escaping from a pile of flaming wreckage were laid gently on a sled. The sled was fortunately large enough for their father to ride with them so he could do his best to comfort both boys. Once the children were at the top of the ravine, the three were taken to a private house. The boys' mother, who was gravely injured, was taken to another house where she spent the night in agony slipping in and out of consciousness. She died the following day.

Much of the intense pain a young girl was experiencing from several broken bones was replaced by fear and anxiety after she was separated from her aunt, and put in the care of strangers in what had to be for the girl a scary situation in an unfamiliar town.

A severely injured father, who was laid out on a stretcher, became quite agitated and hysterical when he saw strangers taking away his daughter without telling him where they were taking her. Despite his injuries, he frantically screamed at the strangers to bring her back to him.

The situation was confusing even for those who were able to walk to the hotel who thought they were being followed and closely watched by people as they walked to the hotel. Their concerns, however, were justified because some of them were indeed closely followed by people who weren't there to offer any kind of help, but were waiting for an opportunity or the right time to rob them.

The last of the surviving passengers, who were those unable to make it up the steep banks by themselves, were finally removed from the disaster scene, which might be better described as a valley of death. The less serious injuries included bruises, gashes, and lacerations but many others had broken bones and likely various severe internal injuries, though internal injuries were difficult to diagnose in 1876.

These survivors were taken to the hotels in Ashtabula where the seriously injured were put on sofas and beds and the less serious sat on the chairs or benches.

After the hotels became overwhelmed to the point that all their sofas, beds, chairs, etc., were taken by the injured survivors, virtually every building in Ashtabula was turned into a hospital of sorts. The injured passengers were laid out on the counters in the stores, the tables in the saloons, and the floors of private homes while waiting treatment by the doctors and surgeons.

It may have been frantic and confusing wherever the injured passengers were receiving whatever treatment was available, but much of the disaster scene had become oddly quiet by 12:00 midnight, which was only about 4½ hours after the bridge collapsed. The people who stood at the top of the ravine and on the abutment to watch the activity left the smoking ruins, and what might have been a bizarre scene on any other night, walked in the snow through the village and gradually disappeared into the night.

Even the members of the Ashtabula Fire Department scattered and eventually went home; the engine house was also silent and empty.

Other than a few men left behind to offer a modicum of protection, or at least the appearance of guarding the disaster scene, the disaster scene on the frozen river became a very lonely, bizarrely quiet, spot as the dead passengers remained there alone.

Not all of the disaster area, however, was completely quiet or still. Perhaps only the best of Hollywood directors and creative people could have come up with a scene equalling what was in Ashtabula the night of December 29, 1876. Yet what happened to the bridge, the train, and the passengers was real.

Some bits and pieces of what remained of the *Pacific Express* were still burning in the ravine and river. The flickering flame, which was in reality more of a funeral pyre, provided the only light, though an unearthly light, through the snow and smoking ruins.

It wasn't only the bodies of the dead passengers that lay in every direction in the still falling snow, but various body parts were also scattered in and near the wreckage. A skull, for example, that was bleached whiter by the heat of the flames

was easily spotted in blackened, burned heap. Several bodies were left behind to smoulder in their burning graves inside the wrecked cars. It must have been a truly horrible and grotesque sight for the men passing by because it led to the macabre sensation the bodies were staring through their blackened eyeless sockets back over the burned wreckage.

Many adjectives have been used to describe the disaster scene but one part of the disaster that was difficult, if not impossible, for people, even reporters, to describe accurately in print at the time was the smell of the burned flesh other than the smell was so intense it filled the air even a half a mile away.

Many of the people who'd gathered during the evening at the top of the ravine came to help even if it was in some small way following the news of the disaster. However, not all came to help but instead watched in macabre fascination as the decision was made to leave the bodies of the dead passengers to simply burn in the remaining fires.

Heroes Emerge

It wasn't all despair or forlorn hope near the disaster scene because heroes, fortunately, always seem to show up in any disaster. We certainly saw it in the 9/11 terrorist attacks and more recently in the 2018 wildfires in California and the April 15, 2019, Notre Dame Cathedral fire. The heroes are, in many cases, average people with little or no training but who have an innate desire to help.

The Ashtabula Disaster was no different and the disaster likely would have been much worse, and the list of fatalities greater, if it wasn't for their help. Citizens, for example, formed a bucket brigade in a vain attempt to control the fire. Other citizens valiantly braved the brutally cold weather, snow, and ice, and in particular the fire, to help the passengers — strangers — to safety.

The citizens who weren't able to help at the disaster scene instead helped in other ways, particular in opening their homes to be used as makeshift medical centers and emergency rooms.

Many of the heroes who emerged during the disaster were passengers helping out injured passengers. Marion Shepard, who was traveling alone, was one of many who risked their lives to help their fellow passengers. The story of her personal will to survive was detailed in the "A Fiery Hell On The Ice" chapter but she was also was hailed by a fellow passenger as a true hero and one of the bravest women he ever met. Keep in this mind this was 1876 when women weren't expected to play the role of heroine in a major disaster. A male passenger said Shepard "was very cool and collected, and she acted in a heroic manner. She helped the women out, and while I was trying to get the men out, she was on the outside smashing the windows with a piece of timber, clearing the way for those inside." {1}

Her encouragement and efforts were similar to those of the "Unsinkable" Molly Brown, who is best remembered during the 1912 sinking of RMS *Titanic* for encouraging the crew in Lifeboat No. 6 to return to where the ship sank and look for survivors.

Another passenger wrote the following glowing terms about her heroic efforts following the disaster: {2}

"She was one of the bravest and best women I ever met. She got out by herself. When I at last came out of the Palatine, after I was satisfied that there were no more persons in the car, the gentlemen who had had their legs broken were still lying within a few feet of the burning cars, and their lives were now again in jeopardy.

"To save their lives was my next endeavor. I couldn't take the two at once. So I took hold of one and dragged him some thirty feet away. Poor fellow! he had several ribs broken, and his ankle was swollen to three times its size. I was very weary at this time. The fire was all the time encroaching, more and more, and the agonizing cries of suffering and burning humanity were hushed, as they suffocated or the cruel flames sent death to relieve them. I got my man away, but the other was still there. This one was delirious from pain and excitement. I was anxious for both. A citizen from Ashtabula came along, and I asked him to watch my charge while I brought back the other to a place of safety. He said he would. I had just reached the other man, when I looked around and saw that the citizen had deserted his post. But there stood Miss Shepard by me. We stood in full eighteen inches of snow and six inches of water, the ice having been broken and crushed by the cars. She said coolly, 'Can't I do something to help you? I am uninjured.' I got the other man away to a place of safety, some twelve feet back from the car. It wasn't over seven minutes after the fall before our car was burning, too." Mr. C. E. Torris says: He saw her standing on the ice and dipping her handkerchief in the water and washing away the blood from the face of a wounded man. And the citizens of Ashtabula also speak of her, and say that it seemed so strange to see her, while all the rest were wounded and bleeding, moving around the engine room, assisting in every way, calm and self-possessed. She seemed more like some good angel who had been sent at such an hour to bestow the gentle ministration of her sex upon the suffering."

A passenger's account concerning Marion Shepard's heroic efforts

As noted earlier, John P. Manning (head telegraph operator) and his assistant Charles B. Leek were the two telegraph operators who worked feverishly at the Ashtabula station almost immediately after the disaster occurred.

Their work in sending telegraphs in which they pleaded for medical help and, just as importantly, stopped other trains making their way to Ashtabula and the collapsed bridge was obviously critical in saving lives. They requested a relief train to be sent to Ashtabula as soon as possible with doctors, especially surgeons, and as much medical supplies as could be loaded quickly.

Manning and Leek faithfully performed their duties and remained in their telegraph office at the Ashtabula station for an impressive 50 hours, with no breaks or rest. Their telegraph seemed to be constantly clicking and buzzing as they sent out news about the disaster, including as much information as they had at the moment on casualties, deaths, and destruction. Their reports and updates were spread throughout the United States and into Canada. It seemed the only time the clicking coming from the telegraph office was silent was for a few moments when Manning or Leek waited for any responses to the messages they sent.

Charles Leek was the first African-American telegraph operator in the United States and needed only five weeks of training from John Manning to be a telegraph operator, which was the shortest time ever needed for a an LS&MS telegraph operator.

Leek's skill and dedication as a telegraph operator wasn't overlooked by the LS&MS. He was later promoted to the head of telegraph operations in Ashtabula and had several white men working under him — an impressive, and rare, circumstance in the late 1800s.

It Was Grisly Work Indeed

After all the injured passengers were taken from the disaster scene to safety and medical care, the enormity of the disaster, despite the midnight hour and the gently falling snow, finally hit home to those standing at the top of the ravine. They were staring at an absolutely horrid sight. The ravine had become a bona fide valley of death: dead passengers, various human body parts, and pieces, large and small, of a wrecked train, and a destroyed bridge, were strewn in several piles across the frozen river and ravine.

It was only a few hours earlier that the cars of the *Pacific Express* were gilded palaces on rail but were now little more than spiderweb-like twisted pieces of twisted iron and metal. The flames that had burned so bright and reached so high in the dark, wintery sky, also burned so hot they'd consumed all the wood and fancy furniture of the passenger cars. The trucks and wheels and heavy rods of the railcars were scattered randomly in every direction on the frozen creek or in the water after the ice melted or broke under the weight of the debris. The bridge, which had stood above the Ashtabula River for several years, had become little more than a mere network of blackened beams in large piles on the frozen river.

However, as noted already, the burned, blackened bodies of men, women, and children — some bodies were still burning —still remained trapped beneath the piles of wreckage that were spread across the snow and ice.

As the Reverend Stephen D. Peet wrote in *The Ashtabula Disaster* (1877), "Blue tongues of fire shot here and there amid the blackened mass, as if some unseen monster were still licking up the life of its unburied victims."

It wasn't only the sight of the bodies of the dead passengers that were laid in what at the time resembled little more than an open grave on the river bank near the abutment of the collapsed bridge, but it was also the thought of the burning bodies, which was made inescapable by the smell, that was so overwhelming for those watching from the ravine. The bodies were found jammed and stuck under twisted trucks and brakes, and heavy bars, and the debris of wood and the ashes of the wreck. Other bodies were crushed, broken, and blackened by the smoke and heat and simply packed in a horrid mass.

The dead passengers seemed to everywhere throughout the ravine, some remained hidden in the dark of the wreckage though other bodies could be seen thanks to the pale flames that flickered here and there.

The soft, gentle form of a young mother was found next to (presumably) her small child, though it was initially difficult to tell the forms were human because both were little more than blackened, burned lumps.

One area of the disaster area was also littered with headless, armless abdomens while only short distance away workers found the missing arms and legs. It was an awful sickening sight even for those who may have seen in the carnage of war. The dead, however, didn't die in a war, yet very little, if anything, resembled a human form. For example, only the head and abdomen of a woman were found in one area of the wreckage though the torn flesh clinging to the bones of its severed arms were found nearby as were the legs that had been crushed and ripped away after the poor woman's passenger car fell from the collapsing bridge.

Men who only hours earlier were able-bodied and hard-working were now sliced in half, missing legs, arms, heads. Even more revolting was the brain matter that oozed from the decapitated heads scattered about in this horrid area.

Yet the workers walking in the area had to remember these pieces of separated, mutilated body parts made up a living human being only a few hours earlier.

Some bodies were packed in heaps below the burning cars in the midst of the horrid bars of iron, on the black, deceitful ice. Other bodies were either stuck in the ice or below the ice of the Ashtabula River.

It had to be an appalling and terrifying scene for anyone who was there and checking through the debris. Few, if any, of the LS&MS workers had any experience in handling such a large disaster or dealing with this type of widespread human carnage, particularly in the darkness and loneliness of the ravine.

It also wasn't easy, though on a much different level and reason, for those waiting at the train station or elsewhere in the area. The long night seemed endless for the worried, nervous family members and friends of the passengers who were waiting for news — any news — coming from the frozen river and ravine.

The LS&MS Officials Finally Arrive

Several Lake Shore & Michigan Southern officials, including the LS&MS superintendent, the LS&MS assistant superintendent, the train-despatcher, and other officials finally arrived in Ashtabula at about 1:30 a.m. on special trains. The railroad officials were accompanied by five surgeons from the Homeopathic College in Cleveland. (Keep in mind the terms "doctors" and "surgeons" were often used rather loosely in the 1800s.)

It soon became very crowded, busy, and loud inside and near the station. The LS&MS railroad officials were almost immediately overwhelmed the moment they arrived at the station by people demanding answers and explanations about what happened to the *Pacific Express*. Some of the people were asking more general questions about what happened to the bridge and the *Pacific Express* but others were demanding specific information on the whereabouts and conditions of their friends and family members who were on the train. Newspaper reporters, who'd already gathered at the Ashtabula station, also began asking the same and similar questions of the LS&MS officials the moment they showed up at the station.

The division superintendent, who was one of the LS&MS officials to arrive in Ashtabula, was someone the families and friends of the passengers, as well as the newspaper reporters present, were confident would have the necessary answers to all their questions, concerns, and complaints. They believed the position of division superintendent gave him a great amount of authority in the LS&MS. (The division superintendent was responsible for track maintenance and oversaw scheduling and other duties contributing to smooth traffic flow between destinations on a specific section of the line.)

The division superintendent likely fully comprehended the enormity of the disaster better than most of the LS&MS officials present in Ashtabula, both from a human viewpoint and a railroad viewpoint. He was trying to reassure the friends and families of the passengers, as well as newspaper reporters, that everything possible was being done to care for the injured passengers. He was, however, also an LS&MS official, and undoubtedly under a great deal of pressure from the railroad to provide as little information as possible about the disaster. He, therefore, had to choose his words very carefully, particularly when speaking to the reporters.

The injured passengers had already, as noted earlier, been removed from the disaster scene and taken to various locations in Ashtabula, including the Eagle Hotel, by the time the surgeons arrived.

The doctors in and around Ashtabula had already worked on the passengers with less serious injuries, such as setting simple broken bones in a splint, dressing the wounds, or applying tourniquets to stop any bleeding. They then waited, as did the seriously injured passengers, for the surgeons from the Homeopathic College to perform more specific work, which would include any necessary amputations.

However, when the Homeopathic College surgeons arrived in Ashtabula, their first priority was to check on the conditions of the injured railroad employees before checking the conditions of any passengers.

A common method of treating badly broken bones or badly cut or mangled limbs in those days wasn't performing surgery to stop the bleeding or suture damaged flesh but instead was by quick amputation.

Some passengers and injured crew members of the *Pacific Express* had been taken to other locations. Peter Levenbroe, who was the engineer on the trailing locomotive *Columbia*, as well as other passengers who needed more medical care, were taken to private homes.

The most seriously injured passengers were, for example, taken into one small house where they were to be treated by several surgeons and doctors who worked simultaneously, though the work typically involved amputating legs or arms. The surgeons worked as fast and as best as they could under miserable circumstances and pressure. As soon as they finished treating one victim, they immediately began working on the next one. Just about anything to do with cleanliness, sanitary conditions, or germs was either unknown, forgotten, or ignored. The doctors hurriedly dressed the wounds and washed away the blood. Many of the injured were wrapped in warm coverings.

About 20 of the more seriously injured, including Peter Levenbroe, were transferred to a hospital in Cleveland later that morning. Levenbroe's injuries, however, were much too serious to be treated at the time and he died later in the hospital.

Meanwhile, as the injured passengers were being treated and moved during the night, the fire in the ravine was allowed to continue burning despite bodies still trapped in the wreckage.

As awful and dreadful the disaster scene was for anyone walking or working in the ravine that night, it became an even ghastlier scene as dawn broke on December 30 when, for the first time, the enormity of the horror of death became clear to everyone. Even the few people who were unaware of the disaster woke up as if from a fearful nightmare once they learned of the extent and absolute horror of the great calamity.

The shapes of the dark, bare, and cold stone abutments and arches on each side of the ravine must have appeared quite odd without the missing bridge. Although they stood as graphic reminders of what happened the previous evening, it's unlikely such a reminder was needed. The nightmare was a sad reality and would continue to be so for many people for the foreseeable future.

Although people in the area pondered over the wreck and the debris, the main thing on everyone's mind that morning were the dozens of bodies still lying on the fresh snow. The great mass of ruins of what had been the bridge the day before and burned wreckage of the *Pacific Express* covered the men, women, and children who had come from different backgrounds and areas yet had all died together so violently. The crushed or burned bodies, and body parts, lay where they had fallen, or where they had been placed, in the hurry and confusion of the night.

At least two things were inescapable for anyone at or near the disaster scene: The odor of burning flesh filled the ravine and dead bodies were everywhere. The memories of the flames, those horrifying fearful flames and the pleading shrieks from those about to die within the flames, the ghastly wounds, the blackened bodies and the unknown, unburied dead.

Meanwhile some people searched the area, some in a desperate, though futile and often discouraging, effort to find missing friends or relatives, as other people, perhaps in frustration, wandered aimlessly around the ravine and the wreckage, seeking some answers to what happened to their friends or relatives.

Villains And Looters Arrive

In another in the series of controversial decisions, the LS&MS officials, and other officials, decided to leave the disaster scene unguarded for a time when they had also decided to allow the fire to burn itself out.

It was probably inevitable, but the controversial decision also led directly to other problems, the most serious of which was the arrival of looters and robbers.

Even though the scene was, as noted, gruesome, it didn't stop, intimidate, or even slow down, looters and pillagers from descending and taking whatever they could find from the unguarded disaster scene.

The terms looters and pillagers were perhaps too kind and generous because they were little better than human vultures by preying on the dead passengers, and by extension the families of those passengers. In many ways, they demonstrated less mercy, compassion, and respect to the victims than did the deadly fires that caused such misery.

It was obvious that the looters took what they could because so little was left behind at the disaster scene before they quickly and silently disappeared into the darkness. The weather and other conditions at the time made it close to impossible to determine how much looting and plundering occurred but the following are a few examples of the robbing, stealing, and looting that was reported:

- One passenger was known to have worn several pieces of valuable jewelry, including an expensive diamond pin, a commander's badge, a Sir Knight's pin, and more. However, when his body was discovered, no trace of the valuable jewelry remained except a cheap pair of celluloid sleeve buttons.
- Among the favorite items for robbers were pocket watches that could be easily and quickly removed from the chains.
- Jewelry stored in trunks was another favorite item for robbers. They didn't carry the trunks away from the wreckage but instead simply grabbed all the jewelry they could quickly put in their pockets and disappeared into the darkness.
- One passenger was carrying several thousand dollars in cash but when his pocket book was found near his body, the money was gone.

It wasn't only looters working at the disaster scene taking whatever they could find belonging to the dead passengers but it was also shameless robbers who wandered through the streets and buildings of Ashtabula and began stealing from the passengers too injured, scared, or both to put up any resistance.

A young man, for example, who had a large splinter driven through his collarbone was robbed of $300 at the Eagle Hotel where he was waiting for medical attention.

In another similar example, an injured man was being assisted by a stranger to a hotel in Ashtabula. The stranger, however, was an experienced pickpocket and took everything out of the injured man's vest pocket without the man realizing it until the stranger was long gone.

Pickpockets and average, unassuming people were among the more common robbers and looters but at least one injured passenger was being "treated" by someone claiming to be a doctor who had offered his assistance. However, the injured passenger became suspicious and wasn't afraid to threaten the fake doctor who was last seen running as fast as he could through the snow away from the area.

Although money, jewelry, watches, and similar valuables were favorite items, they weren't all that was taken from injured passengers, most of whom had already lost most of their possessions, if not family members, in the fire. One robber, for example, with no shame or embarrassment, casually removed the boots from an injured passenger and quietly slipped away into the darkness with the boots.

A boy survived the disaster but with serious injuries, including four broken ribs and a severe laceration in his head along with several contusions and cuts. This wasn't, unfortunately, the only problem for the young boy because his mother and sister were both killed in the disaster.

Despite the pain from his broken ribs, and from the laceration on his head, he was alert enough to understand the possibility that his condition made him a perfect and easy target for any robbers to exploit.

He wasn't certain if he was being affected by paranoia, shock from the disaster, the pain he was feeling, and loss of his mother and sister, or simple just fear of the men , or a combination of those concerns, but in any case he felt the need to protect what he had left.

He became especially suspicious when he noticed several unsavory looking men just standing and watching the area but not helping with the injured passengers. He still had his train ticket, his valuable watch, which had been given to him by his father, his mother's jewelry, and some cash.

Although it was painful and uncomfortable to do so, he turned around as best he could without attracting much attention until he faced away from anyone who might be surveilling the area. He dropped his watch down inside his shirt. He put some of his money in an inside pocket of his vest and the rest of the money in a pocket of his trousers.

A man eventually offered to help the injured boy climb up the stairs. The unknown man was quite helpful but disappeared as soon as they reached the top of the stairs. After a short time, another man came over to help — though he was more interested in helping himself. He apparently suspected the boy had broken ribs so he helped the injured boy in a way to cause such intentional great pain, the poor boy fell helplessly to the floor and almost passed out from the pain.

As soon as the tremendous pain subsided and he regained more of his senses, the boy found himself on the snow, with nothing more than the clothes he was wearing and the watch he had hidden; all his money and his train ticket to California were stolen. The boy was cold, scared, severely injured, without money, and truly alone after his mother and sister were both killed. He was eventually taken to a hotel by some kindhearted people who were legitimately trying to help him. They eventually helped him send a telegraph message back home to his father about the news of what happened to him, and unfortunately what happened to his mother and sister.

The flames that were responsible for so many deaths, so much horror, and so much destruction, also eventually consumed much of what the looters were hoping or expecting to find.

The relentless flames destroyed just about anything and everything that could be treasured by friends and relatives — and looters — whether it was the clothes, keepsakes, or other personal mementos of their dead friends or dead family members.

The fires were so hot and burned so intense for such a long time that, perhaps in a twisted, strange irony, the gold or silver in watches, rings, and other personal jewelry was melted into mere nuggets and much less valuable to the looters.

Even the heavy trunks, which perhaps baggage handlers were grumbling about earlier that day because of their weight, were completely burned and the contents, including fancy clothes or expensive jewelry of the wealthier passengers, destroyed.

A few people were found carrying stolen jewelry, particularly diamonds, while trying to escape from the disaster scene but those instances were isolated successes. The mayor of Ashtabula also appealed for anyone to return whatever they took, whether it was money or valuables, from the injured or dead passengers. About $1,500 worth of the valuables, which would be about $40,000 today, was recovered following investigations by police and detectives. A local saloon keeper was discovered to have taken shawls and satchels from the disaster scene.

FOOTNOTES AND REFERENCES

The Immediate Aftermath

1. Rev. Stephen D. Peet • *The Ashtabula Disaster* • (London, Ontario: J. S. Goodman—Louis Lloyd & Co., 1877) • page 142
2. Rev. Stephen D. Peet • *The Ashtabula Disaster* • (London, Ontario: J. S. Goodman—Louis Lloyd & Co., 1877) • page 143

The Nightmarish Morgue

The Nightmarish Morgue

AS SOON AS THE SURVIVING passengers could be removed from the wreckage and taken to relative safer locations, the LS&MS workers could begin their difficult, unpleasant, and gruesome job of removing the blackened, burned bodies, as well as the debris of the train and the bridge.

The phrase "disaster scene" was woefully inadequate in describing the area in which they were to work. The area was a confusing maze and heaps of twisted, sharp pieces of iron, along with broken trucks, and assorted debris of all sizes, shapes, and weights. Iron rails from the collapsed bridge were scattered on the ice. The maze also included heavy pieces of what had been the *Columbia* locomotive and broken tops of the smashed rail cars.

It wasn't only working in the dangerous conditions of the wreckage and debris because this type of recovery work in the 1870s would be difficult on solid, dry ground in the summer months, but this was late January in northern Ohio following a series of blizzards and frigid temperatures.

Furthermore, most of the recovery work in this disaster would be done on the slippery uneven ice of the frozen Ashtabula River.

To make it safer, if not easier, for the LS&MS workers to do what needed to be done on the frozen river, the Lake Shore & Michigan Southern used one of its trains to bring in several long wooden planks for the workers to put on the ice in an attempt to decrease the chances of slipping and falling. It wasn't a perfect solution but it did help and allowed the workers to perform their work more efficiently as they began carrying away heavy, bulky pieces of the wreckage.

This, of course, wouldn't be typical recovery work of carrying away pieces of wreckage following a train accident. It was also, on many levels, often a thankless job but at the same time it was physically and mentally difficult, at times tedious, and always dangerous. Death seemed to be everywhere and definitely had an affect on each man working the disaster scene. Although they were railroad men, and specifically LS&MS employees, they weren't trained recovery workers as we'd have working such a disaster today.

Although most of the Ashtabula River was frozen, several areas of open water remained that wasn't only obviously cold but might have been up to four feet deep. The LS&MS workers wore high rubber boots and waterproof coats when they worked in the ice, snow, and especially in the water. Even the slightest breeze combined with the ice, snow, and especially the cold water to make the work even more miserable and difficult.

The debris in the piles of wreckage was heavy and cumbersome; the iron was bent, tangled, and twisted together. Much of the debris in the wreck was, furthermore, stuck and wedged tightly in the cold Ashtabula River. The workers had to be careful not to get cut on the sharp pieces of metal and broken glass that seemed to be everywhere.

In addition to the Ashtabula mayor, who'd made several appearances at the disaster scene, other LS&MS officials at the accident scene assisting in the work included the superintendent of bridges and the train dispatcher. Charles Collins, who was the Lake Shore & Michigan Southern official responsible for maintaining the railroad tracks in and around Ashtabula, was seen weeping uncontrollably as he walked through the disaster scene. He perhaps felt that visiting the disaster scene was the best way of dealing with the grief, guilt, and sympathy he felt for

the passengers — not only those who died but also those who survived. (See the "The Disaster Claims Two More Lives" chapter for information on what ultimately happened to Collins.)

Although the Ashtabula mayor was at the disaster scene, he wasn't involved, either directly or indirectly, nor apparently even being consulted, about decisions concerning the recovery efforts the LS&MS had planned. Indeed, the responsibility wasn't even given to, or assumed by, any official, elected, medical or otherwise, from Ashtabula, but instead was the responsibility of an official of the Lake Shore & Michigan Southern.

As the LS&MS workers began removing some of the debris it wasn't unusual, especially as the began their work, to find bodies packed, virtually jammed, inside and under the debris as if the bodies and the debris had become one piece. Other bodies were found buried in the snow or ice under parts of the wreckage. These bodies were often frozen solid to various pieces of the wreckage yet had to be dislodged, removed, and taken from the wreckage.

The workers would also have to remove other bodies, many of which were mutilated, disfigured, and blackened by the intense flames. And that didn't take into account the overwhelming smell of the burnt flesh.

In addition to the planks and other equipment needed by the LS&MS workers at the disaster scene, the LS&MS also arranged a much more somber delivery: The delivery included several boxes in which the LS&MS workers were to place the dead bodies and various body parts.

Some of those working at the disaster scene may have been surprised by the sheer number of boxes that had arrived but other workers may not have even noticed considering what they'd already seen that evening. The bodies of men and women and, perhaps most difficult all, the children, were removed from the piles of wreckage and placed in the boxes with as much respect and dignity as possible by the LS&MS workers.

Because only authorized people, in other words LS&MS workers, were allowed at the disaster scene, relatives and friends of the dead passengers were forbidden to be near the wreckage and, therefore, not able to help carry the boxes containing the bodies that might be their family members. Only a few relatives and friends managed to be at the top of the ravine to view the recovery work for themselves.

In another in a series of questionable decisions, other relatives and friends who wanted to get to Ashtabula weren't even allowed to board trains bound to Ashtabula and were instead detained at the stations in other cities. On the other hand, it may have been better for them not to arrive in Ashtabula until the dead passengers were taken away from the disaster scene. It would have been cruel on many levels if the families witnessed the LS&MS workers discovering and removing the bruised, broken, blackened forms that no longer appeared human.

It was a different story, however, for other people who were allowed to stand on top of the ravine and watch, in macabre curiosity, the work being done far below them on the frozen river. But even some of them had to be shocked and stunned by the time the last blackened form had been removed from the wreckage.

The people on top of the ravine, however, were watching the work of removing the blackened forms from a distance. It would, however, be a different story for many people when the blackened forms were seen "upclose and personal" after they were taken to the nightmarish morgue.

The Freight House Becomes A Nightmarish Morgue

After the blackened forms of the dead passengers were removed from the disaster scene, they were initially placed on horse-drawn sleds and taken to the LS&MS Railroad freight house in Ashtabula.

Even the most talented author of horror novels, such as Edgar Allan Poe, might not be able to come up with a better scene for a macabre story. The freight house wasn't meant for anything but its intended purpose as a building for the railroad to store freight. It, therefore, wasn't a cheery place even on the most pleasant summer days, but in mid-winter, it was a cold, drab, and gloomy place that was made even more so when its doors were closed and the cold, quiet, darkness of the winter day settled into it. It seemed to be an appropriate building to serve as a temporary morgue for this horrible night in Ashtabula.

Very little time seemed to pass before the floor of the freight house was covered almost wall-to-wall with the ghastly sight of 36 bodies that were arranged, in open boxes, in a double line of rows along the sides.

Most relatives and friends, fortunately, weren't allowed near the freight house. It was, as it was at the disaster scene, probably just as well to keep the relatives and friends away to spare them viewing the awful, stomach-churning sight of the freight house turned dreadful temporary morgue.

The LS&MS workers in the freight house may have been too busy placing the lifeless, blackened bodies on the floor to notice but soon everyone in the freight house couldn't help but realize how awful their death had been. The bodies were

The Passengers Lost

Very few man-made disasters or accidents, or even natural disasters, have ever reached so far, or brought so much sadness and emotions to so many areas in the United States before or even after December 29, 1876. Simply put, never before was there such nationwide mourning for any deadly tragedy (We're not including war or terrorist attacks such as September 11).

Perhaps one exception would be the news surrounding the sinking of the RMS *Titanic* that occurred several years after the Ashtabula Disaster. In both cases, people across the United States couldn't wait until they got a hold of a newspaper so they could continue following every tidbit of news about the disaster. The Ashtabula Disaster was unprecedented in U.S. history, and it still remains one of the greatest railroad disasters, and indeed transportation tragedies, in U.S. history.

The following list shows that the passengers who perished in the Ashtabula Disaster called many locations home:

- Ohio (25 passengers)
- New York (23 passengers)
- Illinois (9 passengers)
- Massachusetts (7 passengers)
- Maine (5 passengers)
- Nebraska (2 passengers)
- Canada (2 passengers)

It, therefore, wasn't just a disaster in Ashtabula but in a real sense, was, indeed, close to being a national calamity at the time. (See the upcoming "Passenger Fatalities" section for more information.)

It's unfortunate that more information isn't available about most of these passengers. Most were likely enjoying the holiday week by visiting with family and friends. Some were clergymen, others businessmen, some were farmers. Some, sadly, were just children and had yet to begin fully enjoying their lives.

Most of the crew and passengers who died in the disaster were likely little known outside their communities or places of business. However, among the 92 passengers and crew members killed in the Ashtabula Disaster was a young couple whose bodies were never found or positively identified: Philip Paul Bliss and his wife, Lucy.

Philip Paul Bliss

The following is a short biography of Philip Paul Bliss, which is included in *The 1876 Ashtabula Disaster* because he was the most well-known of all those who perished in the Ashtabula Disaster. His death and the death of his wife, Lucy, was one of the more tragic events in a night of tragic events connected with the Ashtabula Disaster.

Although Philip Paul Bliss (1838-1876) was known as a bass-baritone Gospel singer and conductor, he's probably better known as a composer and writer of hymns. Even today you'll likely find his name in the hymn books at your local

church or chapel. Some of his best known include *Almost Persuaded*, *Hallelujah, What a Saviour!*, *Let the Lower Lights Be Burning*, *Wonderful Words of Life*, and the music for Horatio Spafford's *It Is Well with My Soul*.

Philip Paul Bliss (1838-1876)

Philip Paul Bliss was an American composer, conductor, writer of hymns, and Gospel singer. He wrote many well-known hymns, including Almost Persuaded; Hallelujah, What a Saviour!; Let the Lower Lights Be Burning; Wonderful Words of Life; and the tune for Horatio Spafford's It Is Well with My Soul.

Bliss and his wife Lucy were aboard the Lake Shore & Michigan Southern Pacific Express when it fell from the collapsing bridge in Ashtabula. Although Bliss survived the initial part of the disaster, he went back into the flaming passenger cars looking for his wife. No trace of either body was discovered.

Bliss was born in Clearfield County, Pennsylvania, in 1838. His father, Isaac, taught the family to pray daily but he also loved music and encouraged Philip to develop his passion for singing. His sister was Mary Elizabeth Willson, who was an evangelist as well as a gospel singer and composer in her own right. Bliss had little formal education but was taught lessons from the Bible by his mother.

Bliss met J. G. Towner, who taught singing, in 1857 and it was a fortuitous meeting for both because it was Towner who recognized Bliss's talent and gave him his first formal voice training. In another fortuitous meeting, Bliss also met William B. Bradbury, who persuaded him to become a music teacher.

Bliss took up an appointment in Rome Academy, Pennsylvania, in 1858. While in Rome he met Lucy J. Young, whom he married on June 1, 1859. She, too, came from a musical family and did much to encourage his music career. She was a Presbyterian, and Bliss joined her church.

He turned to composition when he was 22 years old, but didn't copyright any of his compositions. He was also an itinerant music teacher during this time so he went on horseback from community to community accompanied by a melodeon.

Philip and Lucy moved to Chicago in 1864. He not only became known as a singer and teacher, but also had time to write several Gospel songs. He was drafted for service in the Union Army with the 149th Pennsylvania Infantry but because the war was almost over, his notice was canceled after a few weeks.

He next accepted a position in 1865 at Root and Cady Musical Publishers, where he worked until 1873. He conducted musical conventions, singing schools and concerts for his employers. He continued to compose hymns that were often printed in his employer's books.

In another fortuitous moment, he attended one of Dwight L. Moody's revival services in 1869. The song leader was absent and the music was weak on that particular day, however, Bliss's voice stood out in the congregational singing. After the services, and the crowd was leaving, Moody met Bliss and his wife. Bliss said, "as I came to him he had my name and history in about two minutes, and a promise that when I was in Chicago Sunday evenings, I would come and help in the singing at the theater meetings." [1]

Moody was joined by others and urged Bliss to give up his job and become a missionary singer. Bliss decided in 1874 that he was called to the task of "winning souls." He then became a full-time evangelist. Although Bliss made an impressive amount of money from royalties to his music, he gave them to charity and to support his evangelical endeavours.

In addition to possessing an excellent singing voice, Bliss was also a renowned lyricist of Christian music. He'd written several Christian songs before joining the Moody team, and then wrote even more. Among the familiar hymns he wrote were *Almost Persuaded*, *Hallelujah! What a Savior!* and *Jesus Loves Even Me*. He also wrote the music to *It Is Well with My Soul*.

Bliss wrote the gospel song *Hold the Fort* after hearing Major Daniel Webster Whittle narrate an experience in the American Civil War.

Philip and Lucy left their two sons, four-year-old George and one-year-old Philip Paul, with one of his sisters and set off on their train journey aboard the doomed *Pacific Express* train.

Although the exact circumstances of Bliss' death will never be known, what is known is that he survived the crushing collapse of the bridge and the cars from the *Pacific Express* falling and crashing into the ravine and river. He was seen emerging from his wrecked car after climbing and wiggling his way out of the debris. He therefore survived the initial plunge down the ravine and ultimate crashing forces. However, as the carriages caught fire, Bliss was seen returning to the spot in the wreckage where freed himself minutes earlier in an attempt to find and free his wife from the wreckage. Unfortunately, the fire was too great and no trace of either body was ever positively identified.

The Memorial Services

By mid-January, almost three weeks following the disaster, Ashtabula village officials had to make decisions about what to do with, and for, the passengers who died in the disaster — specifically the dozens of bodies that were so burned, distorted, and blackened by the flames that relatives were unable to consider them as human let alone possibly recognize them as family members.

In other words, it wouldn't be the responsibility of the Lake Shore & Michigan Southern Railroad to take care of these unfortunate and unknown passengers but instead the responsibility fell to strangers in a small Ohio town.

The lateral system between the upper chords had the same defects as that between the lower chords, with this exception; the floor-beams had small lugs united to them, and they acted as struts.

No provision was made for holding the members comprising the braces in their places on the angle blocks, and your committee find that many of them were out of place before and at the time the bridge went down. The braces were greatly weakened by imperfect bearings and having their ends chipped off.

A careful calculation showed that the bridge laid down under a load not greater than was liable to be thrown upon it at any time in the ordinary and usual traffic over it. The south truss at the time of the accident supported only 95 per cent. of the weight of the one train on the bridge. The bridge carried a double track. It was so designed, and trains did frequently meet on the bridge. There being but two trusses when trains met, each truss must carry the entire weight of one train; and yet, with only 95 per cent. of the weight of the train on the south truss at the time of the accident, it gave way. A careful and patient calculation of the strength of the brace at the point of failure (third panel point from the west end of the south truss), and of the strain upon it under that load, shows that it had a factor of safety of only one and six-tenths (1.6), when ordinary, prudence and foresight required it to have a factor of safety of five ; and the upper chord from the third panel point to the center of the bridge, numbering from west end, had a factor of safety at the several panel points ranging from two (2) to one and two-tenths (1.2), of five.

There was one weight upon the bridge which has been overlooked, and did not enter into the calculation of the engineers, as an inspection of their statements will show, namely, the snow on the bridge at the time of the accident. The proof shows twenty inches of snow on the ground. It is probable that much of the snow had blown off the bridge; but what ever weight of snow or ice there was on the bridge would still further diminish the factor of safety in both the braces and upper chord.

In these calculations no allowance has been made for oscillation, jar or vibration under a rolling load, but the calculations are made, and the factor of safety arrived at, as if the load was quiescent. The truth is, the bridge was liable to go down at any time during the last ten or eleven years under the loads that might at any time be brought upon it in the ordinary course of the company's business, and it is most remarkable that it did not sooner occur.

It would be needless to say that any engineer would be derelict in his duty who did not provide in the construction of a bridge against wind, snow, ice and the vibration of a rolling load. They are as much to be anticipated and provided against as the law of gravitation.

Your committee are of the opinion that a third or centre truss in bridges carrying two tracks would greatly promote safety and security. The material of the bridge was good, and likewise the workmanship, with the exceptions before stated. There was material enough in the bridge, and a different disposition of it would have secured

five times the strength, and small and comparatively inexpensive additions in the way of diagonals on the braces and upper chord, and a securing of the braces to the brace blocks would have rendered the bridge secure.

It has been suggested that applying the air brakes while on the bridge, or applying the air brakes by the second engine while the first engine was using steam, produced such strains upon the bridge as to destroy it. Your committee are of the opinion that in the second case the strain would be upon the deck of the bridge, and would not affect the bridge itself. In the first case, while the tendency would be to push the bridge to the west, yet the force would chiefly affect the deck; that which would reach the bridge structure would be small; and there was no evidence found at the wreck tending to support such a theory.

The Legislature has no power to punish. it can only, if possible, pro vide laws which shall render less frequent such frightful calamities as that at Ashtabula, Ohio, and others that might be enumerated. The lesson taught by the failure of a highway bridge at Dixon, Illinois, resulting in the loss of sixty lives, should not go unheeded in Ohio.

In this view of the subject, and as instructed by the resolution, your committee has prepared a bill to regulate the construction and inspection of bridges in Ohio, hereto attached, and made a part of this report. The subject is new in legislation and new to your committee, and we doubt not the bill, though as perfect as we could make it, has still many imperfections, and we invite the scrutiny of the Legislature with a view to its improvement.

There are many and serious difficulties in the way of legislation on the subject. It is impossible to construct a specification in a law that will meet all cases that may arise; and then there are some worthy men who expect to remedy the evil of improperly constructed bridges by a higher general education and public sentiment, which shall promulgate, with sufficient force, a correct standard for bridges, rather than by compulsion through legislative action. There is a clashing of interest be tween bridge companies, between the owners of bridge patents, between engineers as to the best kind and form of structure, and between those who desire to put up permanent and durable work, and a class who can make more money by the erection of cheap and insufficient structures. In the bill your committee have tried to avoid this clashing by providing only for required results, leaving parties in interest to work that out by any design which ingenuity might suggest.

Interested parties will claim that the legislation is in the interest of engineers; but the object sought being to save the lives and property of the people themselves, it is believed this legislation will be sustained by public opinion, notwithstanding the friction that its enforcement may produce.

All the testimony taken before the committee is here with submitted.

In addition to what has been said of other engineers, in this report, we desire to mention Albert K. Howland of Boston; W. S. Williams of Canton, Ohio; Col. Becker of Pittsburg; D. W. Caldwell and J. E. Wright, Esqrs, of Columbus, as rendering us efficient and valuable assistance and advice in this investigation.

All of which is respectfully submitted.

Senate Committee:

A. M. Burns, Chairman

T. P. Brown

House Committee:

L. A. Brunner

W. P. Wiltsee

GEO. L. Converse

E. A. Stone

I. M. Barrett

Testimony Of Gustavus Folsom

Q: What is your name, age, residence, and occupation?

A: My name is G. D. Folsom; I reside at 346 Lake Street, Cleveland, Ohio, and am an engineer on the Lake Shore Railroad; my age is forty years.

Q: State whether you were on the engine at the wrecking of the Ashtabula bridge, and what was the first you noticed wrong at the bridge?

A: I was on the Columbia, the second engine drawing the train. As near as I could judge I was about two-thirds of the way across the bridge. The bridge began gradually to sink and to swing to the south, and then it recoiled and went to the north... It seemed that when the chord on the south side gave way the north chord recoiled and drew the bridge to the north. It was very sudden—the recoil was at the moment. The first sensation I experienced was the track giving away. I was applying the air brake very lightly. My engine struck the west abutment and seemed to be held a moment by the forward engine until the tender of my engine swung down against the side of the abutment. The iron express car shot under my tender while my engine seemed to be held. My engine fell on top of it. When my engine dropped down, striking the

bottom, she turned over to the east endwise. The first I observed was both a settling down and a swinging to the south. It was storming very bad. I could not tell precisely when I was on the bridge. I shut off steam about four or six rods east of the bridge. We were running at the rate of from twelve to fifteen miles per hour. My fireman oiled the valves after I shut off steam, and had finished oiling before I noticed the sinking of the bridge. It would take not to exceed thirty seconds to do the oiling of the valves. My engine, at the moment of the break, seemed to plunge forward as if to go down in that direction, and struck the west abutment. I felt the jar when she struck, and then the back end of the engine and the tender swung down. I seized the throttle ratchel with my right hand and the air brake cock and pipe with my left, and was hanging by my arms with my feet downward till my engine dropped perpendicular and struck the bottom. I did not hear any noise as of breaking before I felt the settling and observed the swinging to the south, but while my engine was swinging down against the abutment, or while she was hanging for the moment there I heard two distinct and heavy crashes, and I thought then, at the moment when I heard it, that the train and bridge behind me were going down ahead of me—that is, before I dropped down the face of the abutment. My engine may have made one revolution from the time I noticed the sinking and swinging to the south before I felt her strike the abutment. The wind was blowing terribly strong. I think it was the worst storm I ever experienced on the Lake Shore. I could not give any opinion of the strength of the wind. It came rather from the northeast. I think such a wind would produce a good deal of effect on a moving train. The train was of ordinary heft for that road. My engine was the Columbi**a.** The Socrates was ahead of me. The Socrates was a thirty-two ton engine, and the Columbia a thirty-five ton engine, exclusive of the tender. I had burnt, before reaching the bridge, three-fourths of my tank of coal. I carried nine buckets to ten of coal, each weighing 1,250 pounds—that is, when full loaded. I operated over the road about nine years. I don't know that I ever heard the safety of the bridge questioned. I never really liked the bridge. I can't say I considered it unsafe, or I never would have run over it; but I did not like the bridge. I noticed in passing over it at times a snapping as if the joints were settling together. I heard that snapping, so to speak, but did not feel it. It was not a rattle or continuation of sound, but it was a snap, and when heard it was over with. I never, before that night, noticed any lateral motion to the bridge in passing over it. The pop on the engine was self-acting, and would relieve the boiler of any undue pressure. Soon as my engine turned over I dragged myself out. I was sensible all the time. When I undertook to step I discovered my right leg to be broken. I dragged my self out to near the south corner of the old abutment. Every thing was quiet except the moaning of the wind, and it was dark. When I got half way from my engine to the abutment I called my fireman. At the second call he answered, and said "for God's sake take this off me so I can get up." I told him I could not aid him, but would halloo. I hallood four times, and received no answer. Every thing was still and quiet. I then pulled myself up to the abutment. The next thing I noticed was the fire breaking out near the east abutment on the north side. Up to that time I had neither seen or heard any one except the fireman. In one or two minutes three fellows came down by the abutment on the side where the stairs were. I sent them to relieve the fireman. They got him out. There were screams and cries for help shortly after I saw the fire. I remained about fifteen or twenty minutes near the abutment, and was then taken to the pump house. Before I was taken away the whole wreck was on fire and the noises had all ceased.

Q: What have you to say about your engine being off the track?

A: Nothing more than to give it an emphatic denial.

Q: Did you ever notice that snapping sound on any other of the bridges on the Lake Shore road?

A: No; I never did.

Testimony Of Amasa Stone

Summary of Stone's testimony

Amasa Stone was the former president of the Lake Shore & Michigan Southern Railroad (LS&MS). He admitted that he designed the bridge, but only directed the drawing of the plan. The details of construction, according to Stone, were given to Albert Congdon, who was supervised by Joseph Tomlinson.

Stone's full testimony begins below but an important highlight from his testimony included the following: "I have never constructed any other Howe truss bridge with wrought-iron braces, and know of no other anywhere in the country. When Mr. Rogers made the mistake of putting in the braces it was not negligence in permitting him to continue the superintendence of the erection of the bridge, for there was no other particular in which he could have made a mistake. It was not even unwise to permit him to continue. When the bridge was changed in correcting the mistake there were no more braces inserted."

Stone's Full Testimony:

The following testimony was given by Amasa Stone before the committee appointed by the Legislature of Ohio:

Amasa Stone, being duly sworn, testified as follows:

‡§ Questioned by Mr. Converse:

Q: What is your full name?

A: Amasa Stone.

Q: What relation do you sustain or have sustained to the Lake Shore Railroad Company, and for what length of time?

A: In the building of it, first as superintendent, for about two years. Became its president, I think, about 1856 or 7, and remained until 1867—that is of the Cleveland and Erie Division. Since that time have been director.

Q: What year did you become president of the company?

A: I can't state definitely. I think it was 1855 or 1856, perhaps,

Q: When was this so-called Ashtabula bridge erected?

A: I think it was erected [examines paper] in the autumn of 1863.

Q: Who was the designer of the bridge?

A: I designed the bridge.

Q: State whether you superintended personally in detail the work; and if not, to whom it was intrusted?

A: I only superintended in making its plans. The detail of the iron work was done by Albert Congdon. It was supervised generally by Mr. Tomlinson.

Q: Have you the original plan of the structure?

A: I have not.

Q: Where is it?

A: I don't know, but suppose at the office of the chief engineer, Charles Collins.

Q: Were there full written specifications prepared at the time, and if so, where are they?

A: There were all the specifications that are usually given for the construction of a bridge. I have a copy here of the bill of materials that was given for the bridge.

Q: Were there or not any full written specifications made at the time?

A: There were full specifications.

Q: By whom were they prepared?

A: By myself, except in some minor details.

Q: Where is that paper or specification?

A: Well, that paper, I have in my hand, is all that I would want.

Q: That is not my question. Where are the specifications that were originally prepared by yourself?

A: I can't tell you, sir. That is a copy [referring to paper in his hand] of all the material part of the specification.

Q: When did you see it last, the written specification, made in connection with the plan of the bridge?

A: I have seen nothing of it since the bridge was built, until within a fortnight that paper [referring to same paper] was handed to me.

Q: By whom was this paper prepared and handed to you?

A: It was taken from the order book of the Cleveland Rolling Mill Company, and handed to me by my brother.

Q: Do you desire to make this a part of your answer [referring to same paper]?

A: Just as you please.

Q: Did you make out a strain sheet, in connection with the plan and specifications?

A: I made up the figures at the time.

Q: Where is that paper?

A: I am not aware, sir. Not preserved, as I am aware of.

Q: Was it preserved until the bridge was completed?

A: I am not aware that it was—no longer than that [pointing to paper], until that was made out—the bill of materials was made out.

Q: What was the span of the bridge?

A: One hundred and fifty-four feet between bearings.

Q: What was the width of the bridge, including the chords from outside to outside?

A: Nineteen feet six inches—that is my recollection. It may have been twenty feet.

Q: What is the width of the bridge between the chords, lateral?

A: Either fourteen feet, six, or fourteen feet.

Q: What is the width of each truss?

A: It was two feet nine inches in thickness, and twenty feet in height.

Q: Do you mean from outside to outside?

A: Yes.

Q: From the lower edge of the truss to the upper edge?

A: Yes.

Q: What was the width or length of the panel, and how many were there?

A: Fourteen panels, of eleven feet each.

Q: Will you state to the committee whether there was any change of plans after the work was projected by you?

A: There was none.

Q: In the construction, was there any departure from the original design, in the size, or strength, or any of the parts?

A: There was no departure. As the bridge was finally erected, an error was made by the parties who were raising it, and it gave them a good deal of trouble; and when remedied, the bridge was put up as designed.

Q: What was the error?

A: They put in the braces flat-wise, horizontal instead of vertical.

Q: State whether there were lugs cast to receive the end of the braces?

A: My impression are that there were.

Q: How were those lugs cast to receive the braces, flat-wise or vertical, as you state?

A: Vertically, I designed it. I wasn't aware that there was an error in that in the detail.

Q: Were they not, in fact, cast so as to receive the braces as first put up?

A: I think not, sir.

Q: And were not the lugs chipped off with the cold chisel when the change was made?

A: They might have been. That is a matter I have forgotten about. It was an error in the detail of the work which I wasn't aware of, until I went down to the work, and found that the braces were wrong. If you will analyze that bill [in pointing to paper], you will see that it is impossible to put the brace in flat-wise.

It couldn't be got in as they are put in there. They just fill the entire structure from end to end, and putting it in flat-wise would not have filled it. They were designed to be put in as these [referring to paper].

Q: Was not the original design of those braces to be six inches in width?

A: No, Sir.

Q: What was the original design?

A: It was four by seven; that is my recollection. There was but one bill given, and that is correct.

Q: Can you state whether the lugs upon the brace blocks didn't show that they were to be six inches?

A: I can't.

Q: When, and how, did you first discover that the braces had been put in wrong?

A: I was advised that the bridge was going on very slowly, and having some trouble in raising it—didn't come together right; and I went down myself to see what the trouble was, and there discovered it.

Q: Was not that after the bridge had been raised, and, when let down on its own weight, it was found to be unable to sustain itself?

A: They had been to work at it for some time. It was not raised; they had been to work at it, and found trouble in raising it. When they were changed, I heard of no further trouble.

Q: You are not sure, then, that the change was made before the structure was raised finally?

A: Yes, I know it was.

Q: Who was intrusted with the supervision of putting the bridge in place?

A: My impressions are that Mr. Tomlinson started it. But he was so inefficient that I discharged him, and the work was then put into the hands of Mr. Rogers.

Q: What experience had Mr. Rogers in that kind of work?

A: How many years, I don't know. He had experience in raising constructions.

Q: Had he ever put together an iron bridge before?

A: I don't know as he had.

Q: Or since?

A: I don't know. No, sir.

Q: When you made the inspection yourself, did you not discover, also, that some of the main braces had been used for counter braces and some of the counter braces been used for main braces by Mr. Rogers in erecting the construction?

A: I don't recollect that. Some of the counter braces and the main braces are nearly alike, and might possibly have done so. That is the only error where that could be made. It would be impossible to bridge it any other way.

Q: If the lugs had been clipped off, and changes made, what was there to hold the braces in position?

A: The weight and pressure of the bridge coming together, bound by the vertical truss rods, would hold in place.

Q: Would not the least change of the truss-rods allow the braces to slip out of if there were no other fastening than their merely raising on a plain surface in the brace blocks above and below?

A: The unscrewing of a rod from its bearing would loosen them.

Q: In twenty feet of brace, set in a panel of eleven feet, how much would the rods have to be lengthened to allow it to drop out, if the brace blocks were plain?

‡§ Questioned by Mr. Burns:

Q: With the lugs chipped off?

A: An eighth of an inch would allow a counter brace to move; letting down inch wouldn't move it at all. The bridge would gradually come down to the edge.

‡§ Questioned by Mr. Converse:

Q: Would the dropping out of one or two counters affect the structure of the bridge?

A: It would not.

Q: How many counter braces could be dropped out of that bridge without its crushing?

A: My impressions are, if half of the counter braces were out of place, it would not affect it.

Q: What, then, was the necessity of putting in counters at all?

A: It enables the bringing of the bridge to a perfect bearing, and to receive a shock of a train at the highest speed.

Q: Do not the counters serve the purpose of carrying a large load to the further abutment from the load; and for that reason are they not absolutely necessary to the bridge?

A: As you go to the centre of the bridge, the counter becomes a main brace. Near each end of the bridge they have but little service to perform, otherwise than to receive a shock, as a train may strike it.

Q: If these counters were to drop out near the center of the bridge, would it not affect the structure of the bridge?

A: If they should drop out to a large extent—if several of them dropped out of place, it might.

Q: Would it not, in your judgment, if the bridge should carry a weight of three hundred tons above dead weight, result in the destruction of the bridge?

A: No, sir; you may examine any old bridge that has been up for a series of years, and that has never been screwed up, you will find two-thirds of the counter braces loose in that bridge. These matters, however, I speak of. I suppose you don't take note of this. This is not my testimony.

‡§ Questioned by Mr. Converse:

Q: I think he is taking everything. [The reporter.]

Witness: I give you that, having been an old bridge-builder. I give you the information.

‡§ Questioned by Mr. Converse:

Q: It is important.

Witness: It can be proved, by finding yourself the facts, in any old wooden bridge.

Q: Why was not some other means designed and provided for to hold both the main and counter braces in their old places, after the lugs had been chipped off, in changing the bridge?

A: The lugs were put on more for convenience in raising; the supposition being that the strain put on the braces, with the use of the screws, would bring so heavy a friction upon them that there would be no occasion for any lugs.

Q: I will ask you, sir, whether it is not the universal practice to provide some means for the holding of these braces in place?

A: Not that I am aware of.

Q: I will ask you, sir, if the authorities, without exception, don't require some means to be provided for holding these braces in place?

A: They were held by clamp bolts, at intersections. I suppose that would be sufficient to keep them in place.

Q: Question repeated by Mr. Converse.

A: I am not aware of such.

Q: Can you name a single authority who states that it is not necessary to provide other means than the mere pressure, such as lugs, etc.?

A: I never noticed an allusion to it.

Q: By any of the writers?

A: No, sir,

Q: If one-eighth of an inch in the lengthening of the tie rod allowed the counter to drop out, wouldn't it require some provision to be made to hold them in place?

A: The tie rod would not elongate an eighth of an inch unless it was too weak for this purpose, as they are tightened up five or six feet with a wrench, and intended to put upon the rod a much greater strain than the load itself.

Q: What was the lateral bracing between the lateral chord of the bridge?

A: [Examines paper.] Two and one-half by one-half inch.

Q: Flat bar?

A: Yes.

Q: How near together were they placed?

A: I don't recollect the number.

Q: Were they not at every other panel?

A: The panels might have been twice as long as the other panels, and they came together directly through the entire length of the bridge; they intersected each other; I mean, in other words, there was no place but where there were lateral braces.

Q: The question which I put was, were they not simply at ever other panel?

A: No, sir.

Q: Of the truss?

A: They were not at every panel; but the panel might have been longer than the vertical panels.

Q: Were they not twenty-two feet from these lateral braces?

A: In other words, you ask whether the panels were not twenty-two feet longer?

Q: No, sir; the brace in the lower chords?

A: No, sir.

Q: What distance were they?

A: They came together.

Q: How do you mean come together?

A: I will make a diagram. [Diagram made and shown to committee.]

Q: How far apart were the struts, between the lower chords of the bridge?

A: The struts where the diagonal braces were attached, do you mean?

Q: Any of them.

A: I don't recollect that; they might have been twenty-two feet.

Q: Now these rods, that you speak of as braces, two and one-half by one-half, were they not simply ties, instead of braces? Was it not tension employed, instead of compression?

A: Yes

Q: Will you explain what effect such a compression and tieing would have upon the lower chords of a bridge; is it not an element of weakness which would give it no strength whatever?

A: No, sir; on the contrary, it was on the principle of a perfect truss as applied would act, for the purpose designed.

Q: Let me ask you this question: whether these ties, that you speak of, didn't cross each other in the center of each of these lateral struts through the lower chord?

A: It is possible; but there were struts where the braces intersect at the chords.

Q: Are you sure on that point?

A: Yes.

Q: Have you a photograph of the bridge taken by the company?

A: Yes.

Q: Is it here?

A: Yes.

Q: Will you examine it and see whether you are not mistaken?

A: I don't think it will show that feature; those bottom laterals had but very little service to perform; the bridge would be very safe, even without any laterals there, it was so very thick.

Q: Would not the tie bars, bearing tensile strains, as you have stated, draw the lower chord nearer together? [Photograph of bridge referred to.]

A: No, sir; the whole weight of the bridge draws the trusses; there is great strain upon the chords, and makes them very stiff.

Q: Would it not have been much stronger if the tie-rods had been fastened to each of the brace blocks, so that the panel in the lower ends would have been of the same size as the panel in the chord?

A: That wouldn't have made material difference, unless the bar was larger.

Q: What was the size of the bridge?

A: I have known bridges to be erected — —

Q: What was the size of the strut between the lower chords?

A: That I don't recollect. My impressions are, T rails.

Q: Will you explain to the committee how the track and ties were supported on the bridge?

A: There were three seven-inch beams to each panel; under each rail there were three stringers, bolted together, lapping each other, six by thirteen inches or six by fourteen, I am not certain which. In addition to that there were two other stringers, I think the same size, near the outside of the bridge, upon which there were, when the bridge was constructed originally, three-by-four cross-ties spiked on to those stringers, on which the rails were.

Q: How were these iron cross-ties fastened to the upper chords of the bridge, if fastened at all?

A: My impressions are that they were fastened by loop bolts passing over the and then fastened underneath the top chords, the nuts resting upon the washer.

Q: How many of those beams were there to a panel, did you say?

A: Three.

Q: Please state whether or not the resting of those iron rails upon the top chord in the centre of the panel would not weaken the upper chord?

A: I don't think they would.

Q: Was it usual to have those beams resting on the top chord between the panels in the strongest bridges?

A: It has always been done ; yes, sir.

Q: What is the purpose of the upper chord 2 and what is the strain put upon it? What is the nature of the strain put upon it?

A: The nature of the strain of the upper chord is that truss [referring to photograph].

Q: In the carrying of live weight on the girder in the centre panel here, and straining in a different direction, don't it tend to weaken the upper chord?

A: It has always been regarded to be so minutely as to have no account taken of it.

Q: Isn't it usual to place these cross-beams to strengthen the panel?

A: The top chords are designed to be strong enough to do the duty.

Q: What was the size of the top chord?

A: Four-by-seven inch beams—five of them—parallel.

Q: What shape?

A: T.

Q: What was the size of the flange.

A: One-half inch thick, I think, by four.

Q: What was the size of the web?

A: One-half inch.

Q: Will you be kind enough to take your pencil and give us the surface of the iron on that chord, and tell us how much strain it will bear?

A: I wish to correct the size of the webs. The top chord varied from one-half up to one inch in thickness, being thicker in the middle and lighter at the ends.

Q: Question repeated.

A: Three hundred and seventy-five tons.

Q: How much do you calculate to the square inch in that?

A: Thirty-five thousand pounds.

Q: How many inches of surface do you make each of the stringers?

A: Top chords?

Q: Yes

A: Two hundred and ten inches.

Q: Not in each stringer?

A: Yes, sir—I beg your pardon—no, sir. 1 am mistaken about that. Fifty two inches and a fraction over.

Q: How much, then, would that be? What would be the resistance—fifty two inches, divided into five bars — which you had in the upper chord to resist?

A: Possibly the pressure of nine hundred tons.

Q: Was not the dead weight of this bridge near five hundred tons?

A: No, sir.

Q: What was the dead weight of the bridge, as you remember it?

A: My impression was, something over one hundred tons. I don't recollect just exactly, but you must bear in mind there were two trusses.

Q: Do you remember what the dead weight was per lineal foot?

A: Of the bridge itself?

Q: Yes; including cross-ties and tracks.

A: It wouldn't be far from a ton to the foot run. That may not be accurate.

Q: Could it be as much as three thousand two hundred pounds to the foot?

A: That bridge?

Q: Dead weight.

A: I think it could not. One thousand six hundred pounds to the truss, you mean. I think it was not as much as that.

Q: How far apart were the two tracks that went over the bridge?

A: Seven feet

Q: How near perpendicular above the truss would that bring?

A: It would bring one rail upon each truss.

‡§ Questioned by Mr. Burns:

Q: The outside?

A: The outside rail of each track would be over each truss.

‡§ Questioned by Mr. Converse:

Q: The outer edge or inner edge?

A: It would bring the centre of each rail near the centre of each truss—the outside rail near the centre of each truss.

Q: Would not the bridge have to be nearly twice as strong to carry two tracks in that way than would be required to carry one track in the centre?

A: Yes, sir; twice as long.

Q: With the strain of nine hundred tons on the upper chords, a dead weight, and the added weight of a loaded train and two locomotives, you may state to the Committee whether that wouldn't produce the strain nearly to the capacity of the iron in the upper chord?

A: I think we are mixed in that a little. Did you understand me to say that the bridge had a strain of nine hundred tons?

Q: Was capable of bearing nine hundred tons. I will change the question. If you allow a dead weight of three thousand two hundred pounds to the foot, wouldn't then a loaded train going on one chord on one side of the bridge strain the chord nearly to its capacity?

A: I have carefully considered the matter. With its dead weight, which alone wouldn't strain any portion of that iron, even with two trains upon it, to exceed from eight to nine thousand pounds to the square inch, while it was capable of resisting thirty thousand pounds to the square inch.

Q: Would not that one train on one side of the bridge strain it as much as two trains, or nearly so?

A: It would strain the truss passing over about eighty-five per cent, or as much as it would were two trains passing over at the same time.

Q: It is stated that when the bridge broke the bridge swung to the north, while the load was pitched off to the south. Can you give us any explanation upon that point—why it was so?

A: It is very conclusive evidence, to my mind, that the bridge was carried down by the second locomotive in some way leaving the track. The bridge was not strong enough to take a locomotive across off the rails. Had the bridge broken through weakness it would have pulled in the other direction. I understand you to say that the bridge swung to the north?

Q: Yes.

A: Had the bridge broken from its own weakness, it is conclusive to my mind it would have swung to the south. I am convinced, a model test, to the extent of breaking a truss, would show conclusively that that truss would fall to the south and pull the bridge to the south. An engine dropping on the cross floor beams would tend to deflect them and pull the truss inward—that is, the truss to the north, that the train was passing over on, and when pulled to the north from a vertical line to a small extent it would go down.

Q: You stated a while ago, that the braces were fastened together in the centre—will you explain how they were fastened, and the effect of it upon the bridge?

A: They were fastened by loop-bolts through the yokes, which done, would keep them all in place.

Q: What was the size of the loop-bolts?

A: I am not certain whether it is three-fourth or seven-eight of an inch—I have no means of knowing.

Q: Would either be sufficient to strengthen to any considerable extent the races?

A: It adds to the security of the braces in keeping them in line. A brace twenty-one feet, without intermediate support, would hold a floor less than with the support at the middle brace—in other words, it is like a column twenty-one feet long, compared with one half that length.

Q: Would not this bridge have been stronger if your tie rods had been oblique and the braces perpendicular?

A: Not as strong.

Q: Does not the strength of the brace decrease in proportion to its length?

A: Unsupported it does.

Q: Whether supported or not, does it not?

A: The tensile to the rod, is diminished in strength in its carrying capacity just in proportion as the distance is longer on its angle then it would vertical.

This system makes the compressive members ten feet, nine inches long—while on the system that you suggest would not be nineteen, and one-half feet long, therefore, they are made stronger by being arranged in this wise.

Q: Is not the only support imparted to it, the strength which the counter brace, bearing laterally in the middle?

A: Each one have to support the other—all bind together. It would be impossible to crowd them out of line, therefore, every one of the counters and braces tend to support each other. I have constructed from ten to fifteen miles in length of Howe bridges.

Q: Have you constructed other bridges on the Howe plan with wrought iron braces, as in this bridge?

A: I have not.

Q: Do you know of another bridge?

A: I do not.

Q: Anywhere?

A: No.

Q: When you found that Mr. Rogers had put a brace in wrong on the first putting up the bridge, do you think it was negligence in again trusting him with erection of the structure?

A: No, sir; I think it was not. He couldn't put the work together different than what I designed it.

Q: Do you think it was wise to entrust him with the erection of the bridge after that?

A: I do.

Q: What was the size of the ties reaching from one chord to the other—the sway rods?

A: One and a quarter inches in diameter.

Q: How far a part were they?

A: Each panel eleven feet a part.

Q: Were there not twice that?

A: There were twenty-eight used—that would be right at fourteen panels.

Q: How were they fastened to the chords above and below—how were they drawn together?

A: I don't recollect exactly.

Q: Would it be bad workmanship if in cutting of the threads upon these iron the size was reduced to three-quarters of an inch where the size was an inch and a quarter?

A: Yes, sir. From an inch and a quarter to three-quarters.

Q: Have you examined these rods to see whether they were materially reduced at the ends?

A: No, sir.

Q: How would it be to reduce to five-eighths at the thread ends?

A: From an inch and a quarter?

Q: Whatever size they were.

A: It wouldn't be a good job, as I will state in this connection. My directions there was carried out. The vertical rods were enlarged so that the inside thread was the same diameter as the nut itself.

Q: I am speaking only of the sway rods.

‡§ Questioned by Mr. Burns:

Q: That was your direction?

A: All the vertical rods were made in that way so as to give the bolt the same strength.

‡§ Questioned by Mr. Converse:

Q: Did you make a statement how they were fastened?

A: I don't recollect.

Q: What was the size of the braces originally projected to be put in the bridge and the counters.

A: Seven inches T beams.

Q: The flanges four inch?

A: Yes.

Q: And the web seven?

A: Yes.

Q: What is the thickness of the flange and web?

A: The counters were three-fourth and the main brace three four web.

Q: How was the flange?

A: I can't give the exact thickness—the usual thickness of T beams.

Q: Can you give us some idea, so as to make our calculation upon that subject?

A: My impressions are, about one-half of an inch.

Q: How many of these beams were designed to be? And state whether they were varied in number, as originally planed, as you approach the centre of the bridge.

A: The first portion was supported by six abreast.

Q: As originally planned?

A: Yes; and they diminished to three abreast from the middle panel, the other two being counters. There was used at the bridge five braces in each panel, and at the ends, six main braces.

Q: How much less in size were these beams finally made?

A: I don't know.

Q: Are any of those beams seven inches now by four?

A: I understand them to be; they may be a fraction less. I understood it to be the way I have given.

Q: If there were six at the end of the bridge, was it not after the bridge was rebuilt when five were put in at the end of the bridge, diminishing to the centre?

A: My impressions are there was six put in. The bill shows that there were put in six at the end panels, full length, and five at all the other panels. There is five at every panel. In some panels there are four main and one counter. And others, in the middle, there are three main and two counters. And at the end there are six main braces, and near the end, four main braces and one counter.

Q: Was there not some trouble in finding rolls as originally projected?

A: Not that I know of.

Q: Had you any interest in the rolling-mill where they were designed?

A: At that time, not a dollar.

Q: How long before, or after, did you have, and who were the owners at that time?

A: I was not an owner until I left the charge of the road. The heavy stock holders were Chisholms, Jones, and my brother. I don't know who the other one was.

Q: What is your brother's name?

A: A. B. Stone. The firm name was Stone, Chisholms & Jones.

Q: I will ask you who was the superintendent of that part of the road last year?

A: The general superintendent, Charles Payne; the division superintendent was Mr. Couch.

Q: Whose duty would it be to see to the bridge, and examine it from time to time?

A: The duty of Charles Collins, the chief engineer, generally; who he relies upon to do that duty, I don't know.

Q: Ought not such a structure as that to be examined every few days, while in use as such a company as the "Lake Shore?"

A: The bridge had stool a dozen years without showing any defect or weakness; they would not be likely to examine it as often.

Q: I am only speaking what prudence would require.

A: That would be extraordinary caution, more than is given to structures.

Q: How, often would, with ordinary care, with the amount of travel on it, ought it to be examined?

A: If done by bridge men, experienced men, as often as three months, thoroughly, and then, by the track men, quite frequently.

Q: Would there be any necessity, from time to time, to tighten up the nuts and again loosen on account of the temperature of the weather?

A: Would not; the nuts are practically as tight in warm weather as in cold.

Q: This examination, then, ought to be made for the purpose of observing whether any thing has given away in any part of the structure—whether any nuts are loosened, and things of that kind.

A: Yes, sir.

Q: Why was it that the cars, and the people in them, were burnt up after this accident? What was the cause of it?

A: No doubt it might have been done from the locomotive, or from the stoves in each car.

Q: The locomotive, as I understand, was down in the bottom of the stream.

A: That might have been; it is probable, then, that the fire took place from the stoves.

Q: Why didn't your company comply with the statute of the State, requiring stoves to be put in that would not do that in case of an accident?

A: I examined those stoves, and it was said they would not cause fire; my conclusion was that they were more dangerous than the ones we used—that there was no safety about them any more than any other stoves.

Q: Why didn't you heat the cars by steam from the locomotive?

A: It isn't practicable; no engine can furnish enough steam for its regular work and to heat the cars also. The work of breaking with steam comes when the train is slacking up, and the steam for running the train is not in use.

Q: Your opinion is, then, that no stoves could be provided that could extinguish a fire in case of an accident.

A: No, sir.

Q: And that is the reason that your company made no effort or made no change in the stoves?

A: Yes.

Q: It has been stated that since this bridge fell that when the bridge was first completed that it couldn't bear its own weight. Do you know any thing about that?

A: I never knew anything about that. I knew there was some trouble in raising. When I found out of their being delayed in consequence of that, I went down and found the only thing wrong about it was putting the braces flatwise instead of vertical; and since that was remedied I never heard any other thing not put in right as originally designed. I never heard an difficulty about it. That did cause trouble. They were not designed to go that way, and it would cause trouble in raising the bridge. As soon as that was remedied there was no trouble.

Q: Then you didn't have to change the original plan after that was arranged?

A: No, sir.

‡§ Questioned by Mr. Burns:

Q: Mr. Stone, what, if any, examination or practical test of the self-extinguishing stoves have you seen made?

A: I was called upon to see a self-extinguishing stove at one time, when I was president of the road, and in my judgment it was of no importance—it was of no advantage with fires carried upon cars. It is impossible.

Q: What stove was that?

A: I don't recollect the patentee's name. I have forgotten the patent. I have seen two or three designs. I have only a general impression, because it didn't strike me favorably at all of being any advantage as a practical Stove.

‡§ Questioned by Mr. Brunner:

Q: Did you ever see the Winslow stove?

A: I think that is the one that I saw. [Circular shown to witness.]

‡§ Questioned by Mr. Converse:

Q: One is for wood and the other is for coal?

A: I never saw the coal, I saw the wood. This, in a certain way, will put out the fire, but I don't think it is a practical stove.

‡§ Questioned by Mr. Burns:

Q: Have you any recollection, Mr. Stone, of having said to any one, or more than one, when the Ashtabula bridge was referred to, "that wasn't a good bridge; it wasn't built as you would indorse; you didn't indorse the bridge fully after the bridge was built?" And did you make an expression like this, "that is not my bridge?"

A: I never said it, and I never thought it. I never shirk responsibility. At the time we erected the bridge we was making the road very perfect, and put up what we thought there a very perfect bridge. A better bridge would have been, probably, a stone bridge, or arch. At that time we had determined what funds, we had to expend, as we were short. We designed this to be a first class bridges

‡§ Questioned by Mr. Converse:

Q: When the braces were taken out and put in as "I" braces, were the corners not clipped off and the section surface of the braces very much diminished?

A: The corners were clipped off in some cases, but in no case, in my judgment, to weaken the structure one particle. There was still left a much greater strength at the ends than there would be in the middle; and very often you will find iron reduced one-third at the ends from their sectional size in the middle, and still have more strength in the ends than at the middle. They would cripple before they would crush.

Q: Isn't it, on many of those flanges, clipped away for an inch and a half?

A: No, sir.

Q: I don't mean square inch, I mean flange?

A: No, sir; if one-fourth of the entire area was reduced it wouldn't weaken the bridge.

Q: Well, when the bridge was going up, did you give your personal attention to it?

A: No, sir.

Q: Did you employ any skilled engineer, or instruct the man to make an experiment with the bridge, or examine it, or superintend it?

A: The iron work was done by as thorough a master machinist as I know of. And when he worked at the plans that was all there was of it. And when the bridge was tested I was present, with a very heavy load.

Q: How often were you there while it was being erected—put up?

A: I was at the shops frequently and examined the parts as the machinists were making them. But during the erection of the bridge I don't think I was there but once.

Q: Did you go there at all until you were sent for by Mr. Rogers, stating that the bridge had settled nearly six inches, taking the camber off at the time?

A: I never heard of any such report as that. I heard there was some difficulty about the braces. 1 think I was present at the bridge soon after commencing to raise it, and then when it was reported to me about its not coming together I went down to see what the trouble was.

Q: Did Mr. Collins bring you the word, when you went down?

A: My impression is that he did, but I am not certain, however.

Q: You were there, then, only the once?

A: I think I was there twice. I think I was there three different times. I was there when they commenced raising it, and when the trouble was reported to me, and then when it was tested—there at least three times; and my impression is four times. When the test was made it was stiffer than I supposed.

‡§ Questioned by Mr. Wilstee:

Q: lf a train be passing over the bridge at the rate of ten or fifteen miles an hour, and the air brakes be applied, what effect would it have?

A: It would throw a strain upon it, but very small.

‡§ Questioned by Mr. Brown:

Q: What, in your opinion, was the probable cost of building that bridge, with stone archers?

A: We had it figured at the time, but I have forgotten what they were—not to exceed $15,000 at the time.

Q: This present bridge is estimated to have cost $75,000 or $80,000?

A: That is a mistake. The iron bridge cost—I don't know what it cost—my impression is that it cost $15,000. The iron bridge and masonry cost, possibly, what you said.

Q: We got the impression that it was the iron bridge itself?

A: That is a mistake. I think it cost not far from $100 per foot. It might possibly be more. Iron was very high then. I can't state positively, but not less than $100 per foot.

Q: The building had stone arches, that's what brought it up?

A: Yes. My impressions are that estimate was in the neighborhood of $100 or $115 per foot. Mr. Collins may have the data that he had before us at the time.

‡§ Questioned by Mr. Converse:

Q: What would be the effect upon this bridge if a loaded train, with two locomotives, running on it on the south side, and the wind blowing from the north, if one or all of those sway rods were to break—how would you expect it to act under such circumstances?

A: With sixteen lines of timber from end to end, as they were, and fastened as they were, covered from end to end with ties, fastened from side to side to the bridge, my judgment would be that, together with the great thickness of the truss, which is twice as much as any other bridge, as you would find, that it §. be an extraordinary wind that would affect it at all. If there wasn't lateral bracing—

Q: Sway rods?

A: Sway rods. That, take two in between them abutments, the way it was fastened, would present a very strong lateral strength.

Q: Would or would not a wind blowing from the north put a strain upon these sway rods?

A: A certain strain upon them, but the trusses themselves have double the lateral stiffness of any truss upon an iron bridge that I know of.

Q: The upper chord was bolted every five feet?

A: I think so.

Q: Will you state to the committee whether that mode of fastening the beam and the upper chord together was not an element of weakness?

A: I will state that it is an element of strength.

Q: Didn't weaken the chord in fastening them in that way?

A: The upper chord?

Q: Yes.

A: No, sir.

Q: These bolts that went in these five feet, they were not turned bolts, neither were they put in hot, to fill the holes. So far as the resistance of compression was concerned wouldn't it have been the same as if the hole might have been empty?

A: These holes were made—the surplus strength was more than four times, according to my calculation, what would be required in rods. Clamps were used on the bottom chords to prevent tension.

Q: Can you get for us the original plans and specifications?

A: Well, Mr. Newell or Mr. Collins; they can be got in that way from Mr. Newell or Mr. Collins, if they have it. I don't know. I haven't seen it. If you should not succeed in getting it I will be willing to do anything that I can. You are right near the office.

Testimony Of Charles Collins

Summary of Collins' testimony

Charles Collins, who was the Lake Shore & Michigan Southern official in charge of maintaining the railroad tracks in Ashtabula, testified about his disagreements with Amasa Stone about the design of the bridge. Collins preferred the bridge be made from stone and expressed his serious concerns about the iron Stone intended to use in the bridge.

He was asked about the horrifying fire during his testimony but perhaps the highlight of his appearance before the Legislature of Ohio Joint Committee Investigation included his testimony about not wanting "anything to do with it" and "I think the bridge was rather an experiment."

"About the time the bridge was built, my duties were so heavy I was relieved from looking after the bridge. I never mentioned to any one that the bridge was not mine and that I did not want anything to do with it, since it was placed under the charge of a bridge-man; I thought it out of place for me to say anything about it. I never knew of another bridge being built of wrought iron on this plan. I think the bridge was rather an experiment."

Charles Collins' full testimony:

The following testimony was given by Charles Collins, the engineer of the road, who testified before the committee appointed by the Legislature of Ohio:

Charles Collins, being duly sworn, testified as follows:

‡§ Questioned by Mr. Converse:

Q: What is your full name?

A: Charles Collins.

Q: Where is your place of residence?

A: Cleveland.

Q: How long have you resided in Cleveland?

A: Most of the time since 1850, with the exception of about two years I have been away, but constantly since 1859.

Q: What relations do you sustain to the Lake Shore Railroad Company?

A: I am the engineer and purchasing agent in my department.

Q: What section of the road have you charge of as engineer?

A: The entire line.

Q: You may state what points?

A: From Buffalo to Chicago, with the branches.

Q: How long have you held that position?

A: Since 1859, but not on the entire line. I have held the office on some part of the line.

Q: What relation did you sustain to the company at the time of the so-called Ashtabula bridge was built?

A: The same as I do now.

Q: What year was that erected in?

A: It was commenced in 1863, and finished in 1865, to the best of my recollection.

Q: Did you reside any portion of that time at Ashtabula?

A: I was there a portion of the time, but my home was here.

Q: How long had the bridge been built that was used before this one—before the one that was wrecked on the 29th of December?

A: It was built in 1852, and was used up to the time we commenced to use the iron bridge in 1865. I believe it was 1865. I am speaking to the best of my re collection.

Q: Where are the plans and specifications to that bridge?

A: I don't know, sir.

Q: Do you know where either of them are?

A: No, sir. Nothing more than the plan that was before the jury at Ashtabula**.** I suppose it is the same.

Q: Was that the original plan?

A: It is the only one that I ever saw, sir. From the date on it, I should judge it was an original plan—a general plan.

Q: Were there any specifications accompanying the plan?

A: This plan? No, sir, not to my knowledge.

Q: Isn't this plan that you speak of a full plan of what is known as the working-plan?

A: No, sir.

Q: Were there not working plans made?

A: I suppose there were.

Q: What became of them?

A: I don't know.

Q: Did you ever see them? No, sir; I have no recollection of seeing them. Why are not such things preserved by the company?

A: They are generally, sir; but this seems to be an exceptional case in every particular.

Q: When did you first discover that these papers were absent from your office?

A: They never were at my office.

Q: Didn't they belong at your office?

A: They should have belonged there.

Q: Why were they not, then, at your office if they belonged there?

A: The reason is this: About the time this bridge was commenced, or before, the Cleveland, Painesville, and Ashtabula Railroad Company sought to get a line from Jamestown to Franklinton. They imposed that duty on me. When they done that, the president of the road says: "You have so much to do with the Ashtabula bridge, I will get a bridge-man for the Ashtabula bridge, and we will relieve you entirely." That is the reason, sir.

Q: When did you make search for the plans and specifications, if you ever made any?

A: I never saw the plans or specifications—that is the working plans. The plans were inquired for in my office, and the clerk searched for them and couldn't find them.

Q: When was that?

A: That was since this calamity.

Q: So far as you know, the plans and specifications remained with the president of the company?

A: Yes, sir. I think, sir, they were up at the shop where the bridge was constructed — where the work was done. They would naturally want the working plans there.

Q: Wouldn't they naturally want the working plans and specifications where the bridge was to be set up afterward?

A: Yes, sir, I suppose they would.

Q: State whether the examination of this bridge came under you as an officer of the company.

A: The examination of the bridge? Yes, to parties under me. They were working under my direction.

Q: Why should it belong to them, instead of yourself, to see if it were done, if you were engineer?

A: I couldn't inspect all the bridges myself. I have got to trust somewhat to men. My instruction to men is, if there was any point they were in doubt, to consult me.

Q: You did authorize them?

A: Yes.

Q: When did you authorize and direct to make the examination of them, and when?

A: G. M. Reed is the head of the department.

Q: When was he directed to make an examination?

A: He has no specified time to make examinations. Whenever at such times as he thinks it is necessary.

Q: I understood you a moment ago that you directed the examination to be made whenever you thought it was proper?

A: They have a general order. I would like to explain a little further about the organization of the bridge men and carpenters before the consolidation. For instance, from Buffalo to Erie, from Erie to Cleveland, Cleveland to Toledo, each of those divisions had a bridge gang and a carpenter, who took care of the bridges. After the consolidation, that organization remained the same, and to it was added this general bridge man or superintendent of bridges.

Q: When did this Reed, who is charged with this duty, make a report to you in relation to this bridge?

A: In September, I think.

Q: What report did he make then?

A: It was right.

Q: It was in good condition?

A: Yes.

Q: Was that report made in writing, or verbal?

A: Verbal.

Q: Is it the habit of your company to direct its officers to make examinations, and simply make verbal reports or are they required to be in writing, so as to be placed on record?

A: They are not required to be in writing, the ordinary daily business of the road.

Q: How often did you direct that bridge to be examined?

A: Never had any specified time; he was directed to keep up the inspection properly.

Q: Did he not have instructions from his superiors, in the line of his duties, as to when and how the examination should be made?

A: There was no time specified.

Q: My question was, "How often;" not as to specified time.

A: That was in his judgment.

Q: What business, or duties, had you to perform, then, as chief superintendent, or engineer, which ever it was, if you could simply appoint your subordinates and rely upon their judgment as to what was to be done without any written report, or anything else?

A: My instructions to him was, if he found anything that he was not satisfied with, or wished counsel, to call upon me.

Q: Does it not strike you that that is a very loose way to do business, with such vast interests, and property, and men's lives involved?

A: No, sir; I thought everything was well taken care of.

‡§ Questioned by Mr. —— ——:

Q: I will ask you whether you ever made a statement to various persons, in relation to this Ashtabula bridge that was wrecked, "that you were not responsible for it; that you didn't want the public or anybody else to understand that you were responsible for it; that it was Stone's bridge, and that you never had, or would have anything to do with it?

A: It is a mistake.

Q: Did you make any statement in that direction?

A: No, sir.

Q: I will ask you, if Mr Rogers called upon you when the bridge was settling down, and asked advise of you, and whether you declined to give it, as officer of the road?

A: I was staying at Ashtabula over Sunday and he came to my house on Sunday and wanted me to go down to the bridge with him: I never had been there to see the work, and didn't wish to interfere with it, and declined. He asked me as a personal matter to go, and I went.

Q: Did he ask you what should be done in the matter, or what he should do, and did you decline to give him any information?

A: I said to him, sir, that the braces were in wrong; they got them in flat instead of on the edge, in my opinion; but I have no directions to give in regard to it, as I had nothing to do with it; I may have said that the president, or Mr. Stone, should attend to this bridge matter—that is, the bridge matter.

Q: Did you say to Mr. Rogers that you would notify Mr. Stone, and have him come down and see about it?

A: He requested me to ask him.

Q: Did you do so?

A: I did.

Q: How soon after that?

A: This was Sunday, and this was on the following Monday morning, I think.

Q: Were you there when Mr. Stone was there?

A: Mr. Stone invited me to go, and I did.

Q: What did you discover as to the condition of the bridge, when you went with Mr. Stone?

A: Mr. Stone remarked that the braces were wrong; he was very much surprised to find the braces in that position, and it was wrong, and not as he designed.

Q: I didn't ask you what Mr. Stone remarked; I asked you what you discovered; that is what I want to know.

A: I discovered nothing more than that the braces were not in a proper position.

Q: Was the structure then up, and resting upon the trestle work?

A: I think it was, sir.

Q: Had the wedges been pushed out from under it, to see if it would settle a little?

A: Standing in that condition, at that time, I couldn't tell you, sir.

Q: How much had it settled at the time you went back to look at it with Mr. Stone?

A: I don't know.

Q: Was there any counter brace in that bridge at that time?

A: I don't know.

Q: Was it still resting upon the trestle?

A: I think it was; that is my recollection.

Q: Well, you may state whether any directions were given to Mr. Rogers that day in relation to that bridge?

A: I don't know what directions were given.

Q: Will you be kind enough to state whether Mr. Stone didn't return to Cleveland, stating he would think the matter over, and would give him directions in a day or two?

A: He went to Cleveland that day, to the best of my recollection.

Q: Do you know how soon he went back again?

A: I don't know.

Q: How long after the first visit?

A: I couldn't fix the time.

Q: About how long?

A: My recollection is very poor upon that; I don't know.

Q: What was the progress of the bridge in the erection at the time you went back the second time, from what it was when you were there in the first place?

A: I think it was completed. I think I wasn't there again until it was.

Q: Was that at the time it was tested?

A: Yes.

Q: Do I understand you to say that you never mentioned to any one that this bridge was not yours, and you didn't desire to have the responsibility of it in any manner?

A: No, sir; as I stated before when asked about it, I declined to have any thing to do with it, from the fact that they had appointed some other man to build that bridge and take care of it; and therefore I declined to have anything to say about it, and might have remarked that it was Mr. Stone's or the President's bridge, and I didn't wish to interfere.

Q: Question repeated.

A: I have no recollection of using that language or anything of the kind.

Q: Do you know what changes were made in the bridge after you found it on the braces when you visited it with Mr. Stone?

A: I know of one change that was made then. What others were made, I don't know.

Q: State what they were.

A: That was in turning the braces, and putting in an additional number.

Q: How many were put in, in addition to what there were there when you visited it with Mr. Stone?

A: I don't know, only in the first set of braces.

Q: How much was the increase in the first set?

A: Two in each set, I believe.

Q: Clear through the whole bridge?

A: No, sir; that is in the first set of braces after that.

Q: Two on each side, is it?

A: In each additional brace there was an additional two, making eight; that is to the best of my recollection.

Q: How soon after the structure was erected was it that it came under your care as engineer?

A: I don't know; I can't recollect. It was the time of the building of the second track was in progress; at the same time in making the fill from the old fill to the new ; it was some time in 1866; I will not be positive as to the date.

Q: Did you ever make an inspection of that bridge yourself?

A: Yes, sir.

Q: When was the first?

A: Soon afterward. I was in it when the train went over it, and passed through it.

Q: Did you make any further inspection of it than simply in it when the trains were passing over it?

A: I looked over it at that time.

Q: Did you look at it as an engineer, to see whether there was any weakness, or anything wrong about it?

A: I noticed it.

Q: In the examination, what did you find in the bridge to hold the braces in position on the brace blocks?

A: There was the yoke around the center and the casing on the side of the angle blocks.

Q: Were they not all chipped off?

A: Not all.

Q: When the additional number was put in?

A: No, sir, not all.

Q: Well, the lugs, were they not nearly all chipped off when the change was made in the bridge?

A: I think not, sir.

Q: How many of them?

A: I couldn't say, sir.

Q: If you examined the bridge, why did you not examine that point to see whether those lugs had been clipped, and to see how many remained.

A: I didn't see any trouble in the braces when the bridge was fixed.

Q: You knew that some of those lugs had been chipped off when you made the inspection. The question which I put is, why didn't you make the examination, and know just how many there were, and just what there were to hold these braces?

A: I didn't notice there was anything to affect in any way material. I didn't suppose the braces would get out of position.

Q: Was there anything to hold it except this little support in the center—five eighths —

A: That is the main thing, I suppose.

Q: Would you regard that as any material strength in the construction of a bridge to hold large braces in position—seven-eighths clasps around the center?

A: Yes, sir, I should, sir.

Q: Was it sufficient, then?

A: I never knew anything to the contrary.

Q: I will ask you as an educated engineer, who is supposed to know all about this subject. I want to know if in your judgment if that was sufficient to fasten all those braces in their place?

A: I consider it was, with the block and the yoke.

Q: In the absence of the yoke, would it be sufficient?

A: I think not.

Q: In the absence of the lugs, in the place of blocks, would the yoke be sufficient to hold the braces in their place?

A: I think it would.

Q: In the inspection which you made of the bridge at that time and every time afterward did you notice, that those braces had been clipped off at the ends, when the change was made?

A: Cutting the corners off?

Q: Yes.

A: Cutting the corners off. Yes.

Q: Did that tend to weaken the braces?

A: I think not, sir.

Q: Would it not tend to throw the line of compression away from the centre?

A: I don't consider it would affect it materially.

Q: If the centre line of compression is thrown out of centre of the strut, would it not weaken it very much?

A: Not without it was cut to some great extent.

Q: Suppose it was only one-half an inch?

A: It wouldn't affect it materially.

Q: You think then, that the strut eleven feet long, the line of compression being one-half inch out of the centre iron, would make no difference in its strength as a strut?

A: No, sir; I don't think it would affect it materially.

Q: Did you notice at the time whether the sway rods connected the brace blocks, each brace block at the end of each panel, crossing each other?

A: My impression is now, it was at every other panel.

Q: Would it have been better if they had been at every panel?

A: It would have been better, sir.

Q: Can you state to the committee, how near to each other the struts are from one lower chord to the other chord?

A: I don't recollect positively; but I think they were in every other chord.

Q: Twenty-two feet?

A: Every other panel, I think, sir.

Q: The tension rods, how were they connected, between the lower chords, at what point on the lower chords were the tension rods connected running from one lower chord to the other. How large was the panel, in the lower plan of the bridge?

A: The strut running from chord to chord?

Q: I am speaking of ties drawing against the strut. How far apart they were:

A: They run every other other panel.

Q: They would be twenty-two feet apart?

A: That is my impression about it.

Q: I will ask you, if you can state, whether they are attached at the odd panel, differing from those, where the strut is, so that those chords cross each other?

A: I don't know.

Q: If they did that, wouldn't that destroy the efficiency of the strut, and the tie bar?

A: They wouldn't be as serviceable.

Q: Would they be of any particular value at all?

A: Yes, I think they would.

Q: What would be the effect of drawing up these chords, we are speaking of now, on the lower chords of the bridge?

A: I don't think it would draw them out of line.

Q: Have you at any time made any calculation of the weight of the bridge and the strength of the metal in it?

A: I have not, sir.

Q: Can you state to the committee, whether the original plan which you speak of, has ever been sent before the coroner's jury, with notations of the size of those beams, or braces or the brace blocks?

A: I don't recollect, sir.

Q: Can you tell me what is the size of the braces, or main braces?

A: They are six inches, that is my recollection, and about four-inch flanges.

Q: Were any of them seven inches?

A: I don't recollect that they were, sir.

Q: Did you ever understand, that they were to have been seven inches?

A: No, Sir.

Q: Can you give us the thickness of the flanges, and the width?

A: I can't, sir.

Q: If there should be mark d upon the original plan that the brace-blocks, lugs, were six inches apart, leaving a space # six inches between them, what would that indicate?

A: That the braces were laid flatways.

Q: Suppose there was a lug, also, below where the brace was fit in, further down the angle of the brace-block—I speak of the lug on the brace-block on each side, six inches, now I speak of one lower down, nearer the edge of the brace-block.

A: I think there was, sir.

Q: You say that it was marked in that shape, six inches square, that it would indicate that the braces were to go in flatwise?

A: Yes.

Q: When you went with Mr. Stone, I will ask you if the brace-blocks didn't indicate that thing.

A: I think it did.

Q: Were the braces put in that way by the mistake of Mr. Roger or mistake of the original plan?

A: I don't know.

Q: I will ask you, as an engineer, whether these braces ought not to have been fastened together, so they would all have acted together as one beam?

A: I don't know; I have no experience in building that kind of bridges.

Q: Without experience in that particular kind of a bridge, what would you say from your knowledge on the subject of braces?

A: I should say it would be better to have them fastened together.

Q: If they were not so fastened, then wouldn't that be one defect in the plan of the bridge?, Would it be a defect in the plan of the bridge?

A: I don't think it would be one that would produce any material disarrangement.

Q: Your opinion, then, would be that it would not be material whether this brace was composed of one piece of iron or a half dozen, there being the same surface for the pressure.

A: If proportioned right I think it would answer the purpose, and enough of them.

Q: I am speaking of the same quantity and the shape.

A: I think it would be better to fasten together.

Q: I understood that a moment ago, and I understood you also to state that it would make no material difference.

A: I don't think it would.

Q: Would it affect materially the strength, braces of the same quantity of iron and same surface for pressure, whether it was divided into a half-dozen pieces or whether but one?

A: It might if there was a surplus of material.

Q: I mean the same quantity of material in a brace,

A: The same amount of material would be better.

Q: Would it make material difference whether it was one beam or six beams, it being the same quantity for the brace?

A: If they were held by the clamp, not if there wasn't any clamp to bind them, if they were not locked.

Q: Suppose they are locked firmly, that would leave your braces eleven feet, wouldn't it?

A: Yes, sir.

Q: Wouldn't it be materially weaker?

A: It would be some.

Q: Have you ever known another bridge to be built of wrought-iron on this plan?

A: No, sir.

Q: State to the committee whether this bridge was an experiment or not.

A: I should think it was, rather, so far as I was concerned.

Q: I will ask you whether the upper chords in each truss of this bridge was not the same size from end to end?

A: I think not, sir.

Q: If there is any difference, will you be kind enough to state it?

A: My recollection now is that they run from five-eighths to an inch or an inch and one-eighth; I won't be positive of it; that is my recollection, sir, now.

Q: Do you know whether the ties, or panel-ties, are the same size throughout the bridge, or whether they vary?

A: I couldn't tell you, sir.

Q: Isn't that what you have in your mind, when you think that there is a difference between the end and the centre of the bridge? Isn't it ties that you are thinking of rather than the upper chord?

A: No, sir; the upper chord.

Q: State what the difference was in the width of the chords.

A: From the end of the panel, my recollection of it now is, to the masonry not as wide, with that exception it was the same width throughout, sir.

Q: In speaking of the thickness of the material for the upper chord, will you give us some idea how it progressed from thin to thick?

A: I couldn't tell you, sir. In the erection of the bridge I had nothing to do with it, and have never made any thorough examination of it myself; it is being done now.

Q: Who is doing it?

A: Mr. J. C. Williams, and Mayor Hepburn are making the drawings; they are making up the plans—planning the parts as they are in the bridge.

Q: If it should turn out, in this bridge, that the upper chord was the same size throughout the bridge, would that be an error in judgment in its completion?

A: I think it would, sir.

Q: Have you seen a statement from any engineer, who has been examining the wreck, showing that the panels on either side of the centre of the bridge were too weak, by an actual measurement of the metal?

A: No, sir, I have not read the testimony in the case, and have not seen that statement.

Q: Did you ever see or examine the strain sheets of this bridge?

A: No, sir. There is one being made now, sir.

Q: How do you get the idea, and from what source, that the upper chord is thicker as you approach the center of the bridge?

A: One of the bridge men told me that, and am now making an examination to see how it is.

Q: You didn't speak of it from your own observation?

A: I haven't taken measurement of it myself.

Q: Question repeated.

A: I have not yet, sir.

Q: Never, at any time, on that point?

A: No, sir.

Q: Did you ever, at any time, make an examination with a view to determine, yourself, the exact strength of the bridge?

A: Nothing more than being in it and upon it, and see the action of the train upon it.

Q: Never made any mathematical calculation or measurement?

A: Nothing more than the bottom chord.

Q: What was the size of the bottom chord?

A: It is double bars—five double bars of five inches in width by an inch and three-eighths or an inch and a half.

Q: What, in your judgment, was the cause of this accident?

A: I don't know, sir. It looks very much, sir, that something came off the track; that a car couldn't run off the track—that is only theory—without some tampering with the bridge; that something of that kind—in fact, I don't know; I had better answer the question "I don't know."

Q: I ask for your judgment.

A: I couldn't fix any thing upon it that would do; I might theorize upon it. I say I don't know.

Q: Have you any opinion upon that subject?

A: No, sir.

Q: State whether there was guide rails across the bridge.

A: Yes, on both sides, and extending a short distance both ways.

Q: Would it not prevent any car or locomotive from jumping the track?

A: I expect it would, sir, unless there had been some tampering between the

Q: What was the strength of the cross-ties?

A: I believe three by five.

Q: How close together?

A: I think about two inches or an inch and a half.

Q: Broad?

A: Yes.

Q: State whether a locomotive and train of cars couldn't run across that, on that planking, without breaking.

A: It could, if it was running parallel with the rail or stringers.

Q: If it kept near the guard rail it could run from end to end?

A: Yes.

Q: What was there below this flooring upon which it rested?

A: Stringers.

Q: What was the size of those?

A: I think they were six by fourteen.

Q: What did they rest upon?

A: On the iron floor beams

Q: How many iron floor beams were there?

A: There was three panels—forty-two or forty-three in the whole length of the bridge, I believe, sir.

Q: State whether there was any thing placed on the floor on the top chord to distribute the weight—in other words, to strengthen the chords in the panel.

A: Putting the floor beams on the upper chord.

Q: Isn't that an unusual way?

A: I don't know; it is done, sir.

Q: Ought there not to be something else there to assist in carrying the weight to the end of the panel?

A: I don't see why it should be; it don't occur to me now.

Q: I will ask you whether this chord—whether its particular office isn't simply to resist the compression? If, then, in addition to that force of compression, it is obliged to carry the whole load of a train passing over it doesn't that double the strain upon it? In addition to the compressive strain, isn't there this lateral strain upon each panel?

A: With additional weight upon it?

Q: Additional strain?

A: It makes an additional strain when the weight comes upon it, if there is enough comes upon it.

Q: I know. Isn't there a direct strain upon the chord, the weight of the train passing over it in the way in which this was fixed, throwing the weight on the panels instead of throwing it at the end of the panel—instead of throwing it on the brass blocks and communicate it to the chord there?

A: The arrangement, I believe, first. The angle block was very near it; I will not be sure; some were about eighteen inches. Then the stringer, sixteen by fourteen, would carry it from panel to panel. It would be a very slight spring back. Three pieces, six by fourteen, would carry without much deflection.

Q: Well, three of those stringers, six by fourteen, would carry a locomotive that would weigh forty tons, would it?

A: It is entirely sufficient, sir.

Q: If there was any weakness in the upper chord, I will ask whether it wouldn't add to its weakness in that place—that is, the floor beams directly on the chord, without any thing else to distribute the weight to the end of the panel, except the wooden chord that rests on the floor beams?

A: Yes, it would, if it had a weakness.

Q: Can you state whether it is usual to put these floor-beams directly on the upper chord, or whether it is usual to put something else there, to strengthen the upper chord at that particular place?

A: I think it is generally put upon the end.

Q: Direct?

A: Yes.

Q: Was this bridge intended for a double track bridge?

A: It was built for a double track bridge.

Q: State to the committee whether, with a double track upon it, one-half of the trains wouldn't rest directly over the chord, or perhaps project out over it on one side.

A: Allowing a car to be ten feet, which I believe they are, it would be five feet from the centre of the rail to the outside of the car; that would be two feet and one-half car outside of the rails; then the chord is two feet nine inches entire width ; half of that would be a foot and four and a half inches; that would give the projection beyond the floor.

Q: Wouldn't it be more than that? Wouldn't the outside rail extend directly over the chord on this bridge?

A: Yes.

Q: The centre chord?

A: I think it is the centre chord.

Q: What is the width of the track?

A: It is about five feet from outward to outward rail.

Q: Then it would extend two and a half feet beyond?

A: If the car was ten feet, the car would be two and a half feet outside of the rail.

Q: It would be outside of the centre chord, then, two and a half feet?

A: The car—yes, allowing it to be ten feet.

Q: Would a bridge of this kind be stronger if it had been wider and the chords further apart?

A: I don't know why it should, sir, if the materials were prepared right.

Q: State whether the bridge would have to be twice as strong, or more than that, if used for a double track, than if it was used for a single track.

A: Yes, sir.

Q: Have you been up to the wreck since it occurred?

A: Yes, sir.

Q: Have you examined any of the brace blocks there?

A: I have, sir.

Q: Did you notice, from the paint marks upon it, that these braces had slipped out of position?

A: I noticed that some of them had at right angles from the blocks.

Q: How far had any of them been removed?

A: I didn't measure it, sir.

Q: Some of them as much as two or three inches?

A: I think not; no more than one-half of that.

Q: Did you notice any of these brace blocks broken in two?

A: No.

Q: I will ask if whether you noticed any of these sway rods there?

A: I didn't; I would like to make a statement.

Q: Certainly.

A: When this accident occurred I had to put up a temporary bridge; therefore it took my time to get materials and men, and didn't have time to make an examination of the materials as I would like to have done, and it is almost impossible to do it satisfactorily until our trestle work was done and a diagram made of it, which is now being done; and I wish to state, too, I don't think the gentlemen that are making

the figures upon that can agree until that matter is settled. As to the firm position, and at least the materials in the bridge, I have not had time, sir, and didn't make an examination there, as I would like to have made.

Q: I was going to call your attention to this subject, whether you had noticed any of those sway rods—say one and one-fourth inch sway rods—that had been cut down to five-eighths.

A: No, sir.

Q: In the cutting of the threads?

A: No, sir; I have not made any examination.

Q: Did you notice any of the beams of the upper chord?

A: No, Sir.

Q: What would be the effect on a bridge such as this was, and a train running on the south side of it, across the side of it, and suppose there was a gale blowing from the north at the time, and if one or more of these sway rods were to break?

A: The result would be bad.

Q: How would you expect the bridge to act? What position would it fall? How would it behave?

A: I hardly know; I don't know what effect the flooring would have on the train in the going down of the bridge; it is difficult for me to form any opinion. The floor runs across the bridge, and spiked to all the stringers; anything striking that floor, if it was on the south chord, the floor would be so stiff that it would throw it off-throw the cars or train in one direction, and the bridge would go the other; whatever would strike that floor, and together with the rails, with the chord on one side to give way where the train was, I should expect to see the floor going in one direction and the cars in the other, on account of the floor; that is what I should expect.

Q: What would be the effect on a bridge like that with a train running on it at the rate of ten or twelve miles an hour, and in running on it, would apply the air-brakes for the purpose of stopping the train?

A: I don't know how much it would affect it. If the brakes were applied to a train so as to slacken up the train gradually and if it would come together with a compression, it might raise a wheel of the car from the track.

Q: What would be the effect on the bridge itself? State whether it would be a material matter, in your judgment.

A: I don't think it would be a material matter.

Q: What direction would the force be applied to the bridge in that case?

A: Sudden checking might produce a vibration of the bridge.

Q: Suppose, at the other end of the train, you applied steam to the air-brakes, and applied steam, for forward motion, on the other?

A: I don't think it would affect the bridge materially.

Q: Where would this strain come? Where would the force expend itself—that is, the two forces—where would they expend themselves?

A: The one pulling back and the other pulling forward, breaking a train, I don't think it would affect the bridge.

Q: Wouldn't it compress the bridge the two ends—drawing it together?

A: I don't think it would materially. It might have some force, but not materially

Q: You think it wouldn't materially affect a bridge of this kind?

A: I think so, sir.

Q: I will ask you whether it is part of your duty, as engineer, to look after the general safety of the rolling stock?

A: No, sir; I have nothing to do with it.

Q: I will ask you, why were not these cars supplied with some sort of stove that wouldn't burn up in case of accident?

A: I don't know, sir. I have nothing to do with the rolling stock of the road.

Q: Do you know of any such stoves?

A: I have heard, sir, with water underneath; for instance, if it was capsized, the water would put it out.

Q: What stove was it?

A: This was the Winslow stove, I think, sir.

Q: What was the probable cost of this iron structure?

A: I really don't know, sir.

Q: Can you tell me what it was intended to support per lineal foot, dead weight, and, also, live weight?

A: I can't tell you, sir.

Q: Can you tell us how much more expensive it would have been to build a stone structure than an iron one?

A: There was estimates made, but I don't recollect now.

Q: Can you give us some idea, for our own direction, on that point?

A: I would like to give an idea; but that might mislead, and sometimes makes trouble, because there's a difference in opinion. I don't know what the bridge cost. To begin with, I can give you my opinion—$25,000 difference.

‡§ Questioned by Mr. Burns:

Q: Suppose it should turn out that the sway rods were an inch and a quarter in diameter, and the thread at the bottom was five-eighths of an inch—cut down to that—would you call that good workmanship in that bridge, taking every thing into consideration?

A: I don't really understand it.

Q: Suppose it should turn out that the diameter of the sway rods at the bottom, thread was five-eighths of an inch, while the balance of the rod run through at inch and a quarter, would you call it good workmanship?

A: No, sir.

‡§ Questioned by Mr. Stone:

Q: Did you yourself, as engineer of the road, ever make a thorough inspection of that bridge?

A: So far as looking at it for the safety of the trains.

Q: Did you consider that you had made a thorough inspection? That is the question.

A: To make an analysis of the bridge, I didn't.

Q: I mean, by making a thorough inspection of the road, such an one as would satisfy you in your own mind that that bridge was perfectly safe.

A: Yes; that it was perfectly safe.

Q: I understand you that you made such an inspection.

A: Yes.

Q: How long since did you make such an examination?

A: I don't know. It has been some time. I have been on the bridge often and made an examination.

Q: You say you don't know how long it is?

A: No, sir.

Q: About the length of time?

A: That, properly, belongs to the bridge inspector.

‡§ Questioned by Mr. Converse:

Q: I will ask you one question more: Did the company, or any of its officers, give any orders not to throw water on that wreck?

A: Not to my knowledge, sir.

Q: What preparations did the company make for protection in case of fire there?

A: At the bridge?

Q: Yes.

A: There were two barrels, sunk into the ground, at either end of the bridge, with brine; they were there.

Q: I will ask you whether there was a hydrant connected with the water power there near the bridge?

A: It was not a regular hydrant. There was a pipe, so as to attach a hose.

Q: Did the company ever provide a hose?

A: There has never been a hose put there.

Q: Why not?

A: It was put there more for having a fountain, or for any purpose that we might want to use the water-works.

‡§ Questioned by Mr. Brunner:

Q: Is there a regular watch at that bridge?

A: There was not, but there is now.

‡§ Questioned by Mr. Wiltsee:

Q: No preparation for putting out a fire?

A: There is now.

‡§ Questioned by Mr. Burns:

Q: There is a pump-house at the bottom of the hill?

A: Yes

Q: That is the engine?

A: Yes

Q: For the purpose of throwing water out of the creek up to your reservoir on the hill?

A: Yes, sir.

Q: What is the height of that reservoir above the creek?

A: It is about 105 feet.

Q: You have an engine-house with the capacity of throwing water up from the creek up into that reservoir?

A: Yes. We only commenced doing it, though.

Q: The engine-house was there at the time of the break?

A: Yes.

Q: State whether you had an apparatus, or way of attaching a hose at the engine-house?

A: There was connection with a pipe.

Q: At the engine house?

A: Yes

Q: Did you have a hose at the engine-house on that occasion?

A: No, sir.

Q: Never had?

A: No, sir. That was made there thinking, perhaps, we might want that water for some purpose, and the men put in the water-works thinking we might want a fountain there at some time; but since this destruction there has been a hose ordered.

Q: I wish you would explain to the committee what, if any, facility you had there under your control, or the company's, by which you could put water on that fire as the cars were burning.

A: We hadn't any.

Q: Nothing more than buckets?

A: No, sir.

Q: Then I understand you to say that outside of the assistance that you might have had from the village, the company had no facility for throwing water through a hose or otherwise except by buckets on that fire?

A: No, sir.

Q: It is true of your own personal knowledge?

A: I don't know any thing to the contrary, sir.

Q: I mean at that day — at that point — there was no facility for throwing water through a hose?

A: We had none there.

Q: State to the committee whether the village hose, or the hose of the village fire department, fitted the fire plug at the abutment of your bridge, if you know.

A: I don't know—I couldn't tell you.

Q: State to the committee, then, if you know, what hose and what fire-plug that rumor refers to about the employes of the company not being able to fit the hose on to the plug'

A: The person at the pump-house told me that he had tried it and it wouldn't fit. It didn't go on easy, and he supposed it wouldn't fit at all. He afterward found out, by wrenching hard, it could be got on.

Q: What wouldn't go on?

A: The cupping.

Q: The hose cupping?

A: That is what I understood.

Q: What hose cupping?

A: The village. He told me had tried it.

Q: is your employer?

A: Yes.

Q: At the pump-house?

A: Yes.

Q: When was it? Did he tell you that he had tried to put it on during the fire?

A: No, sir. He didn't state any time?

Q: When did you understand him that he had been making that experiment?

A: He didn't mention any time—I couldn't really say.

Q: State whether, from any source that you know, that any experiment of that kind was made with the village hose on the fire-plug during the time of the fire?

A: I don't, sir.

Q: What is the name of the gentleman that told you?

A: James Manning.

Q: Is he manager of the pump-house?

A: He runs the pump.

‡§ Questioned by Mr. Converse:

Q: How were those floor beams attached to the upper chord, or fastened to it?

A: There were lugs riveted on the floor beams, resting on the inside of the chord, and then the stirrups.

Q: What is the size of the stirrup?

A: I couldn't tell you—five inches or eight. I couldn't tell you.

Q: Now, right in that connection, what would be the effect of applying air brakes on that bridge, upon these floor beams, as to whether it wouldn't shove them right along?

A: I think not, sir.

Q: What would there be to prevent that, except this little stirrup, if there was one?

A: The railing having fish-bolts to it, the rail couldn't move. I don't see how it could transfer this motion to the beam, sir.

Q: Is it unusual for these rails to break in the case of an accident of any kind?

A: Well, we have sometimes a broken rail, sir.

Q: Why couldn't the whole bridge be shoved right along—break off clear –say down this chord; it isn't very far, of course it couldn't go but a few feet before it would strike the panel. Why couldn't the whole of it be shoved right along?

A: You would have to take the rail with it. I don't see how you could take the rails, spikes, and fish-plates on it.

Q: Suppose you move the whole rail?

A: I don't see how that could be done. The fish-plate on the rail, and the rail fastened, sloped, and spiked.

Q: How were those lugs put on the floor?

A: Riveted on the beams.

‡§ Questioned by Mr. Stone:

Q: Is it not the habit with engineers on the road to run under a full head of steam just as long as they can, in order to have time to check up when they stop at different stations?

A: So as to make a shorter time at the station.

Q: That being the fact, and this bridge being near the station, and running, as you say, as fast as they can, in order to make the check at the station, and that being done every day, and then go out under a full head of steam, would not that in time have an effect, or damage the strength of that bridge?

A: If the train was suddenly slacked, and the train coming together suddenly, it might raise the wheel off of the track.

Q: That thing kept up every day there, so close to the station, would it not in time have a material effect upon the bridge?

A: It would be a very long time that it would have any effect.

‡§ Questioned by Mr. Brown:

Q: Would there be any necessity of the company's keeping a hose there at that engine-house, considering that to be an iron bridge? I understand it is only at wooden bridges.

A: We would have a hose there, probably, if there was no bridge there, for the purpose of wetting the ground and keeping the grass bright—we often do—and if there should be a fire about the building or coal-house, or about the vicinity, it could be used for fire purposes.

Q: It wouldn't be a necessity as far as the bridge was concerned?

A: No, sir; I don't think it would.

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Testimony Of Joseph Tomlinson

Summary of Tomlinson's Testimony

Joseph Tomlinson wasn't an employee of the Lake Shore & Michigan Southern (LS&MS) at the time, but was hired by Amasa Stone to be the engineer responsible for creating the plans and drawings for the Ashtabula Bridge. Tomlinson was also

well-known and respected in Canada and the U.S. from 1840 to 1870 for his expertise in building bridges. (He was working at the time for the Canadian Government as the General Superintendent of Lighthouses.)

Tomlinson never approved of a wrought-iron bridge, particularly one following the Howe truss design, over such a large span of the Ashtabula River believing it would be an unnecessarily heavy bridge with all the strain accumulating at the end braces.

Tomlinson's work with the LS&MS and Stone ended due to his differences, both professionally and personally, with Amasa Stone concerning the bridge. Part of his disagreement with Stone was that the bridge would have been stronger and more durable if only the main braces had been sufficiently strong. They weren't, however, as large as designed, and it was Tomlinson's contention that they should be strengthened.

Tomlinson's Full Testimony:

Joseph Tomlinson, civil engineer, being duly sworn, testified as follows: (Testimony taken before the coroner's jury at Ashtabula)

Q: What is your age, occupation, and residence?

A: I now reside at Ottawa, and am general superintendent of light-houses, Canada; I am a civil engineer; my age is between sixty and sixty-one.

‡§ Questioned by Mr. Hall:

Q: How many years have you been engaged in the profession of civil engineer?

A: It is difficult for me to say. I came to this country in 1840; am a mechanic by trade, and took to bridge building as a matter of choice. I was employed on the Housatonic Railroad as a road man.

Q: How many years have you been engaged in the business of bridge building?

A: I think from 1846 to 1870.

Q: How extensive has been your experience in that department?

A: I suppose some years. I built thirteen or fourteen bridges each year as contractor for bridges, and perhaps more. I have been civil engineer for some very large bridges.

Q: What large bridge do you now remember of?

A: I rebuilt the suspension bridge, as one, after it was blown down many years ago—in 1857, I think—and it is yet standing; extends 630 feet. I built one in 1854, 250 feet over Hammond river. I had a letter last week which told me it looks as good as it did the day when I left it. I have not seen that bridge since I built it. For some years past my experience has been more on bridge foundations than on superstructures.

Q: Had you any connection with the drafting, designing, or construction of the bridge at Ashtabula which has lately fallen?

A: I was employed by Mr. Stone to make the drawing for this bridge.

Q: Will you now state in detail, in your own way, the connection you had with that bridge in any manner?

A: I made the plan under the instruction of Mr. Stone. I mention this because I never approved of a wrought iron Howe truss. It makes a much heavier structure, having the principal braces in compression than what they would be if made to act by tension. And another objection is that all the strain accumulates on the end of the brace. Still, notwithstanding that the structure was necessarily heavy, it was intended to be a very strong and permanent structure, and would have been so if the main braces of the bridge had a section in proportion to the tension of the members. When I made out the calculation of the bridge I had instructions from Mr. Stone to proportion the structure so that it would be four tons on the square inch in tension, and four tons on the square inch in compression. That proportion made the tension members much stronger in proportion than the members in compression. When the bars—the H and I bars—were rolled for these heavy members the section on the larger bars, for the main braces, were not made as large as originally intended. That was the main defect in the construction of the bridge. And I also expected, if I had been employed to carry the work out, that those braces, the main braces at the end of the bridge, would have been strengthened or additional bolts riveted to them. When I was doing business with Mr. Stone, in my interviews with him about these matters we never could harmonize.

Whenever I made any suggestions it always led to some discord, and it was these circumstances that I left the work. I would state further that the bottom chords of the bridge, the tension members, were as good work as ever I saw made. The top chord was sufficient for all purposes. I may add here that when it was laid out by me, it was laid out calculating for six-inch, camber, so that when erected a principal part had taken its bearings, it would still have about three and a quarter or four inches camber. That was my calculation. The substance of this is that the main braces of the bridge were the only defective members in the bridge.

Mr. Stone knew it, because we had several conversations on the subject. They were defective in this, that they were too small—they had not sufficient section— they couldn't fill the section when they rolled them in the mill. That was the only defect that I am conscious of in the structure except this unnecessary weight.

I don't know how much it was calculated that each truss should carry to the foot, but I think it was a ton and a quarter or a ton and a half. It is many years to remember. But it was intended to be an exceedingly strong structure. This was Mr. Stone's intention, and the intention of others. It was intended to be an exceedingly strong structure, and was all proportioned except the defect which I mentioned, which was the deficiency in these bars, which formed the main braces.

Q: So far as you know, was this the first application of the principle of Howe truss bridge to iron bridges?

A: Oh, no there have been a great many built with cast iron members in the place of wrought iron bridges, but not by me, though.

Q: Where was the iron work for this bridge made?

A: At the Lake Shore shops, Cleveland.

Q: Did you superintend this work?

A: Yes, sir; I gave the patterns, and the length of every part of it, for the mechanics to work by; and gave them correctly, though it has been reported to the contrary.

Q: Did you also inspect the work, and did you know whether those plans, as furnished by you, were strictly followed?

A: They were followed as long as I had the superintending.

Q: And did you have that superintending until the same was completed?

A: Very nearly.

Q: What parts, if you are able to state, were not completed at the time when that superintending ceased?

A: There were patterns being made by the pattern-makers which I didn't see finished; but the chords were made; and the bottom chords, which were the most important part of the structure, were all finished.

Q: For what part or parts of the bridge were these patterns designed, that you didn't see finished?

A: I have only a kind of indistinct consciousness that the pattern-makers were making some patterns which were not finished, and which I didn't see what they were. The surface of the angle blocks were not planned, and there were some little things not finished, but it was nothing essential.

Q: Had you any thing to do with the superintending of the raising of the bridge, as it is called?

A: No, sir, I never was; I don't think I ever was on the site of the bridge at all, except to pass over it.

Q: In your employment in regard to that bridge, had you any instructions from, or was it, if any, superintended by Mr. Charles Collins?

A: Mr. Charles Collins might have taken a little interest in the matter, but he didn't have any superintendency or authority over it; it was all directed by Mr. Stone.

Q: Had you, at the time, knowledge of the fact that the bridge, after being raised, was taken down, and the position of the braces changed?

A: I think there is some misunderstanding about that; my understanding of the matter is this: that after they began to put the bridge up here, they found that the top chords were longer than the bottom, and the bars were all sent back to Cleveland and shortened; then when they put the bridge up they found that the bridge was below level. That had to be taken apart, and a piece of plate of iron inserted to make up for what they had taken out. That was hearsay at the time, and I have been down to the bridge to-day and examined, and have found it to be the fact, that there was a piece of boiler-plate inserted at the end of the beams that formed the top chords.

Q: In your design, were the braces intended to rest flatways, or upon the edge, with the weight horizontal or vertical?

A: I shouldn't have particularized that, to be positive, until I went down to the bridge this morning. They were intended to lay flat, in the first place, and they were changed to stand edgeways, and when the bridge was erected, I was informed, I can't tell by

whom, I can't remember, that the beams with small sections were used for the end braces, that made this change in the direction of the brace necessary, so as to get in a greater number of braces. I learned this morning for the first time, that there was a greater number of braces put in.

Q: Was the bridge, so far as you know, correctly set up, and if not, wherein was any incorrectly set up or raised?

A: Personally I know a little about raising a bridge; what I have told you was hearsay; I was, moreover, told that the stretchers for the lateral bracing of the bridge were in place at the end of the lateral tie braces; they were placed right across the middle of the lateral bracing, and as a consequence, they would have very little effect. Those were the only things that I have heard were wrong.

Q: Have you, since your arrival here, examined the wreck of the bridge, to as certain whether that information was correct?

A: I have been down at the bridge, and about the lateral bracing I could tell nothing; I tried to find out, but there was no particle left to show how the arrangements were; the pieces between the top chord beams and the angle-blocks, some of them, are still in place; by the top chord beams I mean the five I beams, side by side, which constituted the top chord.

‡§ Questioned by Mr. Goodwin:

Q: During the construction of the iron work of the bridge, did you exercise a supervision over it in the shops?

A: Yes, sir.

Q: And saw and inspected all the iron work for the bridge, except those portions which you have specified as not being finished at the time when you left those immaterial portions?

A: Yes, sir.

Q: You say the unfinished parts were some angle-blocks and some little things—nothing essential, so that you actually inspected all the iron work of the bridge?

A: I inspected it so far as to see when it was done well there. I probably ought to state here, that the strengthening of the end brace was always a matter in my mind, was a matter of dispute with me and Mr. Stone.

Q: When you left the work, had there been any decision made in regard to the matter of strengthening the end brace?

A: No

Q: It is your understanding that the bridge was erected with the members of the upper chord and the braces above the main camber, as they were shown in your own original design?

A: I always understood that the small beams were used in the main braces, and that the beams with the larger section were used in the counter braces. The beams were rolled with web bearing, in thickness from one-half an inch to. I will say, an inch and one-fourth, so that the section of those with an inch and one fourth web would be only double those with one-half inch web. Those with a large section were intended

for an end brace. Those with small sections were intended for an end counter brace. I understood that beams with large sections were used for counter braces, and beams with small sections were used for main braces.

Q: What information had you in regard to this distribution of members?

A: It was talked among us engineers when I was in Cleveland, some time afterward. I can't remember by whom.

Q: Can you recollect, without the assistance of the drawing, substantially, the size you intended for the braces, main and counter, that you intended to go into the bridge, giving us the size of the ends at the ends, and progressing towards the centre of the bridge?

A: Only general. That the largest sections were intended for the end braces, and that they were gradually diminished in size to the centre. The end counter braces were the smallest that there were in the bridge; and then at the middle there were two counter braces, and the section of them was enlarged also.

Q: Did you make a strain sheet for this bridge, and calculate strains for the structure according to your design, and leave that strain sheet with Mr. Stone when you left?

A: I made a strain sheet, as a matter of course, calculating strains for the bridge according to the design and the instruction I received; and I left all the drawings in the office when I left.

Q: You specify in your answer, and particularize the word "the" design. I understood you so. You wish us to understand that the design was made, as you here said, under instructions from Mr. Stone?

A: Certainly, it was made under instructions. I didn't design bridges of the same character when I design bridges to be built by myself.

Q: You say that there was a difference of opinion between yourself and Mr. Stone in regard to some detail of the design; that you had expressed, your intention to strengthen them or increase the number of the end braces; that you and Mr. Stone didn't agree upon that point up to the time that you left. Is that a fact?

A: Yes, sir. You see, looking at the design as I did, and knowing that it could be made a strong structure, I alluded first that the compressive members of the structure, particularly the end braces, could be strengthened to any extent required.

Q: Do you mean that they could have been strengthened to any extent required without material change to other portions of the bridge?

A: Yes, sir, by addition of bolts riveted to them so as to connect each set of braces throughout their entire length.

Q: Would it not have been proper, in your opinion, to have increased the strength of the end braces by lengthening the end beams?

A: I think it was; and it was all changed, so far as it went; and the whole set ought to have been united, from side to side, through the whole length, and not merely at the centre, where the camber passed between them.

Q: If you had control of the construction of the bridge up to its completion, what modification in the design as originally made would you have introduced?

A: Nothing more than to take out the necessary section to have made the strain that came upon it.

Q: How would you have secured that necessary additional section?

A: By riveting bolts of iron to beams would have united them together as one brace, and, at the same time, giving all the necessary section that was required.

Q: Would you have made, provided you had had entire control of the structure, any other modifications?

A: I think not — not if it was to remain a Howe truss. My changes would only have been by changing the character of the structure.

Q: I conclude, then, from what you say, that the principal objection you had to the design was, that the form of the bridge was that of a Howe truss, and that you didn't consider it proper to build a bridge on that general plan of iron as this was built? Am I correct in that conclusion?

A: Yes. I don't approve of the Howe truss when it becomes a large span. I don't in wood, even, if a large span.

Q: Then your objection, as it appears, is to the Howe truss plan for bridges built of iron for a span as great as 150 feet?

A: Yes.

Q: You have said that the bridge was calculated to carry a moving load from 13 tons per lineal foot. That was, as I understood you, to be the working load of the bridge from two to three tons per lineal foot for the whole bridge?

A: Yes.

Q: What was the factor of safety used in your calculation for this bridge?

A: My factor of safety in this bridge was four tons to the square inch in tension and compression, as limited by Mr. Stone; the members in tension were stronger than necessary.

‡§ Questioned by Mr. Morrison:

Q: Were, the members in compression correspondingly weaker than they ought to have been, or stronger?

A: They were weaker in proportion than they ought to have been; but in this they didn't hold section—were not as large in section as they were intended to be; I mean the largest members.

‡§ Questioned by Mr. Goodwin:

Q: I understood you to say that you had nothing to do with the raising of the structure?

A: No; I never was there.

Q: Then your observation of these parts of that bridge were made in the shop or at the mill?

A: Yes.

Q: This structure, which we have been speaking of, what it would have been had the design been followed, you can't say from personal observation, as I understand you, how the bridge was actually constructed or set up?

A: I never saw it; I know only from what I heard.

Q: Did you ever see the bridge as it was when it was put into use?

A: I have passed over it on the train; that is all; never saw it only as I looked out, when I could see nothing of any kind.

‡§ Questioned by Mr. Morrison:

Q: I understand you to say, that in making the plans for this bridge, you was dictated to by Mr. Stone; that your instructions were all from him. Did you consider those instructions as reasonable, and the requirements that he made of you as reasonable and right, under the circumstances?

A: Not exactly reasonable; because in said sections is not a true method in getting at the principal sections. Four tons to the square inch in one place may be perfectly safe; in another, not safe. If the iron had been made a full section and placed in their proper position, the bridge would have been a safe bridge to-day. I should not have built a structure that I had any misgivings about. Do you understand?

‡§ Questioned by Mr. Morrison:

Q: You speak, Mr. Tomlinson, of a strain of four tons to the square inch in one place as being safe, and in another not safe. In which place do you consider it safe in this bridge?

A: I think it would be safe in the top chords; because it is such a short distance between the bearings, and they are so well united together.

Q: Give any other place?

A: No, I don't know of any other place where there are short bearings.

Q: By that do you mean that the compression of four tons to the square inch would be safe in this bridge, only in the top chord?

A: Only in the top chord; because there the panels are short, and the parts that compose the chords were united together in safe places between the panels.

Q: Would you consider the compression of four tons to the square inch safe, as applied§ the main braces in this bridge, as it was erected?

A: No.

Q: Let me ask, then, what would have been the effect of compression upon those main braces, four tons to the square inch, as it was erected in its modified form?

A: That they would be deflected out of line; the members would have been out of their line.

Q: Do you understand, Mr. Tomlinson, or, have you in your own mind a clear idea how this bridge was erected, or set up, as modified from the original drawing?

A: Only from hearsay.

Q: We have had in evidence that the modification consisted in this, that the I beams, which formed the main braces, and counter braces, were set up edgewise— in other words, the web vertical, instead of being, as originally drawn, horizontal; that there were added, at the end of the panel, to the end of the set braces, two braces; to the next one, two; and the next one, one; and the next, one; and the rest of the bridge remained as originally planned ; they were placed vertical, instead of horizontal; that these braces were secured together at their intersections by packing between cast-iron lying horizontally across the intersections; holes through the ends, and washers outside of that corresponding, holds a bolt put through at each of these places—a washer put on with nuts on the ends of these bolts turning up tight on the inside truss. This being the condition, what would be the effect, think you, upon that application of pressure, equal to four tons to the square inch, on that calculation—I mean, taking into consideration, also, the fact that this yoke, as described, around the centre, was the only thing which bound them together, leaving them free for ten feet of their length for deflection?

A: It is a matter of calculation to know what the effect would be; that my impression would be it would spring out—deflect laterally; they would not crush, they would deflect out in the weakest direction.

Q: Did you, at the time of making this plan, have a conversation with Mr. Stone in regard to the section of these braces?

A: Yes. I had represented that the braces were not sufficiently large to meet the requirements; they were not large enough in the first place; they were not what the drawing represented; and when they came to be turned out from the mill they didn't hold full size, as intended.

Q: Did you, at that time, say to Mr. Stone that to secure the resistance of compression of these braces the I beams must be increased, either in numbers or size?

A: My proposition to him was to increase their strength by riveting plate to them; I had suggested to him that they were not strong enough.

‡§ Questioned by Mr. Pettibone:

Q: To what extent was the strength of those I beams— the pieces composing the main braces—impaired from the fact of their having been rolled improperly?

A: It is very difficult to state to what extent; I can't remember, now, how much the deficiency was, but it was a serious fact—so serious that several ought not to have been used.

‡§ Questioned by Mr. Morrison:

Q: You say that you suggested to Mr. Stone that further security and strength should be given to the braces by putting on a plate of iron?

A: I suggested to have a plate that would unite the first set of main braces— two or three sets—with these braces, side by side; and when I suggested anything of this kind to Mr. Stone, he was wrathy, and would not hear, so that I would be driven from his office; and it was under these circumstances that I determined to leave him. The interview about the braces was on one day, and the next day, when I went into his office on some other business, he was so insulting to me that I went up to the office and resigned.

Q: How long a time did this take place before the work of preparing the bridge to be put up took place?

A: It was a month or so after I left before the raising of the bridge was commenced—before they made any attempt to raise it; I am not certain as to the exact time. If the braces that I had for the main braces had been put in their proper places, and the two additional members added for the main section, I think there must have been the necessary strength to have been safe.

Q: I understand from your last statement, that the braces you intended for the main braces at the ends, were changed, and others lighter and less secure, put in their places.

A: Yes, sir, I understood so, it was told me; I didn't see it.

Q: What effect would this exchange of braces have upon the strength of the structure?

A: They would be much securer to the bearing of the strains that came upon them.

Q: When you were at the wreck this morning, as I understood you to say, did you make any examination as regards this exchange of braces?

A: I couldn't tell which were end braces; some of them had been removed and thrown upon the bank on the other side; there were none of them in position.

Q: From what you say of your intercourse with Mr. Stone while working upon the plans of this bridge, Mr. Stone and yourself didn't harmonize.

A: No, we couldn't agree.

Q: Let me ask, what were the main points of difference between yourself and Mr. Stone?

A: That is very hard to answer; my feelings were, that he didn't like to have anybody that had any opinion to give at all.

Q: What I want to get at is, what was the main point of difference between you and Mr. Stone, in regard to the construction of the bridge?

A: As far as my memory goes, I never had any anxiety, except the compressive members of this bridge. I knew that the chord rods were as good as could be. I don't think there was a better set of chords put into a bridge.

Q: I understand from that, that you had no fears, as far as the bridge was concerned, upon which the strain was tensile. And all your fears, and your anxiety, was about those parts which were in compression. What portion, or what part of the members were under compression, which gave you the greatest anxiety?

A: The three first set of braces in the bridge from the ends.

‡§ Questioned by Mr. Pettibone:

Q: If, as you understand, that bridge was modified and the position of the braces changed, and the addition of other braces in the three end sets, would that in your#. have rendered the bridge perfectly safe?

A: If they were equal to the beams of the largest section furnished, I think that it would have been safe.

Q: But if, as you understand, that beams of the smaller section were used for the end set braces, and if two additional set of beams were added to those braces of the same size and the smaller sections were that, in your judgment, give the required additional strength and security to the bridge?

A: If they were above the middle sections, I think it was, and if they were only equal to the smallest section, they wouldn't be sufficient, and it is hardly probable that the smallest section was used.

Q: You have no personal knowledge as to which size section was used in the end sets?

A: No. I have not by personal knowledge, but it was talked about so much by the engineers, and those that were familiar with that class of work, that I have reason to think that the smaller braces were put in the place of larger ones in the first place.

Q: You have looked at this drawing here, have you? Do you recognize it? Is it your work?

A: Yes, sir. This is the preliminary drawing. The first drawing that was made of the bridge?

Q: Does that drawing show the general plan and principles upon which this bridge was constructed?

A: Yes, sir.

Q: Does it, or does it not, show the dimensions of the several parts?

A: It does not show the dimensions. It is too small to show them all. The strain sheet, which ought to be with this, would give the dimension of the several parts. The strain sheet is more important than this.

Q: I want to ask you further, do you know the weight of a locomotive in use for passenger trains—in use on the Lake Shore road?

A: I suppose in the neighborhood of thirty-five tons.

Q: Is that a conjecture?

A: No, it is not. When I was on the road, that was about the weight by which we estimated, including tender with the locomotive as it would bring its weight on the bridge. I speak from memory and might be wrong.

Q: Do you know whether locomotives, at the present day, are made of increased weight than what they were at the time you speak of.

A: I should think that the express engines now, judging from their appearance, are about the same as they were eleven years ago when I was in the habit of proportioning bridges, I knew the exact weight of them.

Q: We have had in evidence, that the bridge upon this second trial, before it was modified and put up, I understand that these main braces by the setting of the bridge by its own weight, were deflected some of them four inches, what would that have on the iron to increase its tendency to deflection?

A: I suppose they were much more readily deflected in the same direction the second time, but my impression is, that they were to be a permanent set in the length so that they would be shortened—too short to use by that over load and piece of iron, it gets a permanent set upon it, it becomes shorter or longer.

Q: To what distance could a bar or I beam, the size of this, in those main braces, be deflected without producing a permanent set, as you term it?

A: I don't think they could be deflected without producing a permanent set.

Q: Suppose these braces to have been put into the structure as first erected, placed horizontally and screwed tighter by the means already described, a deflection vertical of three inches to take place in those braces, would they be likely to return to their line upon the removal of this pressure?

A: Pretty near, I think; but the movement of iron under such circumstances is very uncertain. I should think they would be likely to go to their places again, particularly if the strains were on them but a short time. I consider a day a long time for it to remain under that strain.

Q: Suppose that deflection to be four inches, and to have remained or have been in some days in coming on by the gradual settling of the bridge, what would be its effect?

A: After it had been deflected four inches by the end pressure I would consider the permanent deflection of it would be at least one-third of the full amount of deflection, and this only. And yet I think the strain when produced end. I think, would be much more, so far as it would compress the middle on one side.

Q: Would you consider it safe to take beams which had been subject to such pressure and deflection and change them from a horizontal to a vertical position and subject them to the same pressure without having first, by some mechanical means or some other, to restore them to their original capacity to endure pressure?

A: Without strengthening them I should not consider them fit to use, because they had proved insufficient. The changing of position doesn't make much difference.

Q: We have had in evidence, with these beams and braces having been deflected, without taking out of their position changed from horizontal to vertical and yoked at their intersections, and put into position as compressive members in this bridge, with the tension of new iron, to a certain extent as already stated. What I want to ask, what would be the effect upon these braces, light pressure, or to carry a train of cars with two locomotives, the first deflection being merely from the weight of the bridge?

A: If the column had proved itself too small and too weak to carry a load, it ought to be increased so that it would be three times that strength. To get three times that strength it would not be necessary to have three times that calculation but when put in sufficiently it would bear three times that calculated strength.

Q: If, under a pressure of a heavy train running upon the bridge running over these trusses, one truss bearing six times as much load as the other, and deflection in this main brace should occur laterally, what, in your opinion, would be the effect upon the bridge?

A: If any serious deflection took place in one of the braces it would change the relative bearing force on the truss so as to bring them very much on the outside members of the structure. The question is one to which I couldn't give a positive answer, but as far as my experience goes, I would have thought that that truss would have yielded a couple of feet before it would have gone down.

Q: If the truss had yielded two feet in consequence of this deflection outward or inward, or both main braces, would it have stood there with a strain on it?

A: I should have thought that the deflection of the braces would have allowed the truss to settle two feet before it would have gone down, so as to give time for the train to pass, or that the fracture...wouldn't have taken, place certainly. Wrought iron doesn't break suddenly. There is a gradual yielding; something has to snap before it goes down.

Q: With that statement, suppose these braces to have given way — I understand you, then, to be because at first there would be a gradual settling of the roadway and the train upon it was moving across it, for you two feet or perhaps more, you thought likely to continue until the bridge went down?

A: The movement of the deflection would be sufficient still, in my opinion, to allow the train—I think there would be sufficient warning given to allow the train to get off—sufficient time for it to get off.

Q: Suppose the lower chords of that bridge had parted—all the chords—what effect would that have upon the bridge?

A: It would go down as quick—just as quick as a bow would fly up when the string was cut. If it were so there would be evidence of it, as the braces would cause the ends of the lower chords to strike with force against the abutment.

Q: I understood you to state, I think, in the first of your evidence, that the tensile portions of the bridge were stronger or heavier than they ought to have been; by this what portions do you mean?

A: I mean that the tension members, if they had been secured down, would have been strong enough to crush every brace in the bridge. They were exceedingly strong truss rods. The vertical rods in the bottom chord are the tension members of the bridge. The compression members are the upper chords and the main and counter braces.

Q: Do you know the weight of the iron used in the construction of this bridge?

A: I did know but I don't remember. It was all estimated up at the time, but I don't remember.

Q: Do you know who furnished the iron which went into this bridge?

A: The iron was brought from the Newburg mills. Mr. Jones was the foreman of the mills at the time—I think his name was Jones. The quality of the iron for the tension bars was all good. It was worked under my eye, and I know it to be good. The compression members did not have to be so good. It isn't usual to put the same quality of iron in compression members as in tension members. It isn't usual or necessary to do so. The iron that is to be in compression is usually a harder iron, and is just as good for compression as it would be to put in the best of refined iron.

‡§ Questioned by Mr. Morrison:

Q: On your examination on Thursday evening, 11th inst.,it was understood that you were to go to Cleveland, and, if possible, to obtain the strain sheet and working drawings of this bridge. Did you find them, or have you seen them?

A: I couldn't find them.

Q: Did you apply to the officials of the railroad for them?

A: I did, particularly to Mr. Collins, and he told me that they had hunted thoroughly in his office. Mr. Newell told me that they had made a thorough search of the shops, and went down to the shops and saw Mr. Haywood, who had charge of the pattern-making there, thinking he would be likely to know; and he said he made a thorough search and couldn't find anything that belonged to the bridge. That is all the search I have made about it.

Q: Did you understand that any inquiry for this strain sheet and working plan were made of Mr. Stone?

A: I didn't hear any thing of the kind being made.

Q: Did any one propose to inquire of him?

A: No, sir; if I remember right, when I left Mr. Stone's employment I was told to hand the plans over to Mr. Collins and the work over to Mr. Congdon. I am not surprised that these working plans were not found; because we set no store by them; when the work is done, it is not expected that anything will come up that will require them.

Q: Did you learn, in your visit to Cleveland, any other material facts in regard to the construction of this bridge?

A: No, sir.

Q: When did you return from Cleveland?

A: This morning.

Q: Did you visit the wreck of the bridge immediately after you returned from Cleveland?

A: Yes, sir.

Q: Did you give it a thorough examination, as much as you could in the time you have had?

A: Yes, sir.

Q: Did you examine, Mr. Tomlinson, as regards to the bearings of these main braces and the counter braces upon the angle blocks, to know whether they were in place; can you tell?

A: On the south truss, I think I can find but one or two angle blocks; examined all that I saw, belonged to the north side, except one or two; on one of the angle blocks especially, there was evidence that one of the braces was fully three inches out of place when it was last painted; this is on the north truss.

Q: How about the angle blocks that you found belonging, as you believed, to the south truss? Did you find indications that the braces were out of place?

A: Slightly; so much so, that the lower flange of one or two braces were completely off of the angle block.

Q: In the modification of the bridge and .. of the position of the main braces from horizontal to vertical, did it require a larger surface to the angle blocks to receive the head and foot of the main braces?

A: The same number and size; the braces would only require the same surface; but if the number was increased, then it would require additional surface for these extra braces.

Q: The faces of the angle blocks on this bridge were originally intended to receive I beams, six inch web and four and a half inch flange, lying horizontally; now, by turning those bolts and setting the web vertical and the flange horizontally, would there be breadth enough on the face of the angle block to receive them?

A: There was width enough on the inclined surface of the angle blocks for the six inch braces in place, but any where they interfered with the bolts.

A: There was width enough on the inclined surface of the angle blocks for the six inch braces in place, but any where they interfered with the bolts.

Q: Did you notice what measures were taken to remedy the deficiency, where the bolts were interfered with?

A: Yes; a number of the flanges of the braces had been cut away;

Q: How many of these braces had been cut or chipped, more or less, in order to accommodate the bolts?

A: I couldn't tell; but I should think about two in five.

Q: What effect would this chipping away have upon the sustaining power in those braces?

A: Cutting away a corner, slightly, I don't think it would have very great amount, any dangerous effect; but when the flanges are cut away on one side so as to leave only the web and the flange on the opposite side, it would render the braces less stiff; it would very much impair its strength.

Q: I think you spoke in your first examination, you mentioned that upon the face of these angle blocks, there were lugs cast, into which the heads and foot of the braces were introduced to keep them in position. Was there anything on the angle blocks in the modified structure to take the place of these lugs, or what be came of them?

A: The most of them appeared to have been chipped off.

Q: Was there any thing to prevent the head or foot in these braces from getting out of place?

A: The greater part of the braces seemed to have no provision made for holding them in place.

Q: Did you notice any of these angle blocks where the braces seemed to have changed from their true position, and were sustained merely on the angle blocks?

A: Yes, sir; one angle block showed the braces on one side three inches out of position, and the other as if it was in its true position, and the intermediates in like proportion.

Q: How are you able to tell that this change of position has taken place?

A: The position of each brace is fairly shown in the angle block by the absence of paint, where the brace stood.

Q: This would show, would it not, that the brace was out of position when last painted?

A: Yes, sir.

Q: What proportion of these braces would you think were more or less out of position?

A: I didn't take the number; there are certainly evidences of these braces being seriously out of place.

Q: Did you examine the top block of the end braces on the west end?

A: Yes.

Q: How did you find that as indicating that the braces were out of place?

A: I can't especially say; it didn't come so much under my notice as those that were in the middle of the bridge, and the one at the other end.

Q: Did you examine other portions of the bridge there, and will you please state what portions of the bridge you did examine?

A: I examined every part, that is, inside, as minutely as I could for the short time I have had there.

Q: Will you please state to the jury, if you have made any observations there which, in your judgment, were defective in the construction of the bridge?

A: The braces ought to have been so connected together, and adapted to the angle blocks, that they could not get out of position, either at the top or bottom. These make serious defects, that we can see now. There are other defects which I know of, which don't now show.

Q: You spoke in your former evidence of hearing that the braces, with a small section intended for the centre panel of the truss, were used in the ends; did you find any evidence to-day that satisfied your own mind whether that was true or not?

A: I think nearly all the end braces have been moved from position, but there are several braces of the smaller sections that are cut away very materially, as if they had been made to fit against the largest bolts.

Q: Would that be evidence, to your mind, that they were used in the end panels, where the largest number of braces were required and the largest bolts were used?

A: Yes; because I wouldn't suppose that they would cut away any more metal than was absolutely necessary.

Q: Did you find any evidence, satisfactory to yourself, that the large braces with inch web, which were intended by you for main braces, had been used as counter braces?

A: There are not sufficient braces in place to enable me to answer that question satisfactorily, but there were some braces near the centre of the bridge that have thick web, not quite an inch thick, though.

Q: From what you did observe there, you concluded, did you, that the braces with thick webs were used in the centre of the bridge, and those lighter sections at the end panels of the truss?

A: I can only say that some of the braces which are now near the middle of the bridge have a thick web.

Q: Would this displacement at the head and foot of the braces, both the main and counter, have been likely to attract the attention of the bridge inspector?

A: I think it would be the first thing he would look for.

Q: What would you think of an inspector of a bridge who should fail, for any length of time in making an inspection of the bridge, to notice the fact of these displacements?

A: A person who was in the habit of reasoning and thinking about strains on a structure, would evidently look at those points the first thing; 1 should think his observing facilities were not very good if he didn't see them.

‡§ Questioned by Mr. Perry:

Q: I would like to have you state, if you can, where and how the Trails, forming struts between the two lower chords, were placed—at what point in the panel, I mean?

A: The plan shows how they were intended to be placed, and there is evidence that they were in place, where they were intended, when the chords were taken out of the water. You can have the proof, in many places, which can not be seen now, that the struts were in place against those angle-blocks which have a rest on the end side for the lateral bracing.

Q: Can you tell, from your examination this morning, where they were placed?

A: No, but the wrought-iron washer and the first set of bolts don't project on the inside to receive the strut.

Q: From this do you think that they were not placed as they were intended

A: That is my belief.

Q: Were the floor-beams of the bridge intended for struts?

A: They formed the struts to the top chords.

Q: In what manner?

A: They had pieces riveted to them that fit between and against the edges of the beams of the top chord; I think some were between and some against the edges.

Q: Were these pieces intended to go entirely inside of the top chord, or between the members of the chord, by the plan which you drew?

A: Between the members of the chord.

Q: Did you see, in your examination this morning, any of the floor-beams which had these pieces coming between the members of the top chord?

A: I couldn't see; there was only one beam which I would have thought went inside of the chord.

‡§ Questioned by Mr. Pettibone:

Q: Is it in the intention and design and construction of the Howe truss bridge, either in wood or iron, that each and every part of its component parts should bear its proportional share, above the dead weight of the bridge, of the weight which might be placed upon it?

A: Certainly.

Q: Now, what would be the effect upon a bridge, constructed upon the Howe truss plan, wherein its construction and displacement in its principal chord, whereby they didn't get their true bearings and their proportionate weight, originally designed, what would be the effect upon the other parts?

A: The surplus weight would be transferred to other members.

Q: What would be the effect upon those other members, where the surplus weight was carried or conveyed, in relation to their ability to sustain this additional weight?

A: If they were not sufficiently strong they would give way.

Q: If, in your examination of the wreck of the bridge, you, found a displacement of any of the component parts of the bridge intended to bear compression, or displacement of any of the members composing these component parts, was it, in your judgment, sufficient to endanger the safety of the bridge?

A: Yes; if one set of braces gave way it was the destruction of that truss.

‡§ Questioned by Mr. Morrison:

Q: What provision was made in the original plan of the bridge for preventing lateral motion, or swaying of the lower chords of the bridge.

A: There was a system of lateral bracing, that commenced at the end of the bridge. The first pair of braces extended one panel, crossing each other in the centre panel. The intermediate lateral bracing extended two panels. The diagonal members of the lateral bracing were tension members.

Q: What was the size of those rods?

A: I didn't measure them to-day, but it is in my mind they were two and one half by one-half inch flat bar.

Q: Was there a turn buckle in them?

A: I think not. My own impression is that it was the intention to force the struts in very tight, so as to bring them up to tight bearing, driving the struts in sidewise. They had enlarged ends, that fitted in the recess in the under side of ;angle blocks, and the angle blocks resting upon the lower chord kept them in place.

Q: In what manner was that enlarged end put into the angle blocks—in the form of a dovetail, or in a sort of a hanging hook?

A: It was formed by doubling over the end bar so as to give about one-half inch to hook the width of the bar.

Q: And there was a recess in the angle block into which that hooked?

A: Yes

Q: Was there any other provision made for tightening these diagonal tension rods except the one named?

A: I think not.

Q: Was this all the provision made for preventing the lateral swaying of the bridge in this lower chord?

A: Yes. It would be assisted by the vertical tie braces that extended from the upper chord to the lower. The one would assist the other.

Q: In forming the upper chord of this bridge was there the same section of iron used in there to the whole length?

A: It was not the intention. The heavier bars were intended for the centre compression members.

Q: Did you notice the upper chords—you were there to-day—to see whether the central portion of those chords was composed of heavier bars than the ends?

A: Yes. They are.

Q: Is not the compression strain on the middle upper chord?

A: Yes.

Q: Doesn't that require a much larger calculation of material than at the ends?

A: Yes.

Q: The top chord of this bridge resting, as it did, upon the angle blocks, would be subject to a transverse strain in bearing a load upon the bridge?

A: The transverse strain upon those top chords, in my opinion, would very likely affect the strength of them, because they are a continuous beam, and slightly bending upward.

Q: There are, as I understand it, two ways of using the Howe truss, one by using them as a deck bridge, and the other as a through bridge—the load in one case being upon the upper chord, the other upon the lower?

A: Yes.

Q: Which of the two is preferable, so far as securing strength?

A: The deck. The reason for this is, that the load is all on the top, and doesn't have to be carried up, so it makes a panel difference in the length of the bridge.

Q: Is there not a greater tendency to lateral motion in a deck than in a through bridge?

A: I never thought there could be much difference, having never seen an thing to make me think there could be much difference. If there is any, I think a deck bridge would have the advantage, because the vertical diagonal bracing would hold the trusses vertical.

Q: Upon what do you depend upon your vertical diagonal bracing to keep the upper chords steady in this bridge, in particular?

A: When the diagonal rods are screwed up, it would bring the strains on both the upper and lower chords, against the struts that extend from one side to the other, compelling both trusses to retain a vertical position.

Q: In what manner were those vertical tie braces connected at the ends, with the upper and lower chords?

A: They were both connected in the same manner by hooks, with square— fitted into the ends of the angle blocks, and held in place by short screws. The manner in which they were fastened was sufficient to bear any strain that could be brought upon them by the turning buckles.

Q: How often were those vertical tie braces put in?

A: At every other panel, commencing at the end panel.

‡§ Questioned by Mr. Pettibone:

Q: I desire you to state to the jury, and embody it in one answer if possible. What displacement of the different component parts of that bridge have you observed, would in your judgment, endanger the safety of the bridge?

A: Every displacement as far as it goes, is a detriment, and ought not, under any circumstances, be allowed to take place.

Q: In relation to these defacements of the beams, or chipping off of part of the beams, what would be the effect?

A: If the beams had been kept in place, so that the bearings were fair on their ends, a chipping off of the corners of the flanges would have been no serious detriment, but when they got out of place, then it become a serious detriment.

‡§ Questioned by Mr. Morrison:

Q: Were you in the employment of Mr. Stone before any thing was said to you about drawing the plan of this bridge?

A: No, sir.

Q: Did he send for you especially to draw this plan, and superintend the erecting of the bridge?

A: I presume so. I don't know.

Q: Was this the only employment that you ever had from Mr. Stone?

A: Years ago I was with him a short time—about 1847, I think, but didn't see much of him.

Q: Did he send for you at the time when he projected the building of this bridge?

A: Yes. He telegraphed me at Fredington, but how he came to do so, I don't remember. I know I received a telegram from him and a letter; it was in answer to this telegram that I came to Cleveland.

Q: Did Mr. Stone, at your first interview, inform you for what purpose he had sent for you?

A: Yes, sir. So far as my memory serves, this bridge was the only thing that came up at our first interview.

Q: Did he tell you for what purpose he had sent for you?

A: I couldn't tell especially; but this bridge was the only thing before us for some length of time after I did come.

Q: I understood you to say that you were not favorable to the use of the Howe truss bridge for long spans?

A: Yes, sir.

Q: Did you express your objection to the Howe truss bridge at that time for a bridge of this span?

A: I don't think I did.

Q: How long after you first saw him before you commenced the plan and drawing for the bridge.

A: I suppose right away. There was nothing else for me to do at first. I suppose I commenced the day I came into the office, though I can't remember positively.

Q: Having serious objections to the Howe truss bridge of this length, how came it about that you didn't state those objections to Mr. Stone?

A: Well, I suppose when I first came to Mr. Stone's I looked upon him as a higher authority in bridge matters than myself.

Q: Then Mr. Stone told you just what he wanted done, and how to do it, and you merely drew this plan at his dictation, and in such manner as he directed?

A: Generally, that would be correct; because in carrying out the detail of the plan, there would be, of course, suggestions and consultations between us.

Q: In those conversations did you ever suggest to Mr. Stone that the Howe truss was not the best form of bridge of this span?

A: I think not.

Q: Were you not consulted at all in regard to the plan?

A: No, not in regard to the plan.

Q: You did, then, just what Mr. Stone told you to do, without comment or suggestion?

A: No: I wouldn't say so altogether. I tried to make a great many suggestions; and I would state here that I don't consider that the Howe truss can't be made a good bridge, but it would be so much heavier than any other, and, secondly, more expensive.

Q: Are we to understand from that that the Howe truss bridge, wrought iron, more expensive bridge than wrought iron in every other form than a Howe truss?

A: Yes, sir; the saving in material by some other form would be in itself a great saving.

Q: A saving of expense in the erection of this bridge was not then a matter of consideration?

A: I think not. I think it was Mr. Stone's intention to make a first-class bridge.

Q: Did you think at the time that his intentions, as stated by you, were being carried out in the building of this bridge?

A: I don't consider that they were carried out in a perfect manner by any means.

Q: You give us to understand there was no lack of expenditure or any thing to secure a good bridge?

A: I think that generally would be correct.

Q: Can you tell us now why, in your judgment, a good bridge was not secure?

A: The first defect that I would remember was the beams for the compressive members not holding their full section, and also there being defective rolling. I never thought at that time, or since, there was any other defect in the bridge except in those compressive members. In examining the bridge now, I find there are defects, such as not having the braces held securer in place against the angle blocks, these and the end of the braces not being properly secured together and longer length, are what I hold to be the principal defects in the bridge.

Q: You say there were defects in the rolling of the iron; where was this iron rolled?

A: At Newberg.

Q: Was it a part of the business of the Newberg mills to roll "I" beams, and were they prepared to roll them?

A: They had rolled six inch beams, but I don't think they made it a business of rolling beams; there were not many mills in the country at that time that did, because there were not the beams for them; that's been since.

Q: Do you know of their having rolled any I beams at that mill, since that time?

A: No ; I have not been acquainted with the mill since then. I always considered that Mr. Jones, the foreman of the mill, understood his business well.

Q: If this was a good mill, and the foreman understood his business, and they were skilled in rolling I beams, how do you account for the defects which you have mentioned?

A: That the mills were not adapted for rolling beams of the largest section.

Q: Do we understand from that, that their machinery for the performance of the work was not adapted—?

A: For the larger beams; that is what I understood at the time. You will observe on the work that the small beams are more perfectly rolled than the large ones.

Q: Do you know who were the owners of this Newberg mill at the time?

A: Stone, Chisholm & Jones, I think were the firm.

Q: Was the Mr. Stone of that firm a relative or connection of Mr. Amasa Stone, or the same individual?

A: 1 think it was his brother, A. B. Stone, that was in the business.

‡§ Questioned by Mr. Hall:

Q: I think you stated that in your design for the bridge, the expansion rods varied in size, beginning at the abutment, and growing smaller at the center?

A: That is correct.

Q: In your examination of the wreck, did you ascertain whether or not those rods were placed as intended?

A: No, sir; I didn't measure them myself; I only took it for granted that they were not, by the measurement of other persons who were present, I think it is hard to tell positively about that, until they take up more of the lower chords.

Q: You would not, then, be able to state at this time whether they were correctly placed, or not?

A: No, sir.

Q:. I understand that what is meant by the factor of safety, is the ratio which the breaking weight of the material bears to the load the bridge is intended to carry. Am I right in that?

A: Yes, sir.

Q: What was that factor or ratio in this bridge, as designed by you, under the directions of Mr. Stone?

A: It is generally presumed that the breaking weight of wrought iron in tension is twenty tons to the square inch; in this case it was loaded with only four tons on the square inch, which made it a factor of safety of five, one-fifth of the breaking weight; assuming that the compressive strain of wrought iron was four tons on the square inch, it would be very much below the crushing strains of iron; the section of iron has to be very materially increased when the member in compression has great length.

Q: You designed this bridge, then, so that the calculation showed that it would bear a load of five beams of what you expected it to carry; was that correct?

A: That was correct in the tension members, but it was not correct in the long compressive members.

Q: How was it in the long compression members, as to the ratio of safety?

A: I can't answer that question positively, because it is a matter of calculation.

Q: Were your compression members according to the standard rules of professional engineering, at that time required?

A: Four tons on the square inch in compression, was a safe starting point, if the columns had been proportioned to meet that strain; and the four tons to the square inch in compression would have been safe, if the section had been in proportion to the length, according to the formula of that day.

Q: Taking into consideration the length and position of the compressive members, as designed in that bridge, was the calculation of the compressive members less than the standard rule, or formula, at that time, and if so, about how much less, as near as you can tell?

A: They were much less than any engineer would adopt, if he kept each separate brace as a principal column. If they had been thoroughly united together, then the sections of the bridge, as calculated on the plan, were sufficient—that is, allowing four tons on the square inch.

Q: In your design, was there provision made for so uniting them?

A: No, sir.

Q: Why not?

A: As near as I can remember, the design in my mind for uniting them came up in mind afterwards, because I had not as good sections as it was designed to use in the braces. This was due to the defects in the rolling, in the width, and every thing of that kind; but I don't think that has been the cause of this disaster. I would have used the iron in a different shape. The same section of iron, in a different shape, would have made a wonderful difference

Q: From what you know of the bridge, from your connection with the designing of it, and from your examination of the wreck since the disaster, are you able to form an opinion as to the bridge falling?

A: I certainly have an opinion but then the opinion has varied with me as I have got more and more information about it since I came here. But they are only opinions, and are nothing positive. I suppose everybody forms an opinion.

Q: Please state your opinion.

A: In talking with others, and thinking up the matter after I left here, the conviction was very strong upon my mind that the disaster, was caused by some one of the sets of the main braces, near the east end, having got out of place, which allowed the structure to fall suddenly; and if that was the cause, that the end braces at the east corner would have slipped off of the angle blocks and struck hard against the masonry, so as to leave an impression. To-day I went up and examined the masonry at all the corners, and at the south corner of the east abutment I found it had been struck by the braces, which confirms my opinion that the disaster was caused by one of the set of main braces getting displaced. That would throw every thing else out of place in an instant.

Q: If lugs had been cast upon the angle blocks, fitting the ends of the braces, as they were originally designed to fit, would it have prevented, or not, the displacement of the braces?

A: Lugs on the angle blocks, fitting against the braces, would unquestionably have kept the braces in place. They could not have got out, unless the brace bolts had been slacked.

‡§ Questioned by Mr. Sherman:

Q: Before Mr. Stone applied to you to construct this bridge, he was aware that you were an extensive bridge builder, an architect in that department of business, was he not?

A: I couldn't answer for him about that. I don't think that he thought I was very much.

Q: Did he apply to you by letter, or telegram?

A: I think both, sir.

Q: When he wrote to you, did he write to you for what purpose that he desired your assistance?

A: I couldn't say, certain, whether I knew what he required of me before I arrived, or not; but I knew that it was about some bridge that he had to build.

Q: When you arrived in Cleveland, what work did he say he wanted you to do?

A: I think that the first thing that was said to me was that he wanted to plan this Ashtabula bridge.

Q: Did he direct you to plan it?

A: Yes, sir.

Q: Did he direct you to employ your own skill and knowledge in planning it?

A: I can't say that he did, especially, except that it might be skill as a draftsman.

Q: Who designed the bridge, you or Mr. Stone?

A: That would require some explanation. I looked upon the design of the bridge as being a Howe bridge, and the planning of it out in detail as a mechanical operation. I employed draughtsmen all the time in carrying out my own plans.

Q: You made the design or drawing of this bridge?

A: I did.

Q: Who designed the proportions of the bridge?

A: Mr. Stone.

Q: Do you say that Mr. Stone had anything to do with the planning and proportioning of that bridge?

A: Yes sir.

Q: Do you mean to say that the design and proportion of that bridge was made by Mr. Stone alone?

A: Mr. Stone gave me positive instructions to put four tons to the square inch, four tons to the square inch compression, and that gave the proportion of the bridge.

Q: Mr. Stone, then, directed you to design a bridge where the compression should be four tons upon the square inch and where the tension should be four tons to the square inch?

A: Yes, sir.

Q: And you designed this bridge to carry out that proportion?

A: Yes, sir.

Q: And in that did you tell him that you had got a factor of safety of five?

A: No. There was no factor of safety talked of at that time.

Q: Well, what did you say to him, if anything, as to the factor of safety on that plan?

A: In answer to this you are aware it is a long time since the conversation took place. I don't think there was any question that came up at all. The rolled beams were delivered, and when I complained about the rolled beams then commenced the trouble between me and Mr. Stone. He wouldn't reason about them or hear about them.

Q: Is that all the answer that you desire to give to the question?

A: Yes. If that is not satisfactory ask me another question. That is all I think I can say.

Q: What did you say to Mr. Stone in regard to these railroad beams?

A: I had finished making a full sized section of the beams that they intended to furnish, and when they were delivered they would not hold to the full patterns. Then I represented to him that was the case. What was said it is impossible for me to say now, but I know this, that he never would allow new rails to be furnished in the place of those that were defective. It is impossible for me to remember the words of the conversation that took place eleven years ago. I can only remember the general impression.

Q: Can you remember any thing that he said to you upon your complaining that the sections were not such as you required?

A: I wouldn't be able to remember any thing of the conversation, but I am positive that he knew that they were defective at the time, and that I was told to mind my own business, or to do as I was told, or something to that effect.

Q: Do you mean to say that you requested Mr. Stone to furnish new sections of different sizes, and that he refused to do so? I would like to have you answer that question directly.

A: It was not my business to request anything of Mr. Stone. It was only to tell him what was the case. I could only represent the things as they were.

Q: Did you see Mr. Jones, who was the foreman of the shop where these beams were rolled * Did you have any conversation with him?

A: I presume I had, because I had interviews with him on two or three occasions, and became acquainted with him.

Q: Were you there at the time when these beams were rolled, or any portion of them?

A: I am not aware that I was; but I was there after some of them were rolled, but I am not aware that I ever saw any of them rolled.

Q: Did you make any complaints to Mr. Jones, or any of the members of the firm, that these beams were insufficient or defective or would not answer their place in the bridge?

A: No, I don't know that I ever did; because, I don't think that either of them or I would have had any thing to have acted upon, except it was through Mr. Stone's authority.

Q: How often did you see Mr. Collins, the chief engineer of the road, during the time of the construction of the bridge?

A: Almost every time he was in the office when I was at the office.

Q: Did you make any complaints to Mr. Collins, or any other officer of the company, that Mr. Collins was furnishing you with beams that were defective or insufficient for that bridge?

A: I have no doubt it was talked about in Mr. Collin's presence; that Mr. Collins had nothing to do with it.

Q: Do you now swear, that you intimated anything of the kind to Mr. Collins, at any time before this disaster?

A: I have no doubt that Mr. Collins knew that I was very decided that the materials that were going to be used in those braces were insufficient; I am sure that I spoke about it frequently in the office.

Q: You mean, then, to be understood that from information derived from you, Mr. Collins knew that the material or construction of those beams were insufficient for that bridge?

A: Mr. Collins knew that they were defective—that is my belief.

Q: Do you think that, Mr. Collins, knowing that there were defective compressive members in that bridge, would have permitted it to have been used for the traffic of the road?

A: I don't know what Mr. Collins' mind may have been about it, but I know this much, that Mr. Collins was not going to interfere with Mr. Stone: if it had been his business, then it would have been different, but he had no business with it: never allowed to interfere with the works in any shape or form; and I think when Stone took a large thing of that kind he would trust to Mr. Stone's judgment.

Q: Even if he knew he was building a man-trap?

A: It isn't exactly fair to say that it was a man-trap; a thing may be very defective and yet there are means of making it secure.

Q: Do you say that Mr. Stone, in the construction of that bridge, did not rely upon your skill and experience in bridge-making alone for its safety?

A: He certainly didn't. If he had he would have heard what I had to say.

Q: Have you had any correspondence with Mr. Stone since you left that work, and since the construction of the bridge, in relation to it?

A: Not a word.

Q: Did you state to any of the officers of the road other than what you stated to Mr. Collins, that would be an unsafe bridge if it was completed, or so intimate to any person?

A: No; I don't think I did.

Q: When Mr. Stone consulted with you in regard to the construction of the bridge on your first arrival in Cleveland, did he then state to you that he desired to build a bridge—first-class—for safety, without regard to expense?

A: I don't remember any such conversation; but I have no doubt that he did, and moreover I have no doubt that he thought it was so.

Q: Did you think, when you made the drawing for the bridge, that the main braces, as they appeared in your drawing, and the manner of their being coupled together, would be sufficient for the purpose.

A: I considered that the sections of four tons to the square inch of compression in those braces was safe, as far as carrying the load was concerned. But I didn't consider there was any thing like the strength in them that there was in other parts of the structure.

Q: Did you consider them sufficient for safety?

A: Yes.

Q: In your drawing there is no provision of strength, other than by the coupling that is pointed out on that drawing.

A, Yes that is so.

Q: And at the time you made that drawing you also made strain sheets and furnished it to Mr. Stone, in which you represented to him that the bridge was safe, and that there was a factor of safety of about five?

A: No. I made a strain sheet that showed the section. No, sir; that showed four tons to the square inch in tension, and four tons to the square inch in compression, as I was told, had.

Q: And did you think that was safe and secure—a safe bridge?

A: It would, in my opinion, been a safe bridge, but not proportioned properly, so as to have been as strong as it might have been made, by proportioning it differently.

Q: Did I understand that the tension members of the bridge, in your judgment, were fully sufficient?

A: Yes, sir.

Q: And that the only compression members of the bridge, you think, that were defective or insufficient were the set of braces at the end of d: bridge?

A: The top chords of the bridge were insufficient in their members, in so far as they were defective in the width of their webs.

Q: Did you make any complaint at the time to Mr. Stone of the construction of the bridge, that there was any insufficient members of the top chord?

A: Certainly I did. There is no question about it. He knew it as well as I did.

Q: It isn't your opinion, however, that the bridge fell from any insufficiency of these beams?

A: No, sir.

Q: Did you say, Mr. Tomlinson, that when the set of braces at the ends, were strengthened by adding two more in the third panel and one in each of the others that the bridge would be rendered sufficiently strong in that respect?

A: I believe I have said so because the additional beams would make them about equal and what was intended in the first place.

Q: How many angle blocks on the south truss did you examine, to ascertain whether the braces bore upon as they ought to have done?

A: There are only—I think only three inside, and they don't show of displacement in the braces that those do that are on the other side.

Q: How much displacement did you discover in those angle blocks or braces on the south side?

A: Sufficient displacement for the whole width of the flange to be off from the angle blocks, which would probably be about three-quarters of inch.

Q: How much would that weaken the members or braces that were thus displaced, in your judgment?

A: It wouldn't seriously weaken it.

Q: Do you know whether there was any displacement of the brace in the first panel of the bridge at the east end?

A: That is the one that is ¾ of an inch displacement; I believe it has that displacement.

Q: Are you able to determine that that was the angle block at the east end, from the examination which you have made?

A: I wouldn't like to swear to it, but I believe it to be so. I had hoped to go down this afternoon and make an examination and take measurements; my view this morning was very hasty, and the timbers that had fallen down, prevented me from making a close observation, as I wished to have done.

Q: Could you determine, if you would make a critical examination, as to where this block was, whether in the east end or not?

A: Yes, sir, if it is the same as it was this afternoon.

Q: The lateral and the vertical bracing was all correct; all right as far as you were able to examine?

A: The vertical braces, I have no doubt, were in their proper places; so also was the lateral tie braces; but the struts were not at the foot of the vertical braces, and at the meeting of the horizontal tie braces, so I believe there is every evidence of it.

Q: The reason that you are able to determine that the braces were displaced was, from the paint, or absence of paint.

A: The absence of paint showed where the braces had been when last painted; most of them.

Q: Could you tell as to whether last painted, or the first time, when they were painted; whether there had been any movement or displacement of the braces since the bridge was painted the first time?

A: I can't tell how they were when it was painted the first time, but I should consider that there is positive proof that they were out of place when they were last painted. I might say, seriously out of place.

Q: Is there any circumstance about this place, of the blocks or braces, that enables you to swear positively?

A: That they have ever moved since the bridge was first erected—I can't certainly swear how they placed the braces when the bridge was first erected. But it is impossible to believe that any one should erect a bridge with braces with such imperfect bearings against the angle blocks.

Q: Suppose that bridge, when it was completed for business, was at the time tested by six locomotives rolling over it at the same time, and every thing stood firm, without any unusual deflection one way or the other of the bridge, what you say as to what it was, in your opinion—whether it was a safe bridge or not.

A: As far as the deficiency in section was concerned, with defective iron, it might have been a secure bridge, and yet be so defective in detail that it would be only a matter of time when the braces would be so much out of place as to let the structure fall.

Q: Under that test, if the compressive members of the bridge were insufficient in sections, would you not expect to find some evidence of it?

A: Members of the structure may be very deficient in the quality of the material and the size of the sections, and yet carry, without any apparent yielding, cars loaded in a large traffic.

Q: Would not the test that I have suggested be a fair one for the bridge?

A: Should be fair, of course, on those compressive members.

Q: And when such a bridge, after that test, has stood and borne the traffic for a period of eleven years, without giving any evidences of failure, does it not furnish strong evidence as to strength and safety of the bridge in its construction?

A: It undoubtedly furnishes evidence that the bridge has sufficient strength to bear the wear and tear that it has had, but doesn't furnish that evidence that the long compressive members were equal to the strong tension of the members of the bridge.

Q: Do you know anything as to the quality of iron that you used in this bridge?

A: I always believed, and still believe, that the material that was in the brace bolts and the bottom chords were very good, and so, also, was the workmanship; and anº can look at the beams, that they are not what they ought to be.

Q: Do you mean in the quality of the iron, or in their manufacture?

A: The quality of the iron, of course, I can't speak of; but it isn't in the quality of the iron, but it is in the deficiency of the flanges. They are ragged edges, with deep indentations in them, which weakened them.

Q: Those deficiencies can now be seen or examined, I suppose?

A: Yes.

Q: If those brace beams, when the bridge was first set up, deflected from the weight of the bridge, and when that weight was removed they went back to their original position, would they not be fit to use in the bridge?

A: I would consider them fit to be used—that is, if they had not been compressed so as not to be shorter than the original length that was required. I consider them fit to use, if of sufficient strength to prevent them from deflecting the second time.

Q: There would be no difficulty in a mechanic who should put up the bridge to discover any such defect, 1 suppose; he would naturally discover it, would he not?

A: I should think he would discover it. Any one who understood the nature of iron would naturally measure it to see if it held its length.

Q: Did you call the attention of any body to examine the east abutment where you think you discovered that the set of braces which fell struck against it?

A: There were two gentlemen upon the bridge at the same time when we examined the stone work. One of them gave me his card with the name of Albert H. Howland, C. E., Boston. The name of the other I don't know.

Q: What was the character of those indentations, if you can describe them?

A: The appearance would be as if some thing had struck back against the stone, and made a scrape upward, making a pretty deep indentation.

Q: Did you, while in Cleveland last, state to Mr. Collins, or to any of the officers of the company, that the only defect that you could discover or know of in the bridge was insufficient brace members at the end of the bridge, and if the original plan or design of the bridge had been so altered, with two more braces included in the original plan and the bridge was thus put up, then you would be satisfied that the bridge then was, in substance, safe, without any defects known you?

A: No; I never stated that in full, as you state.

Q: What effect, in your judgment, would be made upon that bridge by a car or engine pulling, after it got on the bridge, moving at 10 or 15 miles per hour on such a night, with such temperature as they said at the time of this disaster?

A: If the bridge had been strong throughout its tension members, it would have little or no effect upon it. The ties were placed so near together, and there were such good guide rails, that the wheels would run from tie to tie, jarring the bridge, but certainly not injuring it.

Q: What effect upon the iron of that bridge would the variations of the temperature have, if any?

A: The variations of the temperature—low temperature would shorten the bridge so that the ends that were on the rails would throw off—so that the difference between extreme warm weather and the extreme cold would be about one and a half inches. I have been in the habit of calculating the changes that do take place in structures on account of these changes, which is a matter of calculation entirely.

Q: In a sudden shock would extreme cold weaken the bridge, in your judgment

A: Where a sudden shock comes on cold short iron I have no doubt it will snap much easier in extreme cold weather than it would in a moderate temperature. But when the bridge is shaken or jarred by the running off of a car, the shock is very much deadened by the timber that is between the track and the iron.

Q: Had you ever constructed an iron bridge prior to this on the Howe plan?

A: No, sir.

‡§ **Questioned by Mr. Dickinson:**

Q: You have stated, I believe that the cross members of the bridge was, in your judgment, in the improper placing of the members on the brace block, there being nothing to keep them in place. Wouldn't a proper inspection and keeping in position of these braces have resulted in the bridge being safe to-day, in your opinion?

A: I think it would. Let me say here that I had no idea of the extent of the displacement of the braces against the upper angle-blocks until to-day.

Q: Your judgment; then, is formed upon your examination to-day and seeing this displacement?

A: I had formed a strong opinion before I came up. From all the circumstances I had learned that the displacement or yielding of the set braces near the east end on the south side had been the cause of the disaster, and if so, I expected to find marks on the masonry where the ends or end of the braces would have struck the masonry. My observation to-day confirmed this opinion, both by the marks on the stone-works and the evidences of displacement of the members on some of the angle-blocks.

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Stone, Collins, And The LS&MS Deny Blame

It's not too surprising that the LS&MS Railroad, Amasa Stone, and Charles Collins, who were found guilty by the Coroners' Jury, publicly rejected the legal verdicts, as well as the guilty verdicts in the court of public opinion, continued to say publicly they weren't to blame for the Ashtabula Disaster.

Even though the LS&MS eventually, though quietly, paid about $500,000 in damage claims to several passengers, the railroad steadfastly refused to admit responsibility for the bridge failure itself. In its continuing denial, the railroad maintained the bridge wasn't the cause for the disaster but instead it was caused by either the *Columbia* (the trailing locomotive) leaving the track or by a broken rail causing the train to derail.

The LS&MS also made an incredible, even bizarre, claim that a tornado not only took out the bridge but did so at the moment the *Pacific Express* crossed over it. [2] It was an even more fantastic claim considering the "tornado" would have occurred during a late December snowstorm in Ohio. It was a claim that might make a science fiction story.

Amasa B. Stone, Jr., who'd designed the bridge and who was responsible for its erection, strongly denied any blame for the disaster almost the moment the bridge collapsed until he moment of his death on May 11, 1883.

Stone was his usual arrogant self, and emphatically refused to admit any guilt or blame, when he was questioned by special investigative committee of the Ohio legislature on January 18, 1877.

He insisted the bridge wasn't only safe and had been sturdily, solidly built, but it had been designed to be stronger than it needed to be. He fervently maintained the disaster had nothing to do with the bridge but was either the result of human error or from an act of God.

He was even able to deflect criticism and questions about the coal-fired stoves that were responsible for setting the passenger cars on fire. When he was asked by a member of the committee about the coal-fired stoves, he insisted that he'd examined every other type of stove that was available at the time and considered them to be unacceptable to be used on the *Pacific Express*:

Q: Why was it that the cars, and the people in them, were burnt up after this accident? What was the cause of it?

A: No doubt it might have been done from the locomotive, or from the stoves in each car.

Q: The locomotive, as I understand, was down in the bottom of the stream.

A: That might have been; it is probable, then, that the fire took place from the stoves.

Q: Why didn't your company comply with the statute of the State, requiring stoves to be put in that would not do that in case of an accident?

A: I examined those stoves, and it was said they would not cause fire; my conclusion was that they were more dangerous than the ones we used—that there was no safety about them any more than any other stoves.

Q: Why didn't you heat the cars by steam from the locomotive?

A: It isn't practicable; no engine can furnish enough steam for its regular work and to heat the cars also. The work of breaking with steam comes when the train is slacking up, and the steam for running the train is not in use.

Q: Your opinion is, then, that no stoves could be provided that could extinguish a fire in case of an accident.

A: No, sir.

Q: And that is the reason that your company made no effort or made no change in the stoves?

A: Yes.

Stone argued the Baker-made stoves, which he did ultimately select, were simply the best available at the time. He also further argued that no stove was available that was designed or built to extinguish itself in case it was damaged or overturned in an accident.

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‡§ Questioned by Mr. Burns:

Q: Mr. Stone, what, if any, examination or practical test of the self-extinguishing stoves have you seen made?

A: I was called upon to see a self-extinguishing stove at one time, when I was president of the road, and in my judgment it was of no importance—it was of no advantage with fires carried upon cars. It is impossible.

Q: What stove was that?

A: I don't recollect the patentee's name. I have forgotten the patent. I have seen two or three designs. I have only a general impression, because it didn't strike me favorably at all of being any advantage as a practical Stove.

‡§ Questioned by Mr. Brunner:

Q: Did you ever see the Winslow stove?

A: I think that is the one that I saw. [Circular shown to witness.]

‡§ Questioned by Mr. Converse:

Q: One is for wood and the other is for coal?

A: I never saw the coal, I saw the wood. This, in a certain way, will put out the fire, but I don't think it is a practical stove.

Stone also repeated his familiar line that when the *Pacific Express* jumped the tracks, it had damaged the bridge in Ashtabula so severely the bridge couldn't support the weight of the train and, therefore, collapsed.

Q: It is stated that when the bridge broke the bridge swung to the north, while the load was pitched off to the south. Can you give us any explanation upon that point—why it was so?

A: It is very conclusive evidence, to my mind, that the bridge was carried down by the second locomotive in some way leaving the track. The bridge was not strong enough to take a locomotive across off the rails. Had the bridge broken through weakness it would have pulled in the other direction. I understand you to say that the bridge swung to the north?

Q: Yes.

A: Had the bridge broken from its own weakness, it is conclusive to my mind it would have swung to the south. I am convinced, a model test, to the extent of breaking a truss, would show conclusively that that truss would fall to the south and pull the bridge to the south. An engine dropping on the cross floor beams would tend to deflect them and pull the truss inward—that is, the truss to the north, that the train was passing over on, and when pulled to the north from a vertical line to a small extent it would go down.

Although Amasa Stone wasn't afraid to show off his arrogance while fervently maintaining he was entirely blameless for the disaster, Charles Collins was a virtual complete opposite. Collins, who'd recently inspected the bridge, reportedly "wept like a baby" at the disaster scene when he saw the wreckage, fires, debris, and bodies scattered in the Ashtabula valley.

Collins testified to the Ohio Legislative Committee that he thought the bridge was safe:

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‡§ Questioned by Mr. Stone:

Q: Did you yourself, as engineer of the road, ever make a thorough inspection of that bridge?

A: So far as looking at it for the safety of the trains.

Q: Did you consider that you had made a thorough inspection? That is the question.

A: To make an analysis of the bridge, I didn't.

Q: I mean, by making a thorough inspection of the road, such an one as would satisfy you in your own mind that that bridge was perfectly safe.

A: Yes; that it was perfectly safe.

Q: I understand you that you made such an inspection.

A: Yes.

Although he testified in public that he always thought the bridge was safe, there was some speculation in and around Ashtabula that he told a different story to his closest friends.

This story — which was based solely on speculation and on no hard evidence — centered around the Lake Shore & Michigan Southern forcing or bullying Collins to give favorable reports about the bridge and that he often said that he believed "it will be a freight and not with a passenger train" if, and when, the bridge would finally collapse.

Perhaps because of Stone's steadfast and strong denials, most of the blame for the disaster, whether correctly or incorrectly, fell onto Charles Collins. Although little doubt remains today that Collins didn't deserve all, or even most, of the blame for the bridge collapse, he nevertheless blamed himself for the disaster and became tormented by an immense amount of guilt.

Three days after he testified to the Ohio Legislative Committee, he was found dead in his bed at his home on Seneca Street in Cleveland. (See "The Disaster Claims Two More Lives" section below for more information.)

FOOTNOTES AND REFERENCES

Investigations, Allegations, And Denials

1. Rev. Stephen D. Peet • *The Ashtabula Disaster* • (London, Ontario: J. S. Goodman—Louis Lloyd & Co., 1877) • pages 207-208

2. Prarie Ghosts website • www.prairieghosts.com

The Disaster Claims Two More Lives

The Disaster Claims Two More Lives

ALTHOUGH THERE WAS, AND STILL is, some question as to his culpability in the disaster, Charles Collins was noticeably depressed and physically upset over the disaster and, at least privately, felt partially responsible for it.

He tried to resign his position at the LS&MS soon after he testified before the Ohio Legislature commission but the LS&MS Board of Directors refused his resignation. It's possible the LS&MS refusing to accept his resignation added to Collins' depression and guilt he felt following the disaster .

The depression, guilt, and emotional breakdown Collins felt apparently became too overwhelming for him to handle. His body was found in the bedroom of his Cleveland home with a gunshot to the head. Authorities found a handgun next to his body. His death occurred just two days after he testified before the Ohio Legislature commission investigating the disaster.

Even though his friends noted Collins' depression and guilt following the disaster, there's always been some question over the initial circumstantial evidence suggesting Collins committed suicide. His death was initially ruled a suicide, but a police report at the time also suggested the gunshot wound may not have been self-inflicted.

Therefore, some efforts were made later to determine whether Collins did commit suicide or was killed in some kind of accident or perhaps murdered to cover up and hide what he knew about the safety of the bridge.

His skull was sent two years after his death to Dr. Stephen Smith, who was a medical expert in New York. After a "careful analysis" of Collin's skull and based on other information, led Dr. Smith to conclude that "Mr. Collins came to his death by a shot wound inflicted by other hands than his own." [1] In other words, in his opinion, it was quite possible that Collins was murdered.

Furthermore, documents discovered in 2001 also have led many to believe he had indeed been murdered. If so, his killer was never found, though many ideas have been proposed over the years.

Collins, perhaps ironically, was also buried in the Chestnut Grove Cemetery, several feet from the mass grave, and his spirit is believed to haunt the cemetery.

Charles Collins' funeral service was held in Ashtabula on Wednesday, January 21, 1877, and perhaps because of the doubt over the cause of his death, it created a great deal of interest in the area.

In its January 22 edition, the day after the funeral, the *Cleveland Herald* published the following article about Collins' funeral service: [2]

> "It was the last tribute of respect that could be paid by the citizens of the place to a man who, while not a permanent resident, was one among the most respected and loved. He held a prominent place in the hearts of the people as an exemplary man and faithful friend, and their attendance upon the services yesterday was the last act of respect to his mortal remains. Besides the citizens of Ashtabula present, there were many of the leading railroad men of this city, who had known and respected Mr. Collins during the many years they had been his friends and business associates.

"Rev. Mr. McGiffert made a few remarks upon the life and character of the deceased. He said that the assembly of people had been called together to pay the last tribute to a man known for honesty, uprightness and truthfulness in all things. He was known in all his dealings for that strict probity of character, that conscientiousness which go so far toward making up the perfect man. He had also the gentle qualities of love and affection for those near and dear to him. The last time he parted from his wife, a few days before his death, not knowing, however, that they were never to meet again, he said to her that he wanted her to remember during their separation, how well he loved her. He was thoughtful always for the welfare of his business associates, and to the young men under him he was a father, a kind friend and firm supporter. In the midst of his many business and worldly cares he did not lose sight of his church relations, and the fruits of his life in this regard are left to testify for him. The spiritual benefit of his employees was not lost sight of while other cares were pressing upon him. After land at Collinwood had been set apart for the erection of a chapel for railroad men, he subscribed first $150, then $350, and when there seemed to be some trouble in raising the necessary amount, he said that the chapel should be built in the spring, any way.

"At the request of the family, Mr. J. H. Devereux, representing the railroad acquaintances of Mr. Collins, then made a few remarks. He said that ever since the accident at the bridge, there had been passing through his mind the idea of falling waters, and the song of Moses and the lamb came to him most vividly. In some manner the character of Moses and that of the dead engineer had assimilated themselves together in his mind. Moses was the type of a perfect engineer. He ran the line of the Israelites through the wilderness to a land of security. He had those characteristics of a noble, true man, which made him great, and in just these particulars did Mr. Collins excel, and they made him the leading engineer of this broad land. The speaker referred to the veneration of the deceased, and referred to the fact that he always rested on the Sabbath day, and that his office was always closed on that day, and that he often went to the house of God. Mr. Devereux attempted to say a few words to the friends, but found himself too much moved to speak further, and closed with a few words of prayer."

Despite the findings of The Legislature of Ohio Joint Committee Investigation and the Coroner's Jury, and other allegations — most of which were unfounded or unsubstantiated — about his blame and liability in the disaster, Collins' reputation remained virtually intact as was the respect people had for him. This was evident at the memorial service that was held in Cleveland, when the Reverend Dr. Hayden, who was Collins' pastor, said the following of him: [3]

"Mr. Collins had a praying mother, and when one owes so much to a praying mother as I do, he will not fail to make important mention of this fact. In 1849 he came to Ohio and began the work of laying out the Cleveland, Columbus, Cincinnati and Indianapolis railroad. Here, amidst the hardships of pioneer life, there were many temptations to desecrate the Sabbath, yet during all this time the young man remembered the influence

Conclusion

The 1869 Ashtabula Disaster

Conclusion

Many people who were familiar with the Ashtabula Disaster, and the bridge in particular, at the time of the disaster weren't necessarily surprised that the Ashtabula Bridge collapsed but may have been more surprised that the bridge remained functional for eleven years without failing or even having a minor mishap. In other words, they were surprised the bridge didn't collapse earlier.

The bridge was inspected at least four times each year by officials from the LS&MS and the only problem they reported was a peculiar "snapping" noise that locomotive engineers reported occasionally heard as their trains crossed over the bridge. This may have been the same snapping noise that Daniel McGuire heard immediately before the bridge collapsed. The bridge may have been inspected several times a year, but apparently in each case, the LS&MS inspectors somehow missed the fact that the metal on the ends of the beams had been poorly, crudely, and in an almost amateurish fashion, filed down to make them fit.

Charles Collins was one of the LS&MS officials who inspected the bridge, and even though he inspected the bridge only ten days before the disaster, he apparently didn't find any problems with it. If he had, however, looked more closely at the I-beams, he'd have found more than enough evidence to declare the bridge to be unsafe and immediately close it to all rail traffic. He would have seen what many others later spotted several weeks after the bridge collapsed and the pieces were on the ground: Several of the I-beams were as much as three inches out of alignment at their juncture with the bearing blocks.

This type of bridge depended on all the parts being properly connected, the displacement of the I-beams meant that it was just a matter of time before something horrible occurred. Otherwise, the displacement of the I-beams meant that it was just a matter of time before something horrible could happen.

Amasa B. Stone, Jr., steadfastly, consistently, and fervently maintained until he died that he wasn't to be blamed for the Ashtabula Disaster. He was, nevertheless, wrong about the bridge being built so sturdy and solid as he maintained. However, as we know all so well today, finding the absolute truth in major investigations is often complex, difficult, incomplete, and frustrating.

Because it's been more than 140 years since the Ashtabula Disaster occurred, it's probably not too surprising that very little can seen today where the horrifying fire and other terrible events took place on the evening of December 29, 1876. The Ashtabula River now flows beneath an ordinary viaduct, which means it might take a bit of effort to imagine the horror, fear, and death that took place there.

One thing that seems to have remained consistent, perhaps even going back to shortly after the January 1988 memorial services and burials, are sightings of the ghosts and spirits of the passengers who died in the disaster. The ghosts of the passengers, for example, are thought to linger at the Chestnut Grove Cemetery, where the remains of the passengers who burned in the fires were laid to rest, although some times the ghosts have been seen at the disaster scene.

People visiting the Chestnut Grove Cemetery even recently have reported seeing ghosts, spirits, and specters walking near the stark, granite obelisk that marks the common grave at the cemetery. It also hasn't been uncommon for some visitors to the cemetery to hear agonizing screams in the darkness, particularly during the evenings of the anniversary of the disaster; some people even claim they've noticed a unusual odor reminiscent of burned meat.

The ghostlike characters and images are often seen wearing period warm weather clothing as they wander around carrying carpetbags and baskets.

The ornate and Gothic mausoleum of Charles Collins is just a short distance away from the mass grave in the Chestnut Grove Cemetery. It's perhaps ironic that Collins, who as the Lake Shore & Michigan Southern inspector may have missed the fatal flaws in the Ashtabula bridge, would be buried so near those in the mass grave.

The spectral figure of a man has often been seen near Collins' tomb and according to the stories often appears with his face in his hands, weeping bitterly, and in eternal torture, cries "I'm sorry -- I'm so very sorry."

Another enduring myth about the disaster is that the *Pacific Express* was carrying gold bullion — perhaps valued as much as $2,000,000 at the time — when the train fell with the collapsing bridge. If so, all the gold bullion was lost somewhere on the river bottom or in the ravine where it still remains there today waiting for someone to find it. Perhaps someone can come up with a new reality show on the History Channel, similar to the *Curse Of Oak Island*, in an attempt to verify the myth and find the missing gold.

As mentioned earlier in the Overview, the Ashtabula Disaster was definitely a combination of greed, cutting corners in construction, guilt, accusations, suicide, confusion, poor judgment, and no one in authority wanting or willing to take charge.

At the same, it was also a story of the sheer determination shown by the passengers to survive and the invaluable assistance from the people in and around Ashtabula who arrived at the accident scene ready to help despite the weather and the horrifying scene they saw.

The Ashtabula Disaster, therefore, should never be forgotten or simply considered as a disaster that occurred more than 140 years ago.

Appendix

The 1869 Ashtabula Disaster

THE APPENDIX HAS INFORMATION ON accidents, collisions, and disasters that occurred on railroads prior to the Ashtabula Disaster. Even though this is far from being an exhaustive list, you'll see that deadly railroad accidents weren't uncommon before December 29, 1876.

Before 1876—More Trains, More Accidents

The history of railroads is truly remarkable and one that is full of impressive successes, beginning with the opening of the Liverpool and Manchester Railway in England (1830) and the Transcontinental Railroad (1869) in the United States. Railroads helped make many men fabulously wealthy, but it's also a history of remarkable failures that took a huge financial and personal toll from workers, managers, investors, and others.

Although railroads, and the idea of railroads, go back hundreds of years, the idea of railroads being powered by steam locomotives was a revolutionary new technology in the early 1800s. It wasn't only products but also passengers that

were moving faster than ever between distant areas. People no longer thought of their neighborhood or village as the "world" and that there was indeed something beyond the river or the mountain.

This was the time of the Industrial Revolution, and railroads were an integral part of that revolution in Europe but arguably even more so in the United States where the rise of the steel, oil, coal, and the shipping businesses helped build the railroads — and vice versa — in the United States.

But that growth in the railroad system during the mid-1800s also came at a cost, particularly concerning safety, and too often, common sense. The poorly designed steam boilers on the locomotives could explode at any time sending metal fragments and scalding steam and hot water through the air.

It wasn't only the locomotives and trains that presented safety concerns. The brittle iron rails weren't always able to support the larger, heavier locomotives and longer trains as well as the increased amount of traffic. The same concerns also applied to the iron bridges that weren't designed to handle these heavier locomotives and longer trains

The first train accident resulting in multiple deaths is believed to have occurred on July 15, 1815, in Philadelphia, County Durham, in the United Kingdom. Dozens of curious spectators were enjoying an up close look at the experimental locomotive *Mechanical Traveller*, also known as the *Steam Horse*, when its wrought iron boiler exploded without warning. The explosion sent streams of hot steam, boiling water, and broken pieces of shrapnel-like iron into the panicked crowd. This early railway disaster resulted in the deaths of up to 16 people, with about 40 more people being hurt, many with serious burns.

Signal failures and human errors led to head-on crashes between two locomotives (also known as "cornfield meets"). Poorly designed and built passenger cars derailed, often with tragic results as fragile wooden coaches splintered on impact, and the debris was often ignited from the kerosene lamps that provided light or the coal stoves that provided heat for the passengers in winter. The September 10, 1874, Thorpe Rail Accident in England, was one such example. It resulted in the deaths of 25 passengers and crew (a telegraph clerk's error was to blame).

The following lists several notable accidents that occurred in the United States, the United Kingdom, and Canada prior to the Ashtabula Disaster. The list certainly isn't exhaustive but nevertheless will give you an idea of how many serious, often deadly, railroad accidents occurred in the 1800s.

1650 — Whickham, County Durham (United Kingdom)

Although tramway accidents, even fatal accidents, aren't necessarily considered to be "rail" accidents, the Whickham accident in 1650 is often included as the earliest known railway accident, if for no other reason than it was also a fatal accident, involving two young boys who were run down by a wagon on a wooden coal tramway.

July 15, 1815 — Philadelphia, County Durham (United Kingdom)

As noted above, as many as 16 people, most of whom were spectators, were killed and perhaps 40 more people seriously injured when the boiler of the experimental locomotive *Mechanical Traveller* exploded while the locomotive was operating on the Newbottle Wagonway at Philadelphia, County Durham.

September 15, 1830 — Parkside, Lancashire (United Kingdom)

William Huskisson has the rather dubious honor of being the first person killed in a train (not tram) accident. He was killed by the locomotive *Rocket* at Parkside, Lancashire, during the opening ceremony of the Liverpool & Manchester Railway.

June 17, 1831 — Charleston, South Carolina

After the fireman tied down the pressure safety valve, the boiler of the locomotive *Best Friend of Charleston* exploded in Charleston, South Carolina. The fireman was killed and the engineer was scalded by the steam. Three other people were injured.

November 8, 1833, Hightstown

An overheated journal led to an axle breaking on a Camden & Amboy passenger train as it moved through the New Jersey countryside between Spotswood and Hightstown. The break caused the carriages to derail and one car to flip over in which two passengers were killed.

It eventually came down to passengers aboard trains in the mid-1800s acknowledging the price they pay for this new gift of speed and convenience wasn't only for their ticket but the real possibility their train might be involved in a serious, even deadly, accident.