History & Heritage Committee
Jennifer Lawrence
1801 Alexander Bell Drive
Reston, VA 20191-4400

April 19, 2019

Dear Jennifer,

On behalf of the Michigan Section of ASCE, it is with great pleasure we provide this nomination package for the Portage Lake Bridge to be recognized as an ASCE National Historic Civil Engineering Landmark. This lift bridge is historically and technologically significant to not only Michigan's Upper Peninsula but also to the United States as a whole.

After over a decade of effort to get the project started, the construction of the Portage Lake Bridge had a chilly start on December 18, 1957. From there it took just over two years to complete with year-round construction through the Keweenaw's harsh winters which average over 200 inches of snow a year.

The design of the lift bridge had the unique challenge of accommodating the many different transportation modes that converge in Houghton and Hancock on either side of the Portage Canal: automobile, rail, and water vessels. To accomplish this, a double deck lift design was chosen with the unique ability to be used in an intermediate raised position. While the top and bottom lift span decks were primarily designed to carry vehicle and rail traffic respectively, the lower deck could also carry vehicles when raised to street level and provide a higher clearance of 35 feet for the waterway. New to lift bridge design, this multimodal lower deck required innovative engineering solutions: a multi-use deck surface and movable intermediate bridge seats. In designing the Portage Lake Bridge to carry heavy loads on both decks concurrently, the lift bridge had the heaviest lift span in the world at 4,584,000 pounds and spanning 260 feet.

Though some of the bridge's innovations may be in use around the nation today, the original purpose for its construction was to serve the nation economically by allowing the efficient transportation of the billions of pounds of copper mined from the northern region of the Keweenaw Peninsula. This region, cut off from the rest of the country by the canal, provided the nation with pure, native copper which was used in most every technological advancement through the mid-1800s to mid-1900s. Today, the lift bridge remains the only land crossing over the Portage Canal for all of the Keweenaw to cross, seeing an Average Daily Traffic of over 25,000.

This nomination of the Portage Lake Bridge was compiled through the extensive efforts of Michigan Technological University graduate students Michael Prast and Emma Beachy with the help of Dr. Tess Ahlborn. The Michigan Department of Transportation is the owner of the bridge and is represented by Bradley Wagner in support of this nomination. The ASCE Michigan chapter recognizes the advancements and contributions of this bridge has made to our profession, and as such, have awarded the Portage Lake Bridge with the 2019 ASCE MI State Historic Landmark of the Year award.

Thank you for your consideration of the Portage Lake Bridge as an ASCE National Historic Civil Engineering Landmark. We look forward to your favorable response.

Sincerely,

Christopher Owen, P.E.
President, ASCE Michigan Section
Email: Christopher.Owen@ads-pipe.com

Michigan Technological University 1885

Civil and Environmental Engineering

April 19, 2019

Jennifer Lawrence
ASCE History & Heritage Committee
1801 Alexander Bell Drive
Reston, VA 20191-4400

Dear Jennifer,

On behalf of the communities of the Keweenaw Peninsula, we are thrilled to nominate the Portage Lake Bridge for an ASCE National Historic Civil Engineering Landmark Award.

The Portage Lake Bridge, also known locally as the Portage Lake Lift Bridge or Houghton-Hancock Bridge, is a double-deck vertical lift bridge in the Upper Peninsula of Michigan built in 1959. The bridge provides the only drivable link between the Keweenaw Peninsula and the rest of the country and played a key role in connecting the Keweenaw's local industries to the nation. The bridge used a first-of-its-kind intermediate lift span position and was an early example of an accelerated bridge construction technique now known as a bridge slide. In total, the Portage Lake Bridge has tremendous historical value, resulted in a number of civil engineering advancements, and had a meaningful impact on the local and regional economies.

To understand the revolutionary nature of the Portage Lake Bridge, it is helpful to understand the bridges that came before it. Portage Lake has always presented an obstacle for the surrounding communities and the main crossing of this canal, between the cities of Houghton and Hancock, has seen many iterations. Beginning in the 1850s, the crossing used a ferry service, followed by a wooden swing bridge in 1875 and a steel swing bridge in 1895. Despite being an improvement over the ferries, each of these bridges had considerable problems and caused delays to ships and land traffic. In fact, the safety and functionality of the steel swing bridge deteriorated so significantly that investigations into its replacement began in the 1940s – over a decade before completion of the current Portage Lake Bridge in 1959. The project required years of work and continued support from the Houghton County Road Commission, the Michigan Department of Transportation, and state and federal elected officials.

As a double-deck vertical lift bridge, the Portage Lake Bridge is the only one of its type in the state of Michigan and is uncommon nationwide. Furthermore, its lift span was the heaviest in the world at the time of construction, weighing 4,584,000 lbs. The installation of the lift span was an early example of the accelerated bridge construction technique now known as a bridge slide. Using several tugboats and barges and with only eight inches of clearance between the lift span and the towers, the 260 foot long lift span was carefully maneuvered into place in September 9, 1959. The bridge also accommodates a wide range of transportation modes, including vehicles, watercraft, and pedestrians. Additionally, while trains originally used the lower deck, snowmobiles now make use of it during the Upper Peninsula's lengthy winters.

Designed by Hazelet & Erdal, a Chicago company that specialized in movable bridges, the double-deck vertical lift design used an innovative intermediate lift span position to manage those many modes

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of transportation and greatly improve the efficiency of the crossing. The double deck allowed rail and automobile traffic to use the bridge simultaneously, while the intermediate position allows the bridge to be open to small watercraft and vehicular traffic simultaneously. The use of the intermediate position also caused further innovations, including the design of a lower lift span deck to accommodate both rail and automobiles and the design of movable intermediate bridge seats to support the lift span in the intermediate position. Only one other bridge, the Sarah Mildred Long Bridge in Maine (completed in 2018), was found to have a dual-purpose lift span similar to that of the Portage Lake Bridge.

Creating a bridge that efficiently handled many types of transportation was crucial, as the Portage Lake crossing had a significant impact on the local and regional economies. The bridge is the only drivable connection between the Keweenaw Peninsula and the rest of the nation. As that link, the bridge served an invaluable purpose by connecting the Keweenaw's copper mining and logging industries to the rest of the country. These industries benefited the local area tremendously, but also provided a significant portion of the nation's copper and supported technological progress nationwide. Furthermore, Portage Lake and its bridge played a role in Lake Superior shipping, serving as a harbor of refuge and shortcut around the Keweenaw Peninsula.

Today, the Portage Lake Bridge still plays an important role in the local economy. Although rail services across the bridge were discontinued in the 1980s, the lower deck is used by snowmobiles in the winter, supporting local tourism and recreation. In 2015, the bridge underwent a significant rehabilitation project and currently sees a considerable amount of traffic in comparison to other historical and significant bridges in the state. The Portage Lake Bridge has served the longest term out of all the Portage Lake crossings and is foreseen to continue this role for decades to come.

The attached package contains the completed ASCE NHCEL nomination form for the Portage Lake Bridge and a more detailed look at the topics outlined on the form and mentioned in this letter. The package also contains a letter of support from the bridge owners, the Michigan Department of Transportation, and supporting documents from throughout the life of the bridge.

We look forward to hearing from you and hope you will appreciate this historic bridge as much as we do. If you have any questions, please do not hesitate to contact us.

Sincerely,

Michael Prast, MSCE student
Michigan Technological University
Phone: 248-245-4729
Email: mdprast@mtu.edu

Emma Beachy, MSCE student
Michigan Technological University
Email: erbeachy@mtu.edu

Tess Ahlborn, PhD, P.E., FACI, FPCI
Professor, Civil & Environmental Eng.
Michigan Technological University
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ASCE National Historic Civil Engineering Landmark Award Nomination Package for the

Portage Lake Bridge

Compiled by
Michael Prast and Emma Beachy
With Dr. Tess Ahlborn

April 19, 2019

Historic Civil Engineering Landmark Nomination

This form may be printed. Please submit one copy for each committee member of all materials relating to the nomination. If more space is required to provide full response, please include additional documentation.

To:History & Heritage Committee
ATTN: Jennifer Lawrence
1801 Alexander Bell Drive
Reston, VA 20191-4400

Date: 4/26/19 ASCE Section: Michigan

~~This is to~~ nominate the following for designation as a Historic Landmark (circle one):
National or Local/State: **Portage Lake Bridge**

Previously nominated for National: Yes **No**; If Yes, when ____________

Located at: Houghton and Hancock County: Houghton State: Michigan

The latitude and longitude to the nearest minute (or U.T.M. coordinates). Attach detailed local and vicinity maps that show access from a major city or the interstate: 47° 7' 26", - 88° 34' 27" See Section 1 (attached).

The proposed landmark's owner: Michigan Department of Transportation

In support of this nomination the following information must be provided:

1. Date of construction (and other significant dates):
   See Section 1 (attached).
2. Names of key civil engineer and other professionals associated with project:
   See Section 2 (attached).
3. Historic (national or local) significance of this landmark
   See Section 3 (attached).
4. Comparable or similar projects, both in the United States and other countries.(Provide name, location, dates, short description of each project)
   See Section 4 (attached).
5. Unique features or characteristics which set this proposed landmark apart from other civil engineering projects, including those in #4 above.
   See Section 5 (attached).
6. Contribution which this structure or project made toward the development of: (1) the civil engineering profession; (2) the nation or a large region thereof (part 2 is necessary for an NHCEL).
   See Section 6 (attached.)

7. A list of published references concerning this nomination.

   See Section 7 (attached).

8. A list of additional documentation in support of this nomination. (Please list all enclosed documents, publications, photographs, and supporting historical evidence. Digital images and one 5” x 7” black & white glossy photo are required for publicity and presentation purposes.)

   See Section 8 (attached).

9. The recommended citation for HHC consideration.

   See Section 9 (attached).

10. A statement of the owner’s support of the nomination.

    See Section 10 (attached).

If this nomination is approved for designation as a National Historic Civil Engineering Landmark by the Board of Direction of ASCE, we understand that the Section will have the major responsibility for the public presentation ceremony of the plaque and for plaque maintenance.

Chairman, Section History & Heritage Committee:

Melinda Bacon, PE [redacted]

Section Secretary:

Brad Ewart, PE Apr 29 2019 9:21 AM

Section President:

Chris Owen, PE

*Note: For State Historic Civil Engineering Landmark designation, the other Section presidents from the state should sign the nomination form or concur with the nomination in writing. If all Sections affected by the nomination agree on dedicating this landmark, the nominating Section should inform the HHC of their decision and send one (1) copy of the nomination package to the staff contact for the HHC

Note: Designation by ASCE as a National Historic Civil Engineering Landmark carries no legal commitment on the part of ASCE, the owner or the governmental jurisdiction in which it is located.

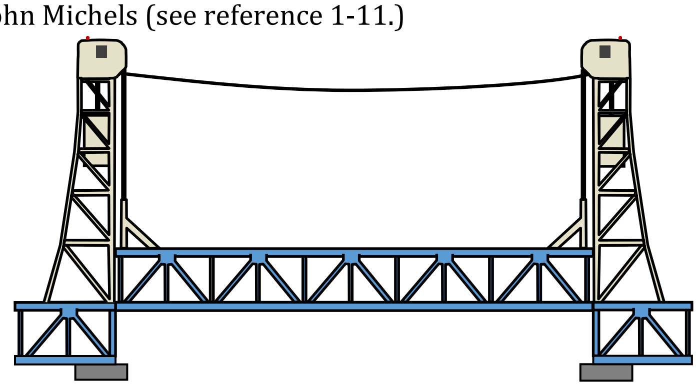
SECTION 1

Date of construction and other significant dates:

The Portage Lake crossing has a long history and many bridges have served the surrounding communities. This junction was and remains the only land crossing to the northern Keweenaw Peninsula and the infrastructure used for it has gone from ferries to swing bridges to the present lift bridge (see Figure 1.1 for location). The Portage Lake Bridge, also locally called the Portage Lake Lift Bridge, Portage Lift Bridge, or Houghton-Hancock Lift Bridge [1-13], took just over two years to complete, starting on Dec. 18, 1957 and opening to traffic on Dec. 20, 1959. In this time, the contractors set the foundations, erected the steel superstructure, and floated the lift span into place, all while allowing full operation of the existing swing bridge just a few feet away. The lift bridge is the centerpiece of the region and historically significant to the nation.

To understand the significance of the lift bridge, it is important to recognize the different crossing designs used prior to the current bridge's construction between the two cities of Houghton and Hancock, MI. The timeline attached to this section highlights the major events in the Portage Lake Bridge's history. The timeline starts with the early forms of crossing infrastructure to establish historical context for the lift bridge and then begins describing the lift bridge's construction. Major events in the lift bridge's life are outlined up to its most recent rehabilitation.

The official "MDOT Construction History of the Houghton-Hancock Lift Bridge" is included in this section as reference 1-12 (document attached in Section 8). While it does not provide a lot of specific dates, it details the different procedures along with any issues that came up during construction. L. H. Gilroy, one of the original MDOT project engineers, took many of the pictures included in this report. John Michels, the last of the original MDOT project engineers to work on the lift bridge, compiled the document upon completion of construction and provided it for this nomination in February, 2019. Al Anderson, a current MDOT Engineer, also provided a hand-written timeline by John Michels (see reference 1-11.)



State of Michigan

Keweenaw Peninsula

Figure 1.1: Location of the Portage Lake Bridge

Section 1 References

[1-1] City of Hancock (2005). "Portage Lake Bridge History." *Historical Pictorials,* (viewed Feb 25, 2019). <www.cityofhancock.com/historical-pictorial-view.php?target=88>. Document attached in Section 8.

[1-2] "History of the Bridge." Date unknown. Houghton County Road Commission Bridges, Portage Lake, 1958-1961, RG77-104. Box 2, Folder 7. Michigan Tech Archives & Copper Country Historical Collections. Document attached in Section 8.

[1-3] Document about Carl Winkler's role in project. Date unknown. Houghton County Road Commission Bridges, Portage Lake, 1958-1961, RG77-104. Box 2, Folder 7. Michigan Tech Archives & Copper Country Historical Collections. Document attached in Section 8.

[1-4] Deter, Bruce (1960). "Keweenaw Crossing." *MDOT,* (viewed Jan, 2019). Available: <www.youtube.com/watch?v=4D6Vx8XHMu0>.

[1-5] Various dedication articles. (June 24-27, 1960). Daily Mining Gazette. Microfilm Collection, MTA & CCHC. Document attached in Section 8.

[1-6] Hayhow, Elizabeth (Sept 29, 1982). "Soo Line Trainmen Bid Adieu." Daily Mining Gazette. Page 1. Microfilm Collection, MTA & CCHC. Document attached in Section 8.

[1-7] Anderson, Al (Feb 7, 2019). Email exchange about Portage Lake Lift Bridge. Document attached in Section 8.

[1-8] "Automobiles Role Across New Portage Lake Bridge," (Dec 21, 1959). Daily Mining Gazette, Pg. 1. Microfilm Collection. MTA & CCHC. Document attached in Section 8.

[1-9] "Carl Winkler Saw New Bridge Need" (June 24, 1960). Daily Mining Gazette. Page 3. Microfilm Collection, MTA & CCHC. See Section 1 reference 5.

[1-10] "Construction Starts on Portage Bridge," (Dec 19, 1957). Daily Mining Gazette, Pg. 1,3. Microfilm Collection. MTA & CCHC. Document attached in Section 8.

[1-11] Michels, John J. Date unknown. "Portage Bridge." Timeline written by John, supplied by Al Anderson (Feb, 2019). Document attached in Section 8.

[1-12] Michael, John J. "Construction History: Houghton-Hancock Vertical Lift Bridge." (1961). *Michigan Department of Transportation.* Provided by John Michels, (Feb, 2019). Document attached in Section 8.

[1-13] "Bridge Has Only One Official Name", (Dec. 4, 1968). Daily Mining Gazette article found on pg. 16 of "Houghton-Hancock Lift Bridge Newspaper Articles- History," compiled and provided by John Michels (Feb, 2019). Document attached in Section 8.

Section 1 Images

[1-14] “Typical Elevation - Towers,” Blueprint Sheet 36 of 129. Jan 25, 1957. Portage Lake Lift Bridge Blueprints 102-D C4. MTA & CCHC. (Header image).

[1-15] “Leviathan,” Photograph. Date unknown. Copper Country Photo File: Bridges. MTA & CCHC.

[1-16] Photograph No: MS044-004-003-003, “First County Bridge Taken from Hancock Side of Portage Lake,” (1876). Copper Country Photo File: Bridges- Portage Lake. MTA & CCHC. <cchi.mtu.edu/copper-country-image-detail?duid=587bc8ae-73e2-42c9-bab0-7007ca3528c1&width=1242&height=732&nid=22176>

[1-17] Photograph No: MTU Neg 00419, “Portage Lake Bridge.” Date unknown. Roy Drier Photo Collection, Copper Country Photo File: Bridges- Portage Lake. MTA & CCHC. <cchi.mtu.edu/copper-country-image-detail?duid=c730aec2-e764-4c46-a22d-aa00e6d8e4ca&width=1242&height=732&nid=16522>

[1-18] “Steel Swing Bridge,” Photograph courtesy of Dr. Kris Mattila, P.E., Associate Professor Michigan Technological University (Feb, 2019).

[1-19] Photograph No: MS044-002-008-024, “Struck Swing Bridge.” (April 15, 1905). Earl Gagnon Photo Collection, Copper Country Photo File: Bridges- Portage Lake. MTA & CCHC. <cchi.mtu.edu/copper-country-image-detail?duid=372f6f8b-9189-46dc-bfcc-e0fcc23914ad&width=1242&height=732&nid=22080>

[1-20] “Ground Breaking with Mayors and John Mackie”. (Dec 18, 1957). Daily Mining Gazette. Microfilm Collection, MTA & CCHC.

[1-21] “Caisson Construction,” Photograph courtesy of Dr. Kris Mattila, PE, Associate Professor at Michigan Technological University (Feb, 2019).

[1-22] “Finished Tower Foundation,” Photograph courtesy of Dr. Kris Mattila, PE, Associate Professor at Michigan Technological University (Feb, 2019).

[1-23] “Erection of the Counterweights and Tower,” Photograph courtesy of Dr. Kris Mattila, PE, Associate Professor at Michigan Technological University (Feb, 2019).

[1-24] Gilroy, L. H.. “Looking E. from Top of West Tower Column, Pier 6,” Photograph. (Apr 29, 1959). *Construction History of Houghton-Hancock Vertical Lift Bridge*, pg 30. Provided courtesy of John Michels (Feb, 2019).

[1-25] “Floating in Lift Span,” (Sept 9, 1959). Photograph courtesy of Dr. Kris Mattila, PE, Associate Professor at Michigan Technological University (Feb, 2019).

[1-26] Gilroy, L. H.. “Looking N. at N. Half of Old Span #2 on Barge,” Photograph. (Jan 12, 1960). *Construction History of Houghton-Hancock Vertical Lift Bridge*, pg 50. Provided courtesy of John Michels (Feb, 2019).

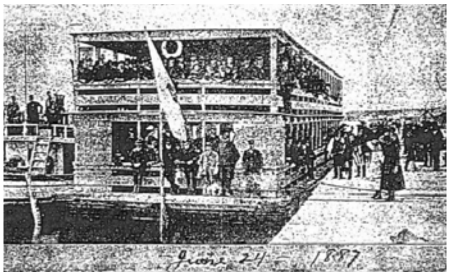
[1-27] “The Formal Dedication Ribbon Cutting”. (June 27, 1960). Daily Mining Gazette. Microfilm Collection, MTA & CCHC.

[1-28] Hayhow, Elizabeth (Sept 29, 1982). "Soo Line Trainmen Bid Adieu," Photograph. Daily Mining Gazette. Page 1. Microfilm Collection, MTA & CCHC.

[1-29] "Fireworks over Lift Bridge," (June 16, 2018). Photograph. <brockit.smugmug.com/Clients/Bridgefest/Bridgefest-2018/i-MHVwssr/A>

[1-30] "Rehabilitation- Lift Cables and Balancing Chains Disconnected," Photograph courtesy of Al Anderson, MDOT Engineer (Mar, 2019).

Key:
MTA & CCHC = Michigan Tech Archives & Copper Country Historical Collections



1850

Regular ferry service by Sam Eales across Portage Lake begins [1,15]

1873

A floating bridge is constructed [2]

1875

Wooden swing bridge between Houghton and Hancock is completed carrying pedestrians and animal carts. Used in conjunction with ferries and collected a toll [2,16]. In 1892, was adapted with a lower level for rail [1,17]

1895

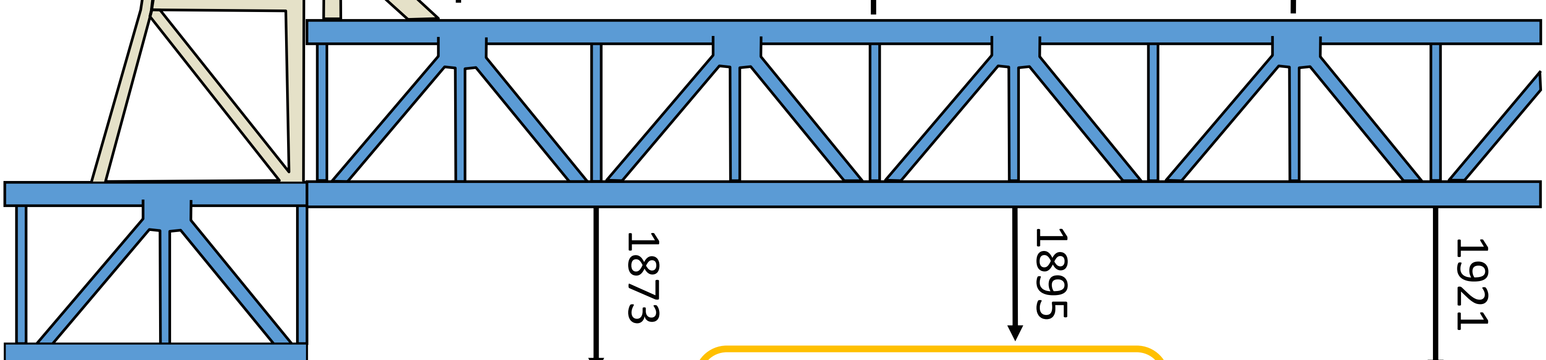
Steel bridge with wooden swing span is constructed by Mineral Range Railroad, replacing the 1875 bridge. Wooden swing span replaced with steel 3 years later [2,18]

April 15, 1905

Swing bridge is struck by steamer, toppling the swing span sideways. Ferries brought back into service while a temporary wooden structure carried rail traffic [2,19]

1921

Michigan State Highway Department takes control of repair, improvement, and maintenance of the bridge



Caisson, foundation, and pier construction [4,21,22]

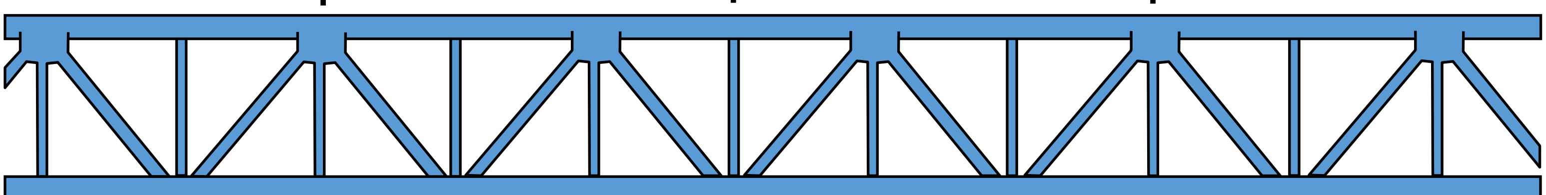
Spearheaded by Carl Winkler, preliminary investigations into replacing the deteriorating swing bridge begin [3, 9]

1940s

Winter 1957—Winter 1958

Center span slid into place on barges and lifted into position, followed by 3 months of equipment testing [4,25]

Sept 9, 1959



Dec 18, 1957

Construction on new lift bridge begins [4,10,20]

Feb, 1959

Steel components arrive and erection begins [4,23,24]

8:00am Dec 20, 1959

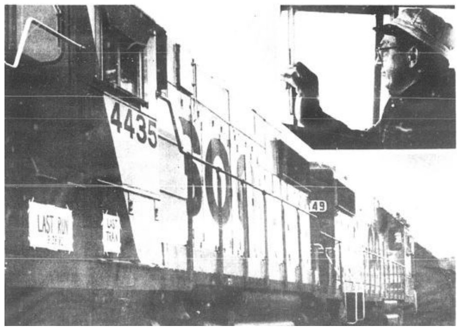
Lift bridge opens to traffic [4,8]

Dec 21, 1959

Start dismantling old swing bridge [4,26]. Road approaches were dismantled first with rail still intact until switched to the lift bridge on Feb 16. Swing span left in place until canal thawed

June 25, 1960

Ribbon cutting ceremony [5,27].

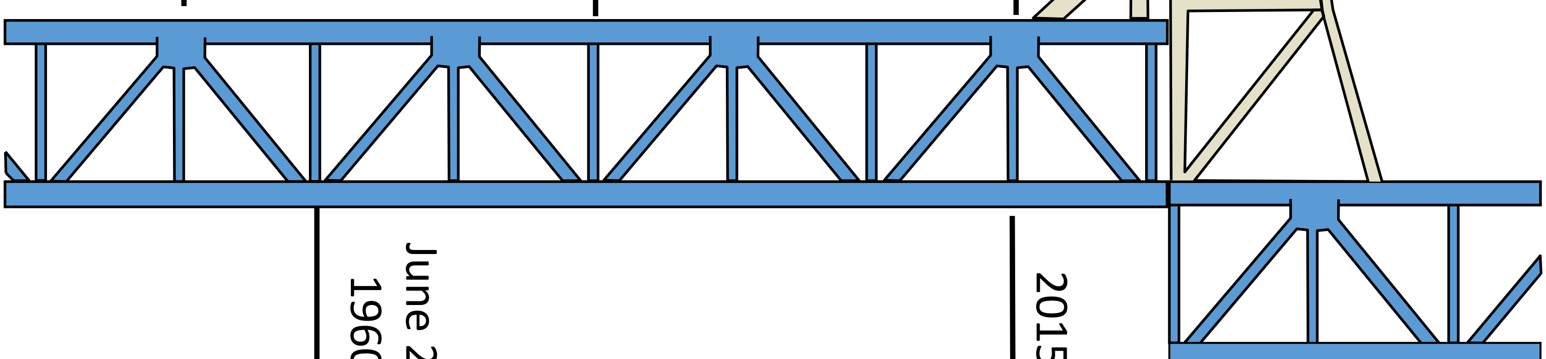


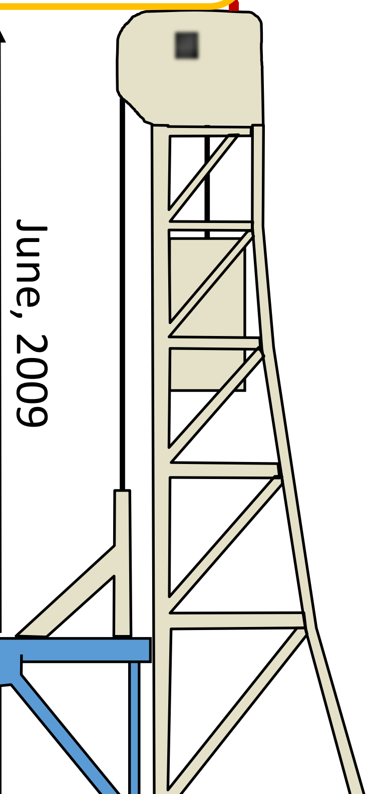
Sept 28, 1982

Last train crosses the bridge– Soo Line Railroad to Gay, MI [6,28]

June, 2009

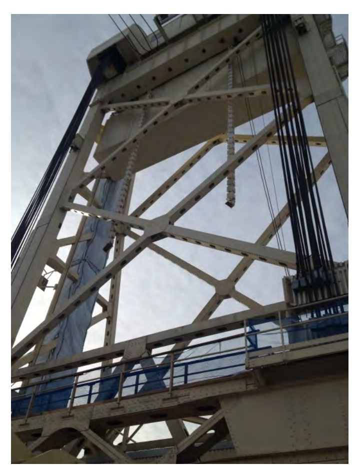
Bridge Fest 50th Anniversary– Annual festival celebrating the lift bridge connecting the communities of Houghton and Hancock. Grand Marshal is Tom D'Arcy (See Section 2) [29]

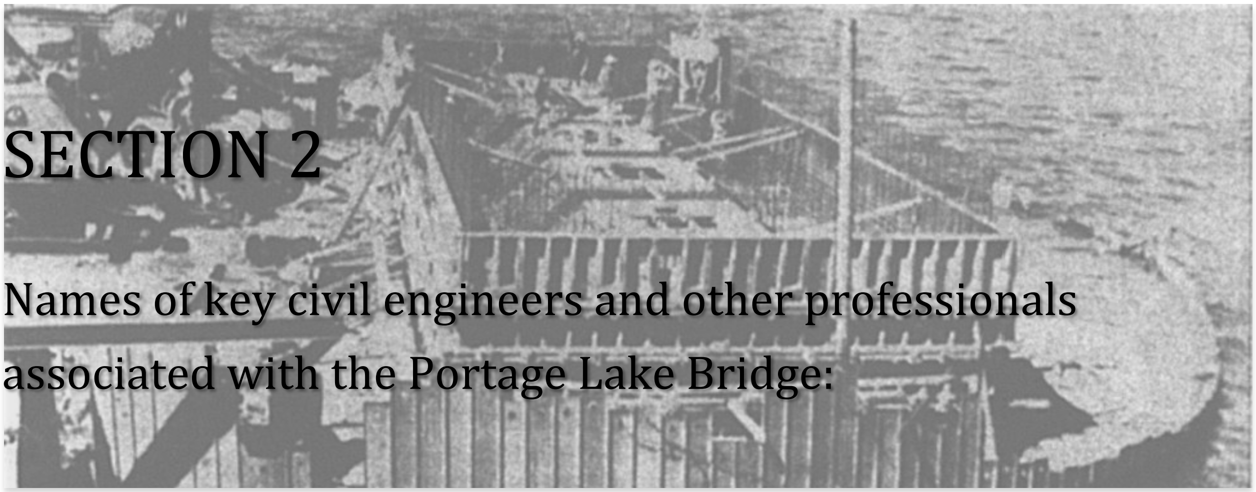




2015

Major rehabilitation of bridge– considered a 50 year fix on lift cables, balance chains, shaft replacements, structural components and a 20 year fix on electrical upgrades, deck patching, and spot painting [7,30]





SECTION 2

Names of key civil engineers and other professionals associated with the Portage Lake Bridge:

By the 1950s most people agreed that the old steel swing bridge was inadequate for the transportation needs of the region calling it “unreasonably obstructive” [2-1], but getting it replaced would not be easy. To replace the bridge, significant support needed to be voiced, paperwork filed, funding secured, a design created, and finally the construction undertaken. Since the 1940s, talks of a new bridge being built across the Portage Canal existed [2-2] but plans were not approved until 1957 when construction started. Though many people worked on the construction of the Portage Lake Bridge, a few groups and people championed the long and arduous process. Those who worked for various government entities and the private consultants came together to create a truly unique bridge.

A case made for the replacement of the existing swing bridge started at the county level with Carl Winkler, the Houghton County Road Commissioner from 1930 to 1964 [2-3]. He identified the massive shortcomings of the existing bridge and spearheaded the process to get the swing bridge replaced. Winkler was in constant contact with state highway officials, congressmen, and the Army Corps. Of Engineers and was often frustrated with the slow speed at which the process moved. Winkler vocalized this frustration that his concerns were not being taken seriously [2-4] in a letter to Charles Ziegler, the State Highway Commissioner from 1943 to 1957 [2-5], reporting a near collision of a freighter into the swing bridge, ending the letter with “Kindly pin this letter on the office wall so you can read the ‘I told you so’ when luck is lacking” [2-6]. The County Commissioner wrote many letters and testimonies and spoke at most all public hearings. Winkler’s work was in an attempt to get upper level officials on his side and convince them that the existing swing bridge needed to be replaced with a better design because it was no longer functional as intended and even dangerous. One of the top officials that Winkler won support of was John B. Bennett, the Michigan Representative in Congress from 1947 to 1964 [2-7]. Bennett helped to push Winkler’s paperwork through on the governmental side of the process. Without the tireless efforts of Carl Winkler, the lift bridge would likely not exist today.

One individual that Winkler was in constant contact with was Charles Ziegler. Ziegler recognized some of the deficiencies of the swing bridge but felt it would be better to just build another bridge at another location to solely take vehicles *or* rail. This would mean the existing swing bridge would not need to open and close as often and would lessen delays. Later convinced by Winkler and others, Ziegler eventually agreed that a replacement bridge in the existing location would be better to serve the cities of Houghton and Hancock. Ziegler was also the government official who signed off on all the lift bridge plans although shortly after construction began, John C. Mackie took over as the State Highway Commissioner (1957-1964) [2-8].

It was necessary in order to obtain funding for the bridge, to prove that the existing swing bridge was a hazard to navigation. Explaining the potential funding source, Assistant Chief of Engineers told Bennett that “the Bridge Alteration Act of 21 June 1940, Public Law 647, 76 Congress, provides that no Bridge shall at any time unreasonably obstruct the free navigation of any navigable waters of the United States” [2-9]. Tasked by the Chief of Engineers with compiling a report of the concerns and conditions of the bridge, Colonel George Kumpe of the U.S. Army Corps. Of Engineers met with Carl Winkler, state highway officials, railroad officials, and the Lake Carriers Association to note their concerns with the swing bridge. The federal bridge alteration funding could only be secured if the Secretary of the Army determined that it was an obstruction to waterway navigation (highway traffic was less important of an inadequacy) [2-9], making the meetings and testimonies of the Lake Carriers Association crucial. After one and a half years of evaluation and backlog, the Corps of Engineers denied the first case report to replace the swing bridge. However, in an effort to persuade the Secretary of the Army, Robert T. Stevens, and his Chief of Engineers, Samuel D. Sturgis, otherwise, Winkler along with Congressman Bennett met with the Army Corps of Engineers officials personally to try and change their minds and this time succeeded [2-9]. Other people who worked on the negotiations for the Portage Lake Lift Bridge following the initial investigation are included in reference 2-10.

With the approval and funding secured for a new bridge, the government hired Hazelet & Erdal Consulting Engineers out of Chicago, IL to design the lift bridge. The company was chosen to tackle the challenge of creating a unique bridge to handle many transportation modes in one small location because they specialized in movable bridges. The project was broken up into a few different teams: the railroad approaches and main truss span, the foundations, and the two towers. One of the young structural engineers of the project, Tom D’Arcy (now retired), worked on the structural design of the rail line approaches as well as parts of the main lift span. In a document included in this section, he shared some of his experiences working on the project and interesting facts as he remembers them [2-11]. Hazelet & Erdal consulted on the design for a little over a year before bidding and construction began.

Figure 2.1: MDOT crew [2-19]

An atypical winter start to construction began on December 18, 1957 with the caisson foundations. The government hired the Al Johnson Construction Company, based out of Minneapolis, as the general contractor and to construct the substructure and approaches [2-12]. The American Bridge Company (part of U. S. Steel, Detroit) completed all of the steel superstructure erection while Bethlehem Steel Company supplied the steel [2-12]. The Michigan Department of Transportation (MDOT) managed the project and had three different head engineers overseeing it over the course of construction. All three of the engineers were Michigan Technological University graduates: L. H. (Tony) Gilroy, Thomas Wiseman, and John Michels. John Michels, currently 91 and retired, was the last engineer to join the project and took over as lead project engineer after the caissons were finished in 1959. He still has an excellent recollection of the project and recorded detailed notes and construction records and collected newspaper articles relevant to the project. He provided some of these notes and documents for this nomination as well as participate in a phone interview about his time working on the bridge [2-13, 2-14, 2-15]. John's role in the project was to oversee the construction operations and field any engineering problems that might arise. He took part in the general inspection of the bridge as well, recalling how every rivet that was put in needed to be tested to ensure it was secure. John also pointed out that one of the concrete plant workers from the project, Bruce Deter, filmed various parts of the construction in his free time. These tapes were compiled into the Keweenaw Crossing video that preserves the history of the Lift Bridge construction process through visual media [2-16, 2-17]. Some of the MDOT crew including John Michels and John C. Mackie are shown in Figure 2.1 above.

More recently, the lift bridge underwent a massive rehabilitation project. This project was one of the first major renovations of the structure since its construction; designed to extend the life another 50 years. This project was led by Al Anderson, an MDOT engineer out of the Superior Region, Ishpeming Transportation Service Center (TSC). He was very helpful in collecting information for this nomination and provided a lot of information that the state had on both the original construction and the recent rehabilitation.

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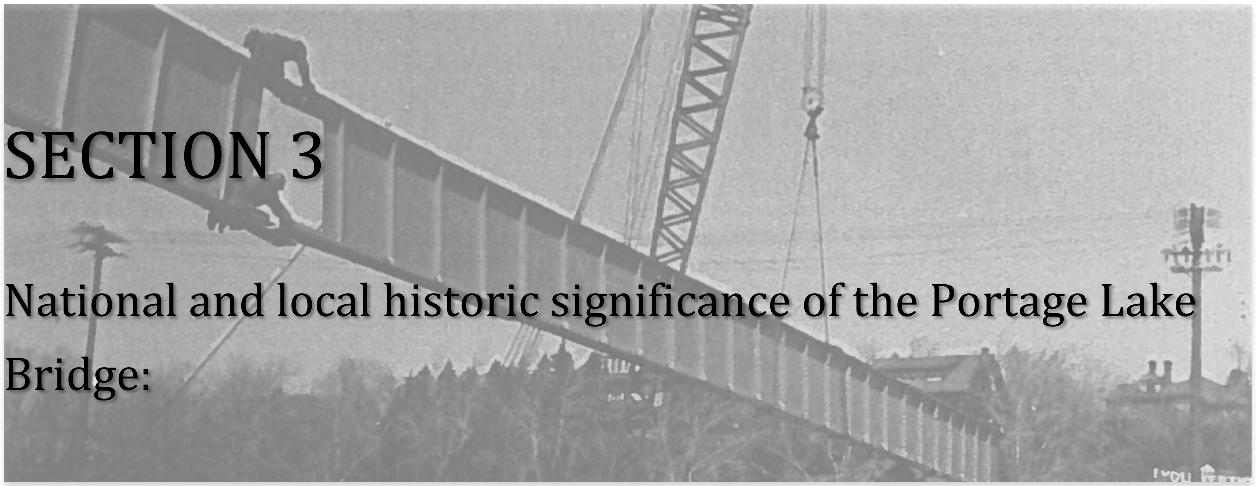

SECTION 3

National and local historic significance of the Portage Lake Bridge:

It is necessary to know the history of why the Portage Lake Bridge is there to understand the importance of the bridge to the local region and nation. The region is rich with native copper deposits and had an influx of mining operations throughout the Keweenaw Peninsula, leading to the nation's first mining boom in the mid-1840s. However, a narrow waterway, the Portage Canal, cut most of these mines off from the rest of the state and nation. To get copper to the rest of the nation, a crossing needed to accommodate both automobile and rail traffic while not restricting the marine traffic in the waterway as seen in Figure 1.1. Though two separate swing bridges served this purpose in the earlier years of the mining industry, they quickly outlived their effectiveness and a new bridge type was required to optimize efficiency for shared vehicle and rail traffic supporting a booming copper industry.

Figure 3.1: Breaking of mass copper underground [3-15]

The Keweenaw Peninsula is rich in many different minerals deposits including silver and nickel but copper is by far the most abundant. The copper in this region, called native copper, is very desirable because it is *pure* copper, often found in solid masses, and very rare even in comparison to other copper deposits [3-1]. Figure 3.1 shows a mass of copper being separated from the surrounding rock. Though Native Americans mined the copper for thousands of years prior to European settlement in the Midwest, the mining boom did not start until Douglass Houghton (the city of Houghton's namesake and the state of Michigan's first geologist) returned from his 1830s and 40s expeditions with reports of massive copper deposits in the region [3-2].

Copper has always been a useful material with numerous beneficial properties and applications. However, it was not until Houghton's report that interest was sparked in the mining the mineral. This increased mining interest came at a time when the use of copper was becoming even more important in emerging technologies. Around the time the first mining companies started setting up operations in the Keweenaw Peninsula (mid 1800s), the telegraph was proven useful and the desire to spread communications across the country grew. This communication line originally used copper wiring. In 1848 alone, the Upper Peninsula of Michigan produced "one million pounds of copper, 92 percent of U.S. copper production" [3-3] and remained the nation's largest copper producer into the late 1800s. As Thomas Edison was developing some of the nation's most influential inventions in the late 1800s, Keweenaw copper production was peaking. This correlation is no coincidence. "The phenomenal growth of the copper industry at that time was due to the rapid and increasing demand because of the telephone, electric light, electric motor, most of his basic inventions" [3-4]. Some of the first electric copper wire is shown in Figure 3.2. To transport this massive volume of copper across the Portage Lake, swing bridges (built at different times- see Section 1) were constructed across the Portage Canal to carry both rail and automotive traffic.

Figure 3.2: Copper wire covered with asphalt that was part of the first underground electrical system [3-16]

In the early 1900s, though copper demand was wavering, World War I brought a spike of interest back to the region. Copper was "used in most every weapon, vehicle, and piece of equipment used on the battlefield" [3-5]. Although no longer the leading producer of copper by quantity (having been surpassed by mines in the Arizona region), the Keweenaw was still the leader in quality of copper, producing the highest purity of ore. A few years later, the Great Depression caused mines to close, although World War II boosted the industry again. Some of the closed mines reopened once again to help supply the nation with the precious mineral. Even with declines in production due to a decrease in demand and rising costs of mining so deep (many shafts ran a mile or more underground) at the time of the lift bridge's construction in 1959, there was still enough industry on the north side of the canal to require a more optimized crossing. The larger mines, including Calumet & Hecla, were still working copper lodes underground and the industry was slightly revived once again in the 1950s and 60s when the mining companies turned to reprocessing their old stamp sands (material separated from the copper at processing plants) as seen in Figure 3.3. With more efficient processing than when the mines were at peak production, the left-over copper missed in the sands (also known as tailings) could be reclaimed, reprocessed, and ended up producing millions of pounds of copper at a lower cost than continuing mining out of the ground. This extended the life of companies like the Quincy Mining Company by more than twenty years beyond mining operations while supplementing others still working underground well into the 1960s [3-6]. In the primary operating years between 1845 and 1968, Michigan's Keweenaw Peninsula produced an estimated 10.5 billion pounds copper valued at over $1 billion [3-7, 3-8] during the mining era.

Figure 3.3: Quincy reclamation dredge in Torch Lake [3-17]

The Portage Lake Bridge was critical in linking the Keweenaw's transportation bottleneck to the rest of the nation. Many mining companies mined and processed their copper ore within close proximity and on the same side of the canal to maximize efficiency. In Figure 3.4, the relative locations of mines to smelters is clearly shown. Many of these locations are also on the northern side of the canal. Once the copper was processed, it would be transported into the market through one of two main ways: shipping and rail. The old swing bridge, while sufficient for all traffic modes at the time it was built, could no longer accommodate the new transportation demands. The steel swing bridge, like the current lift bridge, could handle automobiles, rail, and rotate to allow ships to pass, though it quickly became ineffective. As time went on, the increases in automobile traffic, ship sizes, and even the length of trains began to cause problems with transportation efficiency. For any watercraft to pass through, all land traffic needed to be stopped and the bridge rotated which was the main problem with the swing bridge. This frequent opening caused long delays averaging 9-13 minutes per watercraft passing (often longer for larger ships). With the bridge rotating several times a day, there could be more than an hour of total delays and hundreds of cars on both sides [3-9]. This caused many users of the bridge to lose money directly due to delays and inefficiencies of the bridge (see Section 6 for more details). When so much material and so many people need to cross this bottleneck, the delays could start to add up and hinder not only the regional economy but the national one as well.

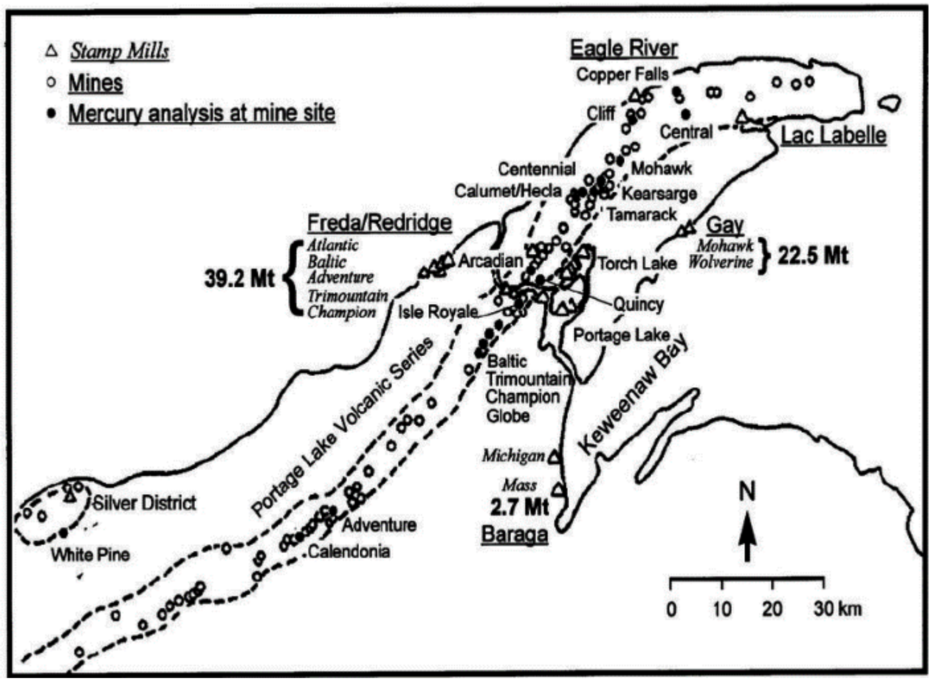

Figure 3.4: Copper mine and stamp mill locations [3-18]

The geometric constraints and structural deficiencies of the swing bridge also bordered on dangerous [3-10]. The lanes for vehicles were very narrow and provided little clearance between large trucks going in opposing directions (see Section 4). A testimony from C. F. Winkler outlines some of the safety concerns caused by the geometry of the bridge along with records of bridge openings provided by the Copper Range Railroad [3-11]. Water vessels shared similar concerns with geometric constraints and functionality. Ship captains reported needing to signal for the bridge to open a mile in advance due to the slowness of its rotation and the need to pass through at full speed in order to not drift into piers during high winds due to the narrow opening [3-12]. These unprecedented types of dangers to navigation and transportation posed more problems than was typically permitted for a structure of this importance to the nation.

The crossing required a new and more efficient way to transport goods and people. Simply renovating and repairing the old bridge would have been ineffective and very expensive. Instead, the solution was to discard the traditional swing bridge design and construct a lift bridge. A new design would allow for a wider roadway, unimpeded rail traffic, increased clearances for shipping traffic, and increased safe pedestrian travel. The lift bridge's design provided a much wider channel clearance of 250 ft compared to the 118 ft of the old bridge to accommodate new larger lake freighters of 75 ft widths, essentially eliminating the worry of drifting into the bridge piers [3-12]. Even today, the 250 ft width is still adequate for current lake freighters that can be around 100 ft wide. Changing the bridge type from a swing style type introduced a new limit, however: height. The bridge can raise to provide a maximum clearance of 100 ft which was the minimum clearance required to provide reasonably unobstructed navigation as determined by the Army Chief of Engineers for this particular waterway [3-12]. This maximum height is still above average for current lift bridge clearances and in general is mostly surpassed by lift bridges on the U.S. coasts that allow passage of larger ocean-going ships [3-13].

Automotive traffic flow was also greatly increased by replacing the old swing bridge with the lift bridge (the current traffic flow is shown below in Figure 3.5). The bridge's design improved local and long distance travel three-fold by having four wider lanes verses the swing bridge's narrow two, addressing the congestion and geometry concerns. Being the densest mode of transportation across the bridge, it was important that the vehicle flow be interrupted as little as possible. To accomplish this, the rail deck was designed to also carry vehicle traffic when the rails were not needed. For cars to use the lower deck, the lift span would raise up only part way so the lower deck lines up with the road surface. This intermediate position is the most common position for the bridge to operate at allowing the most frequent transportation modes cross unobstructed: car and small watercraft. See Sections 5 and 6 for more information on the intermediate position.

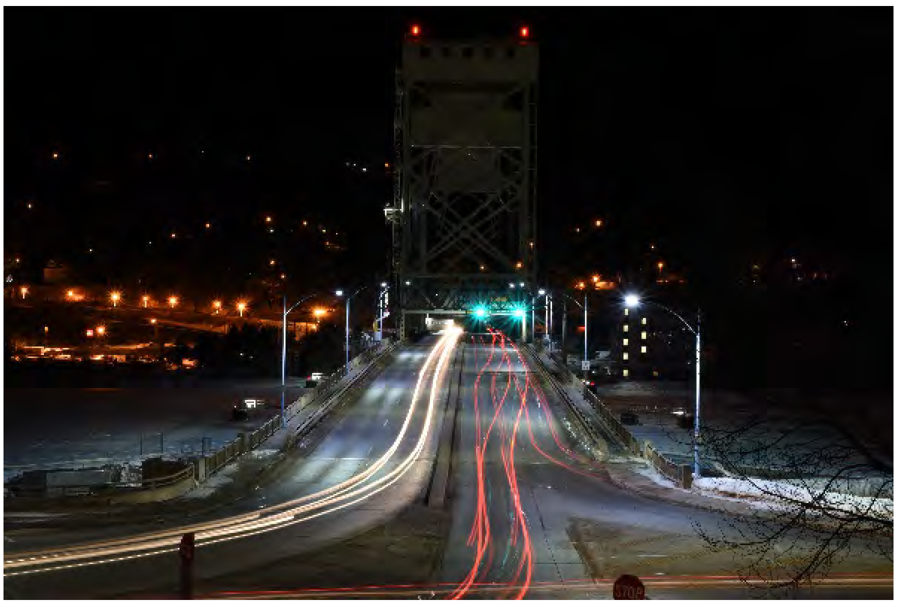

Figure 3.5: Lift bridge night lights and traffic flow [3-19]

The Portage Lake Bridge was and is a vital link between the Keweenaw on the southern shore of Lake Superior and the rest of the country. The copper mining in the area was critical to the development of the nation's technological system and continued to supply some of the purest metal in the world well into the 1960s. The increased efficiency of the new bridge greatly benefited the economic and social interactions between the region and the rest of the country (see Section 6). The only land link in and out of the mining districts, the lift bridge ferried all vehicle and rail traffic. Even today, the Portage Lake Bridge serves a similarly important role to the region. Even though trains no longer use the lower deck, it still provides safe passage to the ever-popular snowmobiles during the winter months in the lowered position and cars in the summer in the intermediate position. The waterway, while not always carrying ships solely involved in the Keweenaw operations, still adequately accommodates all ships passing through or taking refuge in the still waters of the canal. While the Portage Lake Bridge is an unmistakable icon of the Keweenaw, it is also a vital crossing to the rest of the nation. Used in telegraph lines, electrical lines and generators, war ammunition and equipment, and various household items, the Keweenaw's 10.5 billion pounds copper was crucial to society. In order for these systems to get the ore they needed, the transportation out of this remote region needed to be top notch and efficient. The lift bridge directly contributed to increasing the ease of movement of this precious metal throughout the region and nation.

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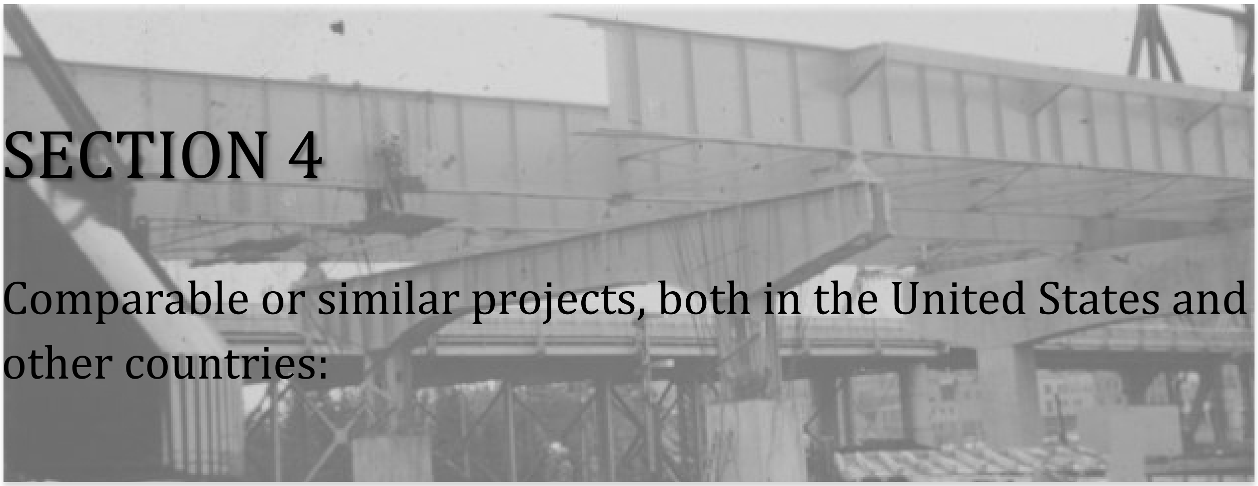

SECTION 4

Comparable or similar projects, both in the United States and other countries:

Armour-Swift-Burlington Bridge

The Armour-Swift-Burlington (ASB) Bridge is currently the only vertical lift bridge listed as an ASCE National Historic Civil Engineering Landmark and was dedicated in 1996. The steel truss bridge was built in 1911 in Kansas City, Missouri and has a unique vertical lift design where the bottom deck telescopes upward into the fixed upper deck [4-1]. With its telescoping design and lack of towers, the bridge looks quite different from typical vertical lift bridges (Figure 4.1). The ASB Bridge inspired the design of the Steel Bridge in Portland, Oregon, which was built in 1912 and has a similar telescoping bottom deck [4-2]. Originally, the bottom deck of the ASB Bridge carried rail traffic and the top deck carried streetcars, pedestrians, and vehicles. In 1987, the top deck of the ASB Bridge was decommissioned and the bridge now only carries trains [4-3]. While the ASB Bridge is a one of a kind vertical lift bridge, the Portage Lake Bridge showcases a number of other unique civil engineering achievements, including its ability to use a multi-modal intermediate deck position, a record-breaking heavy lift span, and an innovative bridge slide construction technique.

Figure 4.1: The Armour Swift Burlington Bridge in 2016 after use of the top deck was discontinued [4-21]

Sarah Mildred Long Bridges

Two vertical lift bridges have spanned the Piscataqua River in Kittery, Maine. The first, built in 1940, was a double deck steel vertical lift bridge [4-4] (Figure 4.2). As with the Portage Lake Bridge, the top deck was used for road traffic and the bottom deck was used for rail. The bridge also had a small movable section on the bottom deck that remained open for small watercraft, reducing the number of times the vertical lift span needed to be raised. Like many vertical lift bridges (and double deck vertical lift bridges in particular), the original Sarah Mildred Long Bridge no longer met the needs of the crossing and needed replacement. In fact, the replacement bridge was in the process of being constructed when, in August of 2016, the old bridge became stuck and had to be left in its open position until its removal upon completion of the new bridge in 2018 [4-5].

A decline in functionality and utility is typical of many double decked vertical lift bridges. Of the few bridges of this type that exist in the United States, many have now been turned into pedestrian bridges (such as the Meridian Bridge in Missouri), replaced (such as the original Sarah Mildred Long Bridge discussed here) or no longer use both decks (see the Armour-Swift Burlington Bridge discussed above). The Portage Lake Bridge has also been affected by time and changing needs: its bottom deck has not been used for rail traffic since the early 1980s [4-6] though it is still used by vehicles when in the intermediate position and snowmobile traffic when lowered during winter. Nonetheless, the bridge still provides an essential service to the area and receives an average annual daily traffic of 30,600 vehicles [4-7]. Considering the Michigan Department of Transportation’s 2015 rehabilitation of the Portage Lake Bridge, it is clear the bridge will remain an important part of the Upper Peninsula’s transportation system for years to come [4-8].

Figure 4.2: The original Sarah Mildred Long Bridge (left) and construction of the new Sarah Long Bridge (right) [4-22]

The original Sarah Mildred Long Bridge was replaced by another double deck vertical lift bridge, completed in 2018 (Figure 4.3). The bridge has two lanes of road on the top deck and railroad tracks on the bottom deck. This new and innovative bridge used precast concrete towers and a 300 foot steel box girder lift span [4-4]. While the bridge has two decks, the lift span only has one deck. The lift span rests at the upper deck level for vehicular use and is moved to the lower deck level when trains need to pass. Similar to the bottom deck of the lift span on the Portage Lake Bridge, the lift span of the Sarah Mildred Long Bridge can be used by either rail or vehicles. However, the 1959 design of the Portage Lake Bridge had the additional ability of having both decks in use at once - the Sarah Mildred Long Bridge's single deck lift span limits the bridge to having only one deck open at a time.

Figure 4.3: The completed Sarah Mildred Long Bridge [4-23]

Duluth Aerial Lift Bridge

The Duluth Aerial Lift bridge is a vertical lift bridge in Duluth, MN originally designed as a transporter bridge but converted to a vertical lift bridge to better handle vehicular traffic. The transporter bridge, built in 1905 [4-9], ferried passengers and vehicles across the Duluth Ship Canal using a gondola attached to the bottom of the truss that spans between the two vertical towers (Figure 4.4). In 1929, the bridge was reconfigured as a vertical lift bridge to accommodate an increase in automobile traffic the gondola could not handle efficiently [4-10] (Figure 4.5). The vertical lift bridge has a span of 386 ft and a lift span weighing 1,800,000 lbs. and carries two lanes of vehicle traffic [4-10].

While the Duluth Aerial Lift Bridge is smaller and less complex than the Portage Lake Bridge, it is one of only two vertical lift bridges in the region and is located approximately two hundred miles west of Houghton. The other vertical lift bridge is part of a 1959 modification to a series of movable and stationary spans that make up the International Railroad Bridge in Sault Ste Marie, MI [4-11] and is located over two hundred fifty miles east of Houghton. While these are interesting historic bridges in their own right, beyond the Portage Lake Bridge, no other bridges in the region have double decks or combine more than one mode of transportation. Interestingly, the project engineers working on construction of the Portage Lake Bridge (including John Michels, who was interviewed for this nomination) visited the Duluth Aerial Bridge for a tour in the late 1950s to better understand how lift bridges were constructed and operated [4-12].

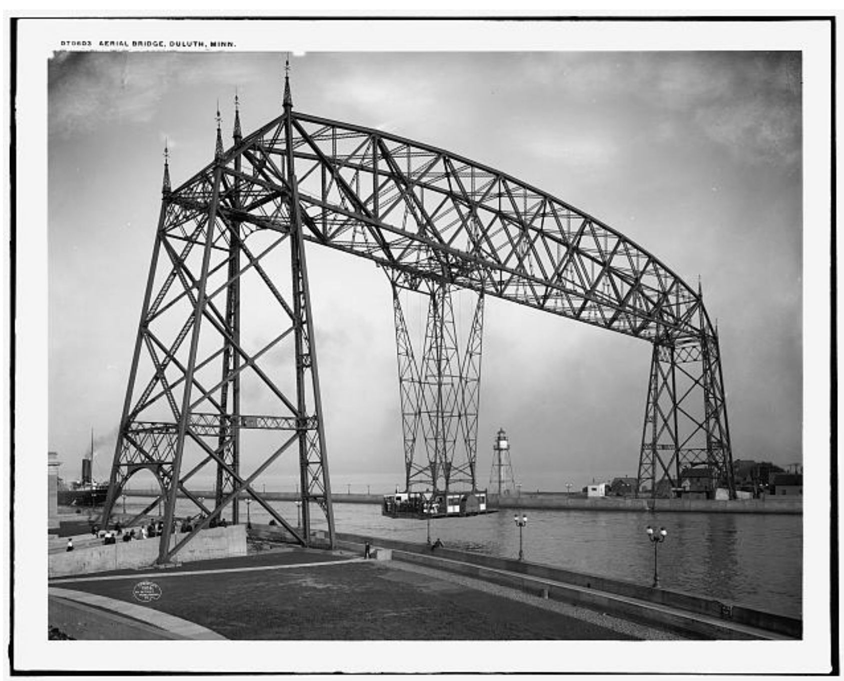

Figure 4.4: The Duluth Aerial Bridge before its modification in 1929 [4-24]

Figure 4.5. The Duluth Aerial Lift Bridge [4-25]

Portage Lake Swing Bridge

The Portage Lake Swing Bridge, the bridge replaced by the Portage Lake Lift Bridge, was a steel swing span bridge built in 1895 by the Mineral Range Railroad [4-13], around a hundred feet east of the current lift bridge location (Figure 4.6). The swing bridge had two decks, with the top providing a two-lane road for vehicles and the bottom deck providing railroad tracks for a number of companies. When open for water traffic, the bridge provided openings of 118 ft and 107 ft wide on the north and south sides respectively. When closed, the bridge could only let through the smallest of boats because of its 5.4 ft vertical clearance [4-14].

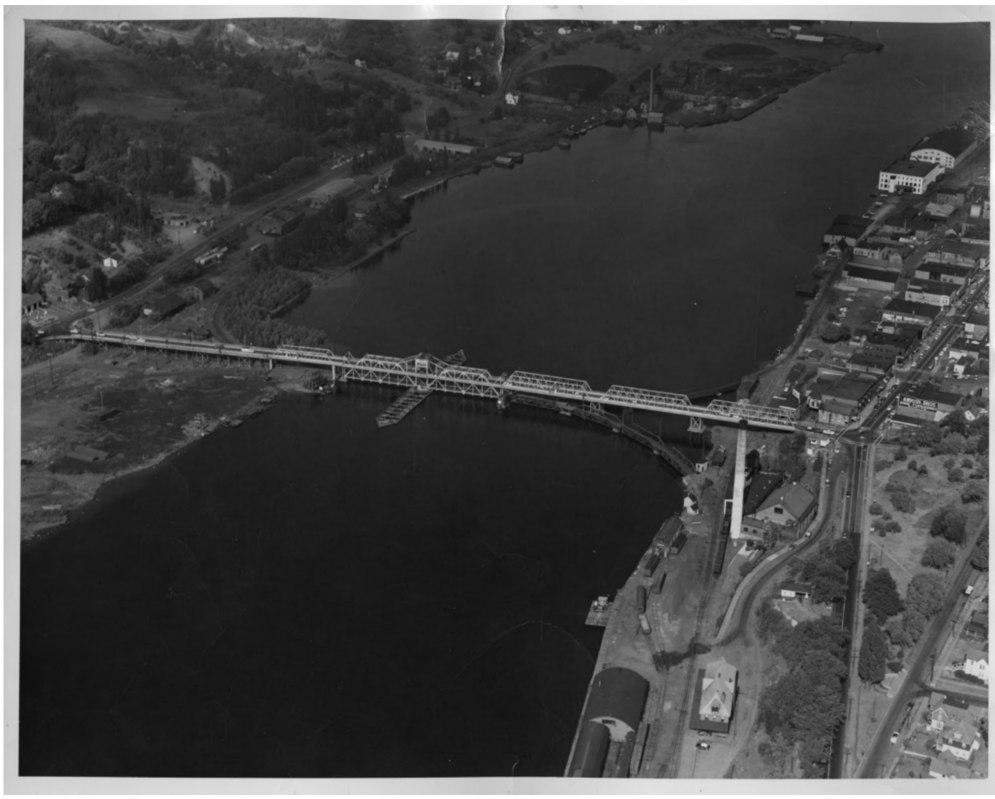

Figure 4.6: Aerial view of the Portage Lake Bridge, likely between 1906 and 1956 [4-26]

While the steel swing span improved on earlier Portage Lake crossings such as ferries and a wooden swing bridge, it would have needed significant work to be made safe and efficient at the time of its replacement in 1959. Discussion of repairing or replacing the bridge occurred as early as the 1940s. One 1945 letter from the Board of County Road Commissions to the Michigan State Highway Department outlined several structural issues with the swing bridge and went on to say "Unless some major repairs are made soon, somebody is going to get hurt" [4-15]. On October 15, 1953, a public hearing was held to discuss the state of the swing bridge. Carl Winkler, Houghton County Road Commissioner at the time, submitted written testimony for that meeting which discussed problems relating to the bridge geometry (see Figure 4.7) and slow opening speed [4-16]. His testimony states the bridge took five to fifteen minutes to allow one boat to pass and caused particularly long delays during stormy days because a large number of freighters used the Portage Canal as a harbor of refuge.

Figure 4.7: View of the narrow roadway of the Portage Lake Swing Bridge from the open swing span section [4-27]

As the structural and functional problems of the swing bridge began to pile up, a variety of bridge replacement options were considered and ultimately a vertical lift design was chosen. A tall stationary bridge would have required more space and longer approaches than could be accommodated by the steep hills surrounding the Portage Canal and the railroads that spurred so much of the economic development in the region. The span was too long for a bascule bridge to be practical and a replacement swing bridge would have been unable to avoid many of the problems the old swing bridge had. Taking into account the limitations of the area and requirements of the crossing, a vertical lift bridge design was an effective solution.

Changing to a vertical lift bridge type addressed many of the concerns with the swing bridge. With a faster opening time and lift span's intermediate position, traffic delays caused by large boats were reduced and delays caused by small watercraft were often eliminated completely. The intermediate position was of particular significance, as a 1953 record of the swing bridge openings shows 563 bridge openings (63% of total openings) were due to small watercraft [4-17]. See sections 5 and 6 for additional information on the intermediate position. The greater size of the lift bridge also resolved many problems. The roadway provided four lanes instead of two, more than tripling the vehicle-per-hour capacity of the crossing [4-18]. This reduced bottlenecks at the crossing and also eliminated the closure of the bridge for Houghton County Road Commission equipment - the former bridge was so narrow traffic had to be stopped in both directions to allow heavy equipment, such as snow plows and road graders, to cross [4-16]. Figure 4.8, a 1959 photograph of both Portage Lake Bridges, clearly shows the great size differences between the old swing bridge and new lift bridge. The clear channel width was more than doubled to 250 feet [4-19] and reduced concerns of ships drifting into the piers while moving through the crossing [4-14]. Overall, replacing the swing bridge with a vertical lift bridge greatly improved the efficiency and safety of the Portage Canal crossing.

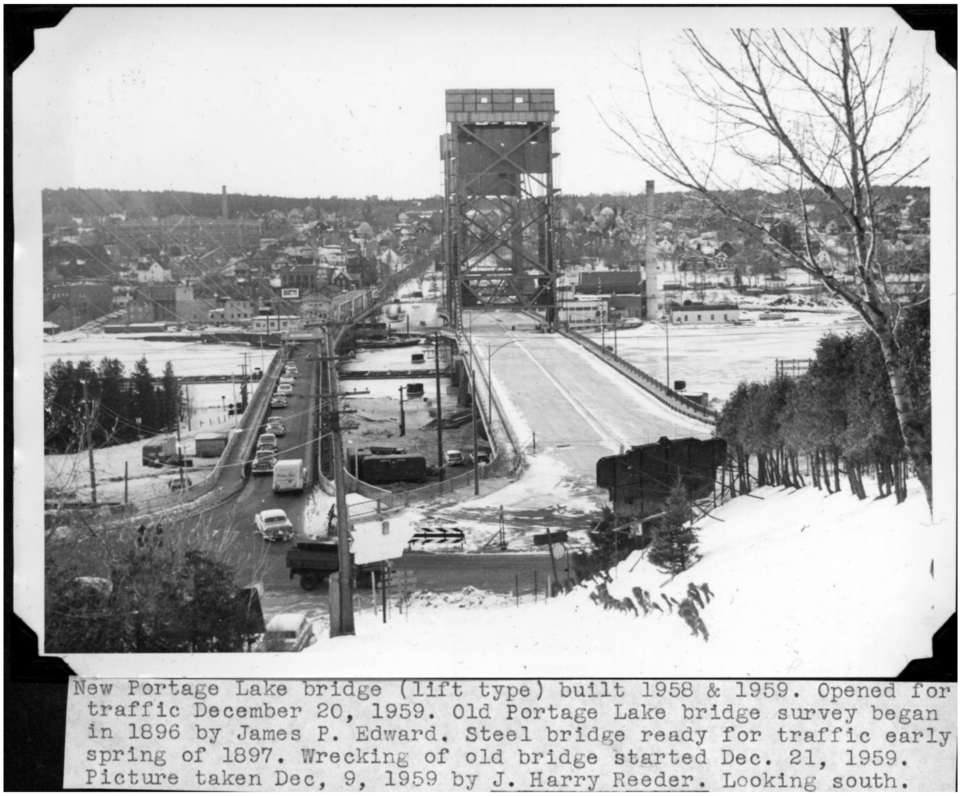

Figure 4.8: View of the old swing bridge (left) and new lift bridge (right) across Portage Lake [4-28]

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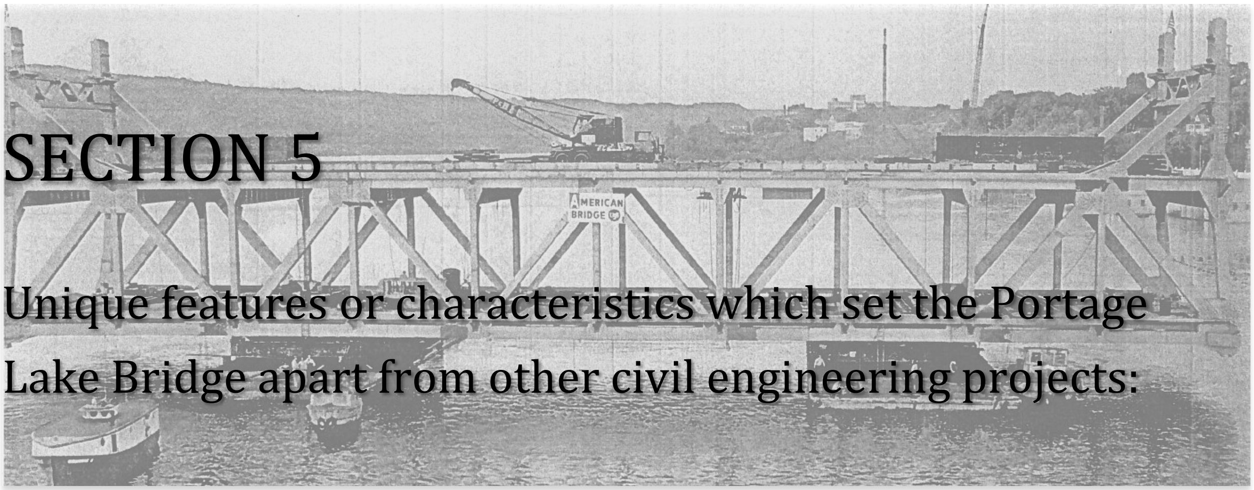

SECTION 5

Unique features or characteristics which set the Portage Lake Bridge apart from other civil engineering projects:

The Portage Lake Bridge has a number of unique features, including its double deck and ability to use its lift span in an intermediate position. This intermediate position required the design of movable intermediate bridge seats and a lower lift span deck that included both railroad tracks and a drivable roadway. Construction of the bridge in 1959 was one of the first uses of the accelerated bridge construction technique now known as a bridge slide. It is only highway bridge in Michigan that is a vertical lift bridge and it had the heaviest lift span in the world at the time of its construction [5-1, 5-2]. The bridge also receives heavy use when compared to other bridges of its type and prominent bridges within the state of Michigan [5-3].

The Portage Lake Bridge is one of only a handful of double deck vertical lift bridges in operation in the United States. Vertical lift bridges are rare in the United States and double deck vertical lift bridges are even more sparse. Furthermore, due to age and difficulty of maintenance, few of these double deck vertical lift bridges are still in use today. Some examples of those still in operation include the Steel Bridge in Oregon, the Broadway Bridge in New York City, and the Carlton Bridge in Maine. A number of others, such as the Meridian Bridge in Missouri and the original Sarah Mildred Long Bridge in Maine (see Section 4), have been replaced or converted to other uses. In contrast to many double deck vertical lift bridges, the Portage Lake Bridge is in excellent condition and receives a considerable amount of use. The bridge had an average daily traffic of 12,500 in 1955 [5-4] and 25,000 in 2016 [5-5]. Although rail no longer uses the bottom deck, both decks are still used by vehicular traffic and the bridge also still meets AASHTO requirements for deck geometry, despite being built 60 years ago [5-5]. Furthermore, the Michigan Department of Transportation (MDOT) recently invested in a significant rehabilitation of the Portage Lake Bridge [5-6], showing that this bridge, unlike many others of its type, will continue to function as a vital crossing in the region.

Even within the uncommon category of double deck vertical lift bridges, the Portage Lake Bridge has the unique ability to use its lift span in an intermediate position. In this position, the lift span is partially raised so the bottom deck functions as part of the upper roadway, providing a waterway clearance of 35 ft [5-2] while still allowing the vehicle traffic to continue (Figure 5.1). This gives the bridge much greater flexibility in handling the variety of modes of transportation that use the Portage Canal. Figure 5.1 shows the bridge in the intermediate position. During the summer months, the bridge is typically left in this position to allow small sailboats and watercraft to pass by. Trains stopped running to the Keweenaw Peninsula in the 1980s [5-7] so the bridge can now be left in its intermediate position for long periods, further reducing the number of bridge openings and traffic delays. In the course of the research for this nomination, no other vertical lift bridge was found to have the ability to use its double deck in an intermediate position. It is worth noting, however, that the new Sarah Mildred Long Bridge (see Section 4) has a dual-purpose lift span that can be used by either rail or vehicles, similar to the bottom deck of the Portage Lake Bridge. The unique design features on the Portage Lake Bridge allow for two modes of transportation to pass through the crossing at once, with the exception of when the lift span is fully raised. This sets the bridge apart from most other movable bridges which require one transportation mode to stop before another can proceed.

Figure 5.1: Portage Lake Bridge in intermediate position in 2015 [5-13]

The intermediate position of the lift span required several unusual additions to the lift bridge, including movable intermediate bridge seats and a combined roadway and railway surface. To rest in the fully lowered and intermediate positions, the lift span requires two sets of seats - the bridge components that the corners of the lift span rest on. Fixed intermediate bridge seats would have interfered with the lift span's ability to raise and lower fully, so movable intermediate seats were designed. A system of rollers and hydraulics is used to move the seats out from underneath the upper deck after the lift span has been raised above them. See Section 6 for further information and images of the intermediate bridge seats. The intermediate position also required the bottom of the lift span deck to have a surface that was useable by both trains and vehicles, an unusual feature that required Hazelet & Erdal to research different materials for creating a drivable surface on the lower deck for both transportation modes [5-1]. Although the bottom deck is no longer used by trains, snowmobiles use it during the winter to access the sizeable network of snowmobile trails in the Keweenaw Peninsula (see Section 6 for details).

Unlike many other vertical lift bridges, the Portage Lake Bridge has its mechanical equipment high in its towers. Typical vertical lift bridges place the lifting equipment on or near the lift span. Placing the machinery in the towers simplified the mechanical design of the lifting system but brought additional challenges. The heavy equipment required stronger towers and complicated the construction process slightly. With the harsh Upper Peninsula winters and high winds often seen in the Portage Canal, the placement of the mechanical equipment can also make access and maintenance more difficult.

Interestingly, the construction of the Portage Lake Bridge was an early example of an accelerated bridge construction technique known as a bridge slide. This technique involves key parts of a bridge being assembled near the main worksite, then moved into their permanent place over a short period of time. During construction of the Portage Lake Bridge, the lift span was built on barges at a site near the bridge and floated into place on Sept 9, 1959 (see Figure 5.2) [5-9].

During the course of researching this nomination, no definite information was found regarding the first use of this technique. Tom D'Arcy, a Hazelet & Erdal structural engineer on the project, and Al Anderson, a MDOT engineer involved in the recent renovation, were not aware of any other bridges that used the technique before its use here in 1959 [5-1, 5-8]. However, John Michels, one of the original project engineers, said he had heard of bridge slides completed on the east coast prior to the construction of this bridge [5-10]. Regardless, the lift span construction was certainly at the forefront of this technique and its use with the heaviest lift span at the time makes the achievement all that more impressive. Today, accelerated bridge construction techniques such as bridge slides are becoming more popular but are still relatively uncommon within the United States.

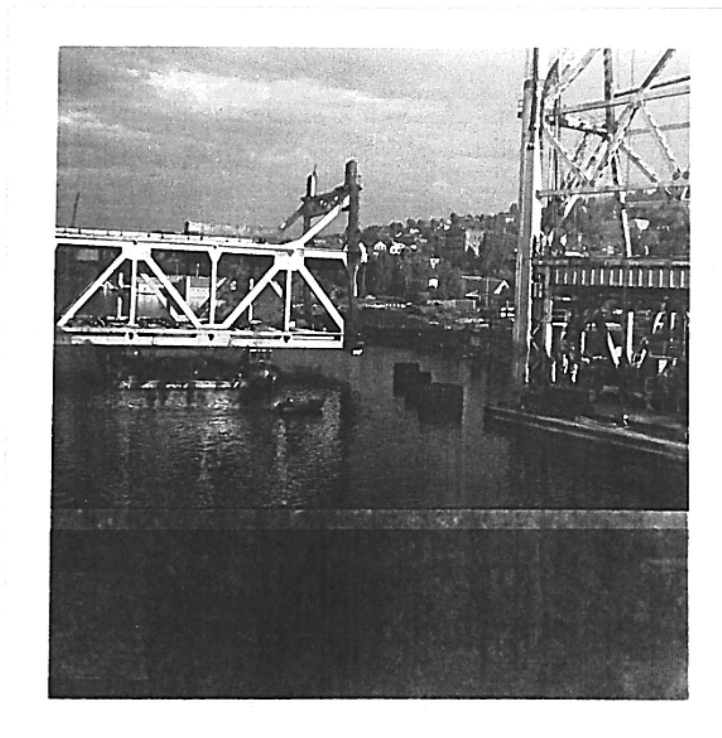

Figure 5.2: Floating the lift span into place on September 9, 1959 [5-14]

The Portage Lake Bridge has a variety of other unique features, including its size, regional rarity, and high level of use. At the time of construction, the bridge had the heaviest lift span in the world: 4,584,000 pounds [5-2]. This enormous weight is due to superstructure requirements for the four-lane roadway on the top deck combined with the rail system on the bottom deck. The bridge is also the only double deck vertical lift bridge in the state of Michigan. The only other vertical lift bridge in Michigan is part of the International Railroad Bridge in Sault Ste. Marie [5-11]. Finally, the bridge receives a large amount of vehicular traffic in comparison to other bridges in Michigan. According to MDOT's 2017 Annual Average Daily Traffic Map, the Portage Lake Bridge has an AADT of 30,600 vehicles - significantly higher than the AADT of most other notable historic bridges in the state. These bridges include the Mackinac Bridge (AADT of 8,120) at the Straits of Mackinac, the Blue Water Bridge (13,550) connecting the Port Huron, MI to Sarnia, Ontario, and the International Bridge (4,850) connecting the cities of Sault Ste. Marie in Michigan and Ontario [5-3]. With its heavy usage, early bridge slide construction technique, and unique double deck with an intermediate position to minimize traffic disruption, the Portage Lake Bridge displays a number of unique features that distinguish it from other bridges in the country.

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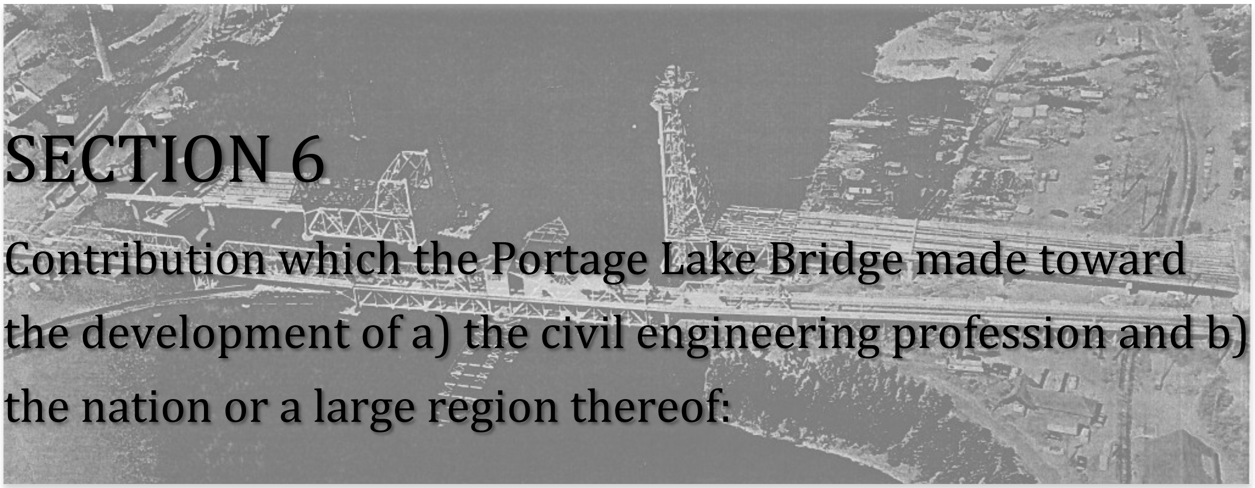

SECTION 6

Contribution which the Portage Lake Bridge made toward the development of a) the civil engineering profession and b) the nation or a large region thereof:

a) Contribution to Civil Engineering

The Portage Lake Bridge contributed to the development of the civil engineering profession in several key ways. First, its use of an intermediate lift span position was an innovative way for the bridge to be more flexible in meeting the needs of each transportation mode that used the crossing, including rail, vehicle, and marine traffic. The intermediate position, while a unique idea itself, also led to the construction of the heaviest lift span in the world [6-1] and resulted in several additional innovations including movable intermediate bridge seats and a multi-use bottom deck. Second, the construction of the bridge was an early example of a "bridge slide", an accelerated bridge construction technique now catching on throughout the country.

At the time of the Portage Lake Bridge's construction in the 1950s, the Portage Lake crossing was an intersection for a wide variety of transportation modes. Cars and pedestrians traveled between Houghton and Hancock daily and trains linked the copper-rich Keweenaw Peninsula to the rest of the country. On the water, small watercraft used the canal for recreation and larger ships used it for a shortcut around the Keweenaw Peninsula and harbor of refuge during storms. As discussed in Section 6.b., each of these modes played an important role in the economic development of the area. Unfortunately, the old swing bridge severely limited the free passage of people and goods through the crossing. It was particularly important to the designers of the new bridge to find a design that would be able to facilitate efficient use of the crossing.

Ultimately, a double deck vertical lift bridge was chosen for the Portage Lake crossing. The double deck, also a feature of the lift bridge's predecessors, was a proven success in allowing both trains and vehicles to use the crossing unimpeded by each other. The large loads caused by the combined loading of steam locomotives and vehicular traffic resulted in an extremely heavy and stiff lift span. In fact, the lift span weighed 4,584,000 pounds (or 17,630 pounds per foot over the 260 foot span) – the heaviest lift span ever built at the time [6-1].

Although using a double deck resolved issues relating to two transportation modes, it could not address the old swing bridge's frequent openings (and subsequent traffic delays) due to small boats. As discussed in Section 4, 63% of the bridge openings in 1953 were due to small watercraft [6-2] and eliminating those would greatly increase the functionality of the crossing. To reduce the number of openings but still have the benefits of a double deck, the structural engineers at Hazelet & Erdal added an intermediate position to the traditional double deck design. In this position, the lift span raises partway so the lower lift span deck functions as part of the top roadway deck rather than part of the rail deck. This allows the roadway to remain open while simultaneously providing a vertical clearance of 35 ft underneath the bridge for boats [6-1]. See Figure 6.1 for a diagram of the bridge's various positions. The intermediate position allowed the bridge to cater to the most frequent users of the bridge - cars and small watercraft - without sacrificing functionality for the economically important rail and shipping industries. The intermediate position was a first-of-its-kind engineering solution that greatly increased the flexibility of this bridge in managing the numerous modes of transportation that use it. Today, only one other bridge, the Sarah Mildred Long Bridge in Maine (completed in 2018), was found to have a dual-purpose lift span similar to that of the Portage Lake Bridge (see Section 4 for details).

Figure 6.1: Diagram of the three lift span positions used by the Portage Lake Bridge

The intermediate position required several further innovations to function properly. Movable intermediate bridge seats were designed so the bridge could rest in the intermediate position as well as fully raise and lower. In a typical vertical lift bridge, the lift span is held up by mechanical means when raised and rests on seats when lowered. These bridge seats are the components that the lift span bears on in its resting position and are usually located on the top of the piers at each corner of the lift span. For safety and efficiency reasons, the fixed and intermediate positions require the lift span to rest partially on supports rather than be fully supported by the counterweights and machinery that are used to move the span. However, for the intermediate position, these supports could not be fixed like the seats on the foundations, as that would prevent the lift span from freely moving up and down. At times when the lift span is lowered and both decks are in use, the intermediate bridge seats are retracted and located underneath the top deck of the bridge. To put the bridge in the intermediate position, the lift span is raised above both decks, the movable seats are extended using hydraulics and rollers, and the lift span is lowered onto the seats. See Figure 6.2 for a photo of one of the four the intermediate bridge seats.

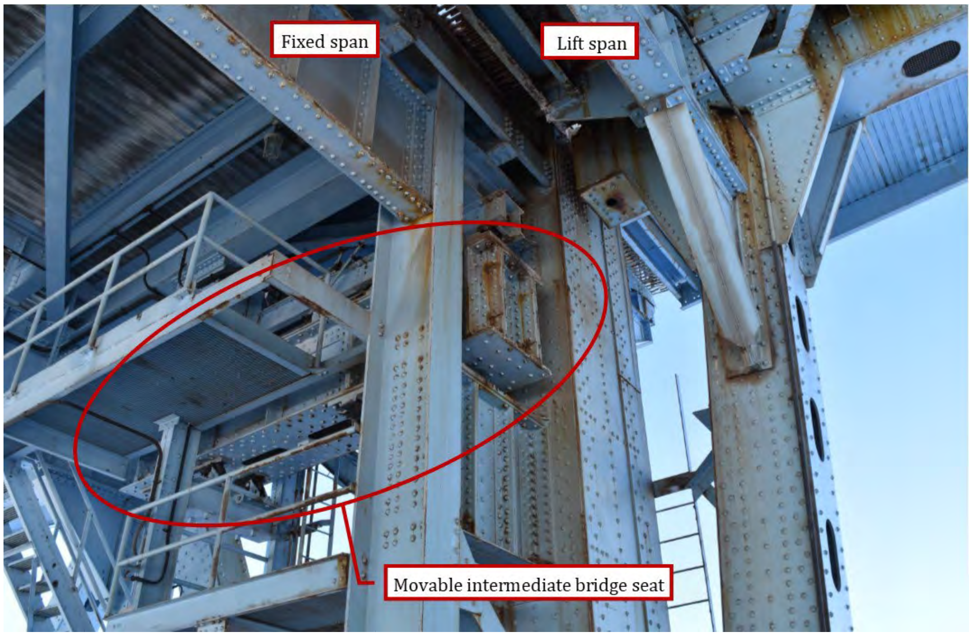

Figure 6.2: Southwest movable intermediate bridge seat in retracted position [6-22]

The bridge design required the lower deck to be used by trains in the fully closed position and by vehicles when in the intermediate position. Tom D'Arcy, an engineer with Hazelet & Erdal who was interviewed as part of the research for this nomination, recalls that a bridge deck with a combined rail and roadway surface was a noteworthy feature in that time. The design of the bottom deck required the design engineers to research several types of materials that would help incorporate the rails into the roadway surface with minimal impact on automotive drivability [6-3].

In addition to its noteworthy design, the Portage Lake Bridge also advanced the civil engineering profession through its construction techniques. The lift span of the bridge was floated into place using an "accelerated bridge construction" technique now known as a bridge slide. This technique has the main portion of the bridge built nearby, then moved into its final location over a short period of time. This helps reduce the amount of time a crossing is closed to traffic. The slide-in construction technique was used in the lift bridge construction because the old steel swing bridge had to remain functional during construction, as it provided the only drivable link between the Keweenaw Peninsula and the rest of the nation. However, the lift bridge was built so close to the old bridge that, when open, the swing span extended between the partially constructed towers of the lift bridge (see Figures 6.3 and 6.4). The lift span could not be built in place, as was typical, because that would prevent the swing bridge from opening at all and effectively close the waterway for the duration of construction.

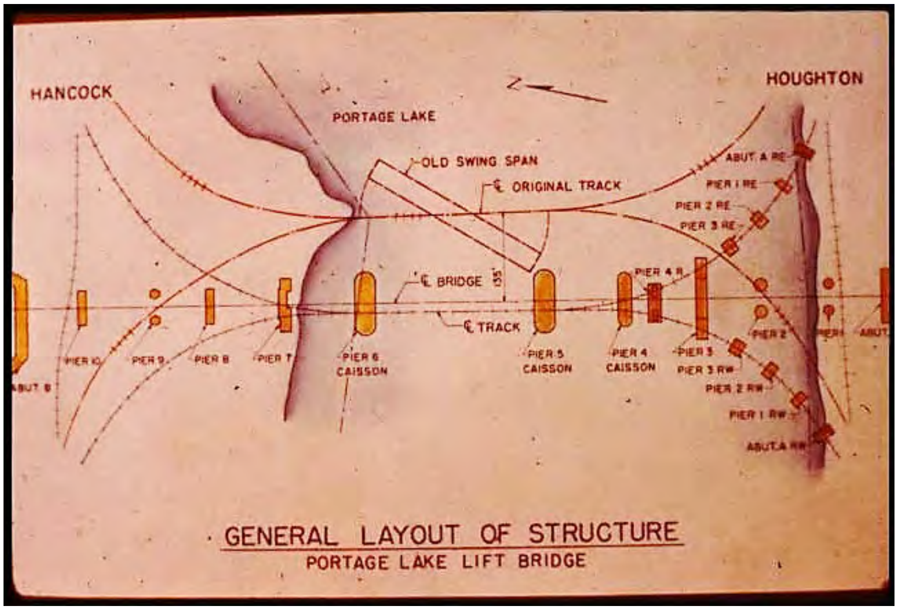

Figure 6.3: Plan view of old and new Portage Lake bridge layouts [6-23]

Figure 6.4: Boat passing through the Portage Lake bridges in 1959 [6-24]

To avoid closing Portage Lake to boat traffic, the lift span was constructed a quarter mile west of the bridge on barges moored to the shore of Portage Lake and on September 9, 1959, the lift span was floated into place between the towers using four tugboats [6-4]. The operation required great precision; on each end of the 260 foot lift span, there were only four inches of space in which to maneuver the span into place (Figure 6.5) [6-5]. The lift span was then attached to the counterweights and raised into a fully open position, where it would remain until construction was complete. Keeping the lift span raised allowed the swing bridge to continue normal operations below. As noted in the construction history compiled by John Michels, a project engineer who worked on the project, the lift span had two barges placed on the upper deck. These barges were filled with water so, combined with the weight of the unfinished lift span, the lift span and counterweights would be balanced [6-4]. Although likely not the first bridge slide project in the United States, the Portage Lake Bridge project was an early example of the technique and was completed significantly earlier than other bridge slide projects. Today, this slide-in bridge technique is becoming more common due to efforts such as the Every Day Counts initiative by the Federal Highway Administration [6-6].

Figure 6.5: Floating lift span into place [6-25]

Overall, the Portage Lake Bridge resulted in several technological advancements in the civil engineering profession. The design of an intermediate lift span position greatly increased the flexibility of the bridge in juggling the many modes of transportation that used the bridge. This novel solution required further innovation in the design of movable intermediate bridge seats as well as a combined rail and roadway surface on the lower lift span deck. During construction, due to the proximity of the old swing bridge and to ensure the crossing would remain functional, the lift span was floated into place on barges. This was an early example of the slide-in accelerated bridge construction technique, which has only become popular in the last few decades. In both design and construction, the Portage Lake Bridge used unique solutions to best fulfill the wide-ranging needs at the crossing.

b) Contribution to the Region and Nation

The benefits that the Portage Lake Bridge provided to the nation were significant both socially and economically. The Keweenaw Peninsula, as the location of the nation's first mining boom in the mid-1800s and comprised of the rare native copper, directly provided the resources the nation required to stay at the forefront of technological development (see Section 3). Because these mines were cut off from the rest of the state and nation by a narrow waterway, the Portage Canal, the bridge was the vital link to allow this natural resource to spread and be used. However, the crossing did not just need to be adequate, it needed to optimize efficiency in order to maximize the economic benefit valued at over $1 billion during the copper mining era [6-11]. The industries on the north side of the canal required steady and uninterrupted travel across the waterway. Any delay, small or catastrophic, would have economic impacts on the various companies still operating in the 1950s. The lift bridge optimized road traffic for people and logging, rail for copper, and shipping for a variety of materials which greatly benefited operations in the Lake Superior region. While the land transportation systems were directly linked to the Keweenaw Peninsula, the waterway was linked to many other industrial centers that share the lake. Therefore, the safer and more efficient passage under the bridge positively impacted more than just local business; it impacted national businesses.

The bridge had four major transportation modes that all shared the same infrastructure space; automobile, rail, water, and pedestrian. Although pedestrian traffic wasn't the most nationally influential mode across the bridge, it is still a very important one locally. With the cities of Houghton and Hancock being on either side, there is regular foot traffic between the two cities for work and play. This was taken into consideration by designing into the structure a wide walkway on both sides of the bridge as well on both decks. As such, when the bridge is in its intermediate position, which it is quite often, the top deck walkways are unavailable. The walkways on the lower deck, while not accessible when the lift span is in the fully lowered position, allow continued walkability when in the intermediate position.

Automobile traffic was and is by far the most popular mode of transportation across the bridge. In 1955, as plans and finances were being secured for the new lift bridge, the average daily traffic (ADT) was 12,500 vehicles [6-7]. Looking at the same record, there was a peak volume of 1,437 vehicles crossing in just one hour on one day in May. Even today, the ADT has climbed to around 25,000 according to the 2016 National Bridge Inventory. This is quite high compared to other historic Michigan bridges (see Section 5 for comparisons). These automobiles carried people for work and recreation, equipment and materials for mining, as well as other much needed goods. With the increased popularity in personal vehicles, people did not need to live close to where they worked anymore. The towns that neighbored mining operations expanded and grew. With the two major cities, Houghton and Hancock, situated on either side of the bridge, it was very popular for people to live on one side and work on the other. As shown previously in Figure 3.4, most of the mines were on the secluded portion of the Keweenaw Peninsula. This meant that anyone who lived on the south side of the canal needed to cross the bridge every day for work and vise-versa. The social and economic benefits of the lift bridge increasing traffic flow over the crossing were very significant locally. As stated in Section 4, the capacity of the bridge was tripled and the delays due to bridge openings were decreased significantly due to the intermediate lift position and quicker operation.

The fact that the bridge could allow its most heavily used form of traffic to continue while maintaining unobstructed waterway access for small vessels was the key to its impact on the rest of the country. By allowing more vehicle traffic to cross with fewer delays, the industries that utilized automobiles could optimize their transportation network. This allowed them to increase their contribution to the local and national economy. Not only did many mine workers need to cross the bridge to go to work but the mines themselves required supplies not available on the northern side of the canal. As roads and transportation systems expanded, largely due to the Federal Aid Highway Act of 1956, the trucking of materials and supplies became more popular. Trucks were getting bigger and more powerful and could go more places than trains and ships, allowing easier access to remote facilities. The old swing bridge could not handle the increased size and volume of trucks desiring to cross (as stated in Section 4). The lift bridge's wider lanes and clearances solved this problem, allowing companies to maximize their trucking capacity.

The easier movement across the bridge not only greatly impacted the local region through the transportation of supplies but also the national economy mainly through logging. During the peak of the mining industry, the lumber cut down was most often used for mine purposes and remained in the area. However, as mining operations decreased, the need for the lumber locally dwindled. This created a new export market of timber from the vast regenerated forests on the Keweenaw Peninsula. Many of the mining companies that still had large land holdings began selling more and more of their lumber. By the 1950s, the Calumet & Hecla Mining Company was logging 104,000 acres of land it already owned and logging became the Copper Range Mining Company's primary source of income [6-8]. Much of this lumber was transported by trucks over the bridge to the rail and shipping yards. Even today, with the rail and mining industries gone, the logging continues and seeing large logging trucks crossing the bridge is a common occurrence, Figure 6.6.

Figure 6.6: Logging truck as viewed from operation booth [6-26]

Although automobiles made up much of the land traffic that crossed the lift bridge, there was still a very functional and important rail system that also needed to cross at the same location. In the 1950s, three different rail companies shared the access across the lift bridge, moving goods and people south to the rest of the nation: Copper Range Railroad, Soo Line, and Milwaukee Road. This meant that the bridge still needed to carry the heavy rail system while still being used by automobiles (hence the double deck design). The lower deck was primarily designed to carry this rail traffic in the bridge's lower position, allowing vehicles to continue above. The bridge connected the mining industry still in the northern part of the Keweenaw to the rest of the nation primarily through this mode. Into the 1950s and 60s, Copper Range Railroad alone was taking an average of one to two trains with 9-26 rail cars a day across the bridge carrying rock, stamp sand, copper, and timber [6-14]. These trains would transport their various materials to McKeever, MI where they would switch trains to head down to Chicago, IL. From Chicago, the materials would be processed and sent all over the nation to be used in every way imaginable. Figure 6.7 is a map of the Copper Range's rail line from the Keweenaw south to Chicago. Though this map is from 1917, most of the lines were still active into the 1950s and 60s. Passenger rail also kept the northern Keweenaw Peninsula socially connected to the rest of the nation. In 1957, the Milwaukee Railroad was still offering passenger transit to and from Calumet and Chicago. From Chicago, a passenger could then travel anywhere in the county as seen in reference 16. This train system also served the region through a contract with the U.S. Postal Service into the 1960s [6-18].

Figure 6.7: Map of Copper Range rail lines [6-15]

The last train crossed on September 28th, 1982 from the Soo Line Railroad, retiring the rail lines crossing the bridge and throughout the northern Keweenaw [6-17]. The span is now only used in the lower position for maintenance, over-height loads that are too tall for upper deck clearances, and during winter. Otherwise the deck remains in the intermediate position to allow the very popular pleasure crafts to proceed under the bridge's 35ft clearance. Today, the Portage Lake Bridge carries a new mode of transportation not previously designed for. During the winter, the old rail deck and approaches are utilized by snowmobilers wanting to safely cross the waterway to access the vast northern Keweenaw trails as seen in Figure 6.8. Since the decline of the copper and subsequent rail industries, many of the old lines have been converted into ATV and groomed snowmobile trails for winter tourism on both sides of the bridge. This winter recreation remains economically important and unique to the local region.

Figure 6.8: Snowmobilers Using the Lower Deck to Cross the Canal [6-27]

Last but not least, the Portage Lift Bridge increased the ease and efficiency of waterway travel. The ships that passed through the Portage Canal not only serviced the Keweenaw copper industry but they also served the industries on the western side of Lake Superior. With the copper industry dwindling by the 1950s, there were not as many ships directly serving the Keweenaw as there had been during peak production. However, there were still many other industries on the western shores of Lake Superior that transported their goods by freighter; primarily iron ore. These ships carrying material in and out of the Lake Superior region travel all over the great lakes and some even out to the Atlantic Ocean for further spread of goods. In 1955, the lakers (Great Lakes freighters) would have transported between 80 and 100 million tons of iron ore during the periods when the lakes were not frozen [6-9]. A lot of these ships avoided the swing bridge's canal bottleneck and busyness when they could, instead opting to take the trip around the tip of the Keweenaw. However, this was not always safe. Often times, ships would use the Portage Canal as "a sheltered route in times of stormy weather on Lake Superior off Keweenaw Peninsula" [6-10]. Prior to the lift bridge, many ships decided to take the risk of Lake Superior storms rather than be delayed with the old swing bridge hassle. This risk was unnecessary to need to take because it was not a natural obstruction they were avoiding. The canal not only had the ability to provide efficient and safe passage to western Lake Superior, but it also saves distance and sailing time [6-10]. In

1955, the "commerce on the waterway averages about 600,000 tons annually and vessel trips average about 400 of large lake carrier type and 500 smaller craft of 30 tons or less" [6-10]. This is a significant number of ships serving industries that are vital to the nation's infrastructure and economy. In a letter sent to the Secretary of the Army from Major General B. L. Robinson, the acting Chief of Engineers for Civil Works, he outlined the cost benefits of the crossing:

> "About 100 large vessels pass Keweenaw Peninsula each day and in an average year they are exposed to 23 days of severe storm conditions. Therefore, about 2,300 vessels would have good reason to use the waterway, or about 1,900 more than at present. The Lake Carrier's Association presented data estimating one hour gain in sailing time and earning capacity of a large vessel at about $200 per hour, thus, the 1,900 vessels would represent a saving of $380,000 per year. In addition, estimates of the cost of delays to the vessels now using the waterway amount to $10,000 annually in added cost of operation" [6-10].

He concludes that even though there were potential cost savings for ships to use the waterway, they were risking the bad weather conditions and taking the longer route to avoid the dangers and backups of the old swing bridge. To put in current dollar values for context, the money could have been saved is valued at $3.5 million and the cost in delays due to the swing bridge equivalent to $94,000. While the cost due to the bridge *delays* seems low compared to the savings of using the canal, the potential cost of *dangers* of passing through the old bridge needed to be taken into consideration. The slow operation of the swing span required ships to signal their approach more than a mile away from the bridge and hope the signal was heard before it was too late to stop. With the narrow opening clearance there was a high danger of ships being blown or drifting into the piers. "Vessel masters testified it is necessary to go full speed in strong winds to avoid drifting" [6-10]. The Portage Lake Lift Bridge solved both of these issues, making the opening more than twice as wide and having a faster span moving operation. This meant that most of the danger and delay costs would be eliminated and the savings due to sailing time could be retained. The importance of this particular mode of transportation was not only critical to the local copper industry, but also to the iron industries on the west side of the lake. As shown in Figure 6.9, the raw goods are mined around Lake Superior and then transported to the lower Great Lakes for processing. This meant that a large amount of ship traffic needed to go past or through the Keweenaw Peninsula to connect to the rest of the country. Making sure the waterway was as efficient as possible was a high priority. Both the copper and iron industries that used the waterway were very important to the development of the nation and positively impacted the national economy.

Figure 6.9: Great Lakes ore shipping routes [6-28]

Today, the lift bridge provides a direct benefit to the year-round tourism of the region. With the mining industry gone, what remains in its place is a large historical tourism industry. There are many national historic parks in the area that encompass some of the premier mining locations like Quincy Mine, Calumet and Hecla, and other locations important to the copper industry. The Quincy Mine Hoist, within one of these national parks, is even an American Society of Mechanical Engineers Landmark [6-20]. Because many of the mine locations were on the northern side of the canal, tourists need to cross the bridge to get to them. For visitors who enjoy the outdoors, the Keweenaw also offers year-round recreation. In the summer, there are countless trails for hiking, mountain biking, and ATVs. In the winter, there is snowshoeing, snowmobiling, and alpine and Nordic skiing. Snowmobiles are seen driving across the lower deck to access these trails on a regular basis and are critical to the local businesses in the snowy region. The Keweenaw has world class year-round recreation and rich historical value making tourism an important part of the region's economy and the lift bridge is the key that connects it all to the rest of the nation.

The Portage Lake Bridge was critical in linking economic industries of Michigan's Upper Peninsula and the greater Lake Superior region to the rest of the nation. The industries on the northern side of the bridge required regular access across and through the Portage Canal in a variety of different ways. In expressing the importance of this crossing and the need to keep it at the forefront of efficiency and reliability, Carl Winkler stated that "A failure of this crossing would not only be a terrible inconvenience, but would in all probability create havoc with business of the Keweenaw Peninsula, and would very likely cause curtailment of the Copper Industry north of the Lake and throw hundreds of people out of work" [6-12]. The vice president of the Calumet and Hecla Mining Company expressed the same concerns when a ship almost collided with the old swing bridge; "2300 employees are dependent on this Company's continuous operation. If the present bridge was made inoperable, this Company would have to close down a sizable portion of its operation almost immediately" [6-13]. Residents needed steady automotive access to travel to work or have fun exploring the area. The logging industry at the later end of the Keweenaw operations required regular trucking access to get the lumber out of the woods and to the sawmills for production. During the copper mining years and into the 1970s, the rail industry was the primary transporter of the precious metal and sometimes people, requiring its own type of infrastructure accommodations. The waterway was opened for smaller boats to have an unobstructed passing and the larger ships now had a safer opening to cross. Increasing waterway maneuverability greatly benefited the industries on the western side of Lake Superior even as these industries continue to operate today. The Portage Canal is still important to act as a safety route in times of bad weather, giving ships the option of safer travel if Lake Superior proves too violent. Openings of the lift span are still in the 400 per year range, including pleasure craft and lakers [6-19]. The lift bridge allowed all this transportation to continue essentially uninterrupted and connected the Keweenaw's economic center, valued at over $1 billion during the copper mining era, to the rest of the nation [6-11]. The Portage Lake Bridge, though tucked away in the northernmost part of Michigan, optimized a multimodal crossing that was critical to the social and economic success of the country as a whole.

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[6-22] “Intermediate Bridge Seat,” (Mar 7, 2019). Photograph courtesy of Michael Prast (Mar 2019).

[6-23] “General Layout of Structure,” Photograph courtesy of Dr. Kris Mattila, P.E., Associate Professor Michigan Technological University (Feb, 2019).

[6-24] Photograph No: MS025-02-08-018, “Swing Bridge in use during Lift Bridge Construction,” (1959). J. Harry Reeder Photo Collection. MTA & CCHC.

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[6-26] “Logging Truck on Bridge.” (Mar 7, 2019). Photograph courtesy of Michael Prast (Mar 2019).

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Key:
MTA & CCHC = Michigan Tech Archives & Copper Country Historical Collections

SECTION 7

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[4-11] Historic American Engineering Record, "Sault Ste. Marie International Railroad Bridge, Spanning Soo Locks at St. Marys Falls Canal, Sault Ste. Marie, Chippewa County, MI." *Library of Congress,* (viewed Mar 17, 2019). <www.loc.gov/resource/hhh.mi0638.photos/?sp=16>

[4-12] Michels, John. Personal communication on Lift Bridge. (9 am Feb 20, 2019).

[4-13] "History of the Bridge." Date unknown. Houghton County Road Commission Bridges, Portage Lake, 1958-1961, RG77-104. Box 2, Folder 7. Michigan Tech Archives & Copper Country Historical Collections. Document attached in Section 8.

[4-14] Robinson, Major General B. L.. Letter to Secretary of the Army Re: Public Hearing Under Bridge Alteration Act, Houghton-Hancock Bridge over Portage Lake, Mich. March 7, 1955. Houghton County Road Commission Bridges, Portage Lake, 1954-1955, RG77-104. Box 2, Folder 5. MTA & CCHC. Document attached in Section 8.

[4-15] Winkler, C. F.. Letter to R. F. Rosatti. May 8, 1945. Houghton County Road Commission Bridges, Portage Lake, 1941-1945, RG77-104. Box 2, Folder 2. MTA & CCHC. Document attached in Section 8.

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[4-19] Michels, John J. Date unknown. "Interesting Facts." Provided by John Michels, (Feb 2019). Document attached in Section 8.

Section 5 References

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[5-2] Michels, John J. Circa 1957-1960. "Interesting Facts." Provided by John Michels, (Feb 2019). Document attached in Section 8.

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[5-7] Hayhow, Elizabeth (Sept 29, 1982). "Soo Line Trainmen Bid Adieu." Daily Mining Gazette. Microfilm collection, Michigan Tech Archives & Copper Country Historical Collections. Document attached in Section 8.

[5-8] Anderson, Al (Feb 7, 2019). Email exchange about Portage Lake Lift Bridge. Document attached in Section 8.

[5-9] Deter, Bruce (1960). "Keweenaw Crossing." MDOT, (viewed Jan 2019). Available: <www.youtube.com/watch?v=4D6Vx8XHMu0>

[5-10] Michels, John. Personal communication on Lift Bridge. (9 am Feb 20, 2019).

[5-11] Historic American Engineering Record, "Sault Ste. Marie International Railroad Bridge, Spanning Soo Locks at St. Marys Falls Canal, Sault Ste. Marie, Chippewa County, MI." Library of Congress, (Mar 17, 2019). <www.loc.gov/resource/hhh.mi0638.photos/?sp=16>

Section 6 References

[6-1] Michels, John J. Circa 1957-1960. "Interesting Facts." Provided by John Michels, (Feb 2019). Document attached in Section 8.

[6-2] Puffer, H. R.. Letter to Col. George Kumpe Re: US-41 Crossing Portage Canal Between Houghton & Hancock. October 30, 1953. Houghton County Road Commission Bridges, Portage Lake, 1953, RG77-104. Box 2, Folder 4. MTA & CCHC. Document attached in Section 8.

[6-3] D'Arcy, Tom (Feb 8, 2019). "Houghton Hancock Bridge." Written supplement to personal call on Feb 11, 2019. Document attached in Section 8.

[6-4] Gilroy, L.H, Michels, John. "Construction History: Houghton-Hancock Vertical Lift Bridge." (1961). *Michigan Department of Transportation.* Provided by John Michels, (Feb, 2019). Pages 35-36. Document attached in Section 8.

[6-5] Deter, Bruce (1960). "Keweenaw Crossing." MDOT, (viewed Jan, 2019). Available: < www.youtube.com/watch?v=4D6Vx8XHMu0>

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[6-8] Busch, Jane C.. "Copper Country Survey Final Report and Historic Preservation Plan," pg. 71. (Aug, 2013). *Keweenaw National Historical Park Advisory Commission,* (viewed Mar 15, 2019). Document attached in Section 8.

[6-9] "Shipping Iron Ore on the Great Lakes" (1955). *Arthur Lodge Productions, Inc.,* (viewed Mar, 2019). Available: < www.youtube.com/watch?v=IUayi_TVdCc>.

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[6-14] “Copper Range Railroad Daily Train Log,” January 3, 1963. Copper Range Company Records, MS-080. Box 415. MTA & CCHC. Document attached in Section 8.

[6-15] “Copper Range Railroad Lines,” 1917. Copper Range Company Records, MS-080. MTA & CCHC. Document attached in Section 8.

[6-16] “Milwaukee Railroad Brochure Map,” February 18, 1957. Copper Country Vertical File: Railroads- Milwaukee Road. MTA & CCHC. Document attached in Section 8.

[6-17] Hayhow, Elizabeth (September 29, 1982). “Soo Line Trainmen Bid Adieu”. Daily Mining Gazette. Page 1,3. Microfilm Collection, MTA & CCHC. Document attached in Section 8.

[6-18] “Copper Country Limited,” Date unknown. American-Rails.com, (viewed Mar, 2019). <www.american-rails.com/copper-country.html>

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SECTION 8

A list of additional documentation in support of this nomination:

This section includes various documents and pictures that are relevant to the Portage Lake Bridge's history and this nomination. Section 8 contains all the primary and some secondary sources that are cited in the previous section of the nomination package. These documents are important to have preserved and accompany the rest of the nomination because they help to tell the story of this bridge and provide source material for the writing. They also often provide more in-depth information about some of the aspects of the lift bridge.

Section 8 is broken up into six sub-sections, each containing the documents relevant to include for that section of the nomination. For example, the first subsection, titled "Section 1 Documents", holds all the documents attached for Section 1.

Section 8 also contains photographs intended for publicity and presentation purposes.

Section 1 Attached Documents:

[1-1] City of Hancock (2005). “Portage Lake Bridge History.” *Historical Pictorials,* (viewed Feb 25, 2019). <www.cityofhancock.com/historical-pictorial-view.php?target=88>.

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[1-5] Various dedication articles. (June 24-27, 1960). Daily Mining Gazette. Microfilm Collection, MTA & CCHC.

[1-6] Hayhow, Elizabeth (Sept 29, 1982). “Soo Line Trainmen Bid Adieu.” Daily Mining Gazette. Page 1. Microfilm Collection, MTA & CCHC.

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[1-8] “Automobiles Role Across New Portage Lake Bridge,” (Dec 21, 1959). Daily Mining Gazette, Pg. 1. Microfilm Collection. MTA & CCHC.

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[1-12] Michael, John J. “Construction History: Houghton-Hancock Vertical Lift Bridge.” (1961). *Michigan Department of Transportation.* Provided by John Michels, (Feb, 2019).

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Historical Pictorials

PORTAGE LAKE BRIDGE HISTORY

Original visitors to the Keweenaw found a peninsula, connected to the Upper Peninsula mainland, at both east and west ends, with a series of connected lakes (Portage Lake and Torch Lake), with a waterway and swampy areas interconnecting them, and small creeks connected to Lake Superior. [These were dredged out in the 1870's to form what is now the Keweenaw Waterway].

Thus it was in the early 1800's, but with the discovery of copper in the mid 1840's by Douglass Houghton, everything changed. Mining came, along with people, from everywhere. As mining enterprises sprung up on both sides of the waterway, along with the towns of Hancock and Houghton, traveling across the dividing waterway became a necessity throughout the year.

In the next decade, barges and small boats ferried people, horses, and goods across the waterway, also bringing commerce via the waterway to other communities such as Dollar Bay, Lake Linden & Hubbell, White City, Jacobsville, and many other settlements, and in winter, via roadways marked across the ice, often a hazardous passage. In 1853, one Sam Eales, seeing a need, obtained a ferry boat, the Lizzie Sutton, (later adding the Liviathen (1858), and (1865) the Northern Light ferries). Fees at the time were 10 cents for pedestrians (each way), 40 cents for each horse, and 60 cents for a horse & buggy, but ice crossings were still required in winter. But by the 1870s, it had become apparent that something year round was now needed. On February 16, 1871, the Houghton County Board of Supervisors granted rights to three men - Messrs. Streeter, Gottstein, and Ames, to form a new company and build a private wooden toll bridge across the waterway. This project failed, due to piling problems on the north side, but the need was recognized.

It would be January, 1875, when the Board of Supervisors granted private investors George Shelden, and James Edwards, authority to construct a (primarily) wooden, two lane toll bridge, with a swing center section to pass maritime traffic, and with their investment of $10,000, a new company was formed. By September 30, 1875, the turntable for the swing section arrived on the Cuyahoga, and by January, 1876, the bridge was in use. Bridge tolls: 1 cent each for pedestrians (one way), 10 cents for single horse draws (over and back), and 15 cents for double horse wagons (over and back). (The ferries went out of business by late 1876, after the bridge was opened). But rapidly increasing commerce in the area, along with high maintenance costs, as well as a new need to accommodate railroad traffic, caused the owners to sell the bridge to Houghton County in 1891. Tolls were immediately abolished, the plank roadway was raised and rebuilt, and a railroad level was added underneath (1892).

In 1897, the Mineral Range Railroad Company built a new iron swing type bridge, replacing the old wooden bridge. This bridge also featured a two lane roadway, with a railroad crossing underneath. New reconstructed support cribs were also sunk. But on August 15, 1905, disaster struck, when the steamer Northern Wave (Mutual Transit Lines), en route to the Quincy Smelter to pick up copper ingots, smashed into the center section, destroying much of it. The mishap was apparently caused by a mixup in signals. The bridge would be replaced one year later, again with an iron bridge, and center swing section, and a control house above the roadway, over the center turnstile. This new bridge would have 118 ft. of clearance on the north maritime passage, and 108 ft. on the south side passage. (Newspaper accounts of the period, gave maritime traffic at 6,000 bridge openings per year, and up to 40 daily train crossings per day, both of which began to taper off by 1920). Although almost struck again in 1940 by the Steamer Maritana (Hutchenson Lines), it narrowly avoided the collision by dropping its anchors which caught the submarine telephone cables, stopping it just short of the bridge. (This would happen again 20 years later). Light signaling was added during WWII, to augment the steam whistles already in use. The bridge served the communities until 1960.

In the late 1950s, the Michigan Department of Transportation began studies on how best to replace the aging bridge, with a more modern one, that would accommodate the now much larger ships plying the waterway. It was decided to build what would be become the worlds heaviest aerial lift bridge, which was under construction by 1959, just to the West of the then current bridge. This new bridge, with 4 traffic lanes above, and a railroad crossing below, had it's ribbon cutting on Saturday, June 25, 1960. But it almost didn't happen. During the night before, the Steamer J.F. Schoelkoff (American Steamship Company), traveling westward, signaled for the bridge to open, but the signals were not acted on. Dropping all their anchors, they snagged the submarine telephone cables in an eerie repeat of 20 years previously. Onlookers for the ribbon cutting ceremonies were treated to the spectacle of a large freighter jammed crossways in the waterway, just a quarter mile from the Bridge. Area phone service was disrupted for nearly three days. Telephone service to the bridge, and marine radios were installed shortly. That incident not withstanding, the new Portage Lake Lift Bridge continues to well serve the area, as the possibility of adding yet another new bridge may be explored.

1878 - Taken from the north side of Ruppe Dock and Warehouse in Hancock.

1892 - Taken from just west of Houghton end. Note new railroad line feeding into bridge from the east bank (right side of photo), and white control shack on left (west) side of swing section.

1905 - Demolished swing section wreckage is loaded onto two barges for removal. Shack on left was power feed (via submarine cables) to controls and motors on swing turnstile.

1960 (Aerial) - This aerial photo, taken from east of bridges (looking west), shows the rebuilt 1906 bridge. Note control house built above roadway on center of swing section. Bridge construction area (Hancock side) is on right side of photo immediately above new bridge, and just above that (cluster of buildings on shore) was the Naval Reserve Training Center.

1960 (Lift) - Old bridge can clearly be seen in the photo taken from just west (looking east) on the Hancock side construction materials area.

Text and digital imaging by Roland Bruce Burgan, 2005. Original photos: City of Hancock Archives.

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<u>C O P Y</u>

A. HISTORY OF THE BRIDGE.

Following is a history of the bridge, in chronological order.

<u>1871</u> - A charter was granted to Will Streeter of Hancock, and Peter Gottstein of Houghton, for a bridge to be no less than 14' above the water, 24' in width, with 60' passage for vessels.
A sum of $50,000.00 was to be raised, but the panic of 1873 put a stop to this.

<u>1873</u> - A floating bridge was constructed. It was a double end scow working on a cable, using steam for power, and would accommodate 8 teams on each trip.

<u>1875</u> - By selling stock to citizens in both cities, $47,000.00 was raised, and a wood structure was completed byccontractors Fox and Howard of Chicago. This was the first bridge to span the Portage Canal. The bridge was not used extensively from 1875 - 1876, because a landslide wrecked 200' of the north end. It took several months and $5,000.00 to reconstruct this north end. Because a toll was collected on the bridge, the ferry continued to operate because of friends and rates.

<u>1878</u> - Ferry interests were bought out and the bridge began to pay dividends.

<u>1883</u> - Mineral Range Railroad applied to the Board of Supervisors of Houghton County, to build a bridge about a mile east of the present structure and to connect their railroad on the Keweenaw Peninsula with the M.H.& O. Railroad at Houghton.

In order to prevent traffic from side-tracking Houghton, an upper structure was built for animals, vehicles, and pedestrians, while the lower part was reserved for rail traffic.

A. HISTORY OF THE BRIDGE (continued)

1886 - M.H. & O. Railroad constructed their leg of the south "Y" from L'Anse to the bridge. This bridge was wooden.

1891 - The Bridge Company saw fit to sell their structure to the County, under threat by the County that if they didn't liquidate, the County would erect a "safe" bridge.

1895 - The present steel structure was built as it stands today, except for the draw. This draw was of wood and 180' long. Provisions were made for one street car track.

1898 - Mineral Range Railroad applied to Houghton County for permission to build a new steel swing span and built it. This new swing span was 180' long.

1902 - The Copper Range Railroad Company built the present steel spans of the Copper Range leg of the "Y", which is southwest of the swing span. With the Mineral Range Railroad and the Copper Range Railroad now both coming in to the bridge, a spread span was constructed. The cost of the spread span was worked out between the two railroads.

During this year, the Mineral Range Railroad sold their rights to the draw span to the County, and then the county granted permission to the Copper Range Company, for use of the draw span.

A separate agreement was worked out between the Copper Range Railroad and the Mineral Range Railroad, to use the trucks across the bridge, jointly.

1905 - The swing span was struck by the steamer Northern Wave at 4:30 P.M. on April 15, because the operators of either vessel or bridge, had their signals crossed. Upon impact, the vessel was stopped, but the force of the blow toppled the swing span sideways.

A. HISTORY OF THE BRIDGE (continued)

Ferries were again brought into service and the Board of Supervisors were called to regulate traffic and to establish proper fares.

On April 17, a locomotive tender and a gondola toppled off scows and fell into the water.

A temporary wooden structure was constructed to carry the rail traffic.

According to the terms of the act, however, the county is not relieved of any municipal obligation under its police powers.

1929 - The resurfacing of the bridge was completed, using prefabricated concrete slabs.

1948 - The existing 6x6 timber cross ties were replaced with 6" - 25# wide flange steel beams at about 4' centers.
On these steel beams were welded $4\frac{1}{2}$" "I" beam lck flooring which was filled flush with concrete.

1950 - A bituminous concrete surface was placed on the concrete floor mentioned above.

1952 - The entire structure was cleaned and painted aluminum.

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Inasmuch as this is not a natural waterway, some historical significance to the bridge exists.

A sum of $30,000.00 was raised in 1859 by subscription from Copper Mining Companies and merchants, to dig a channel 10' deep and 80' wide.

A. HISTORY OF THE BRIDGE (continued)

In June, 1860, the first lake steamer was piloted to Hancock through the south entry. Tolls were charged by the Portage Lake and River Improvement Company.

In 1864, the Portage Lake and Lake Superior Ship Canal Company was organized and land grants totalling 400,000 acres were made by Congress to aid the company. Work started in 1868 and after two failures and two reorganizations, the north entry was completed in 1873. Tolls were charged, but theccanal was a financial failure.

The Federal Government bought both south and north canals on August 3, 1891, for a sum of $350,000.00, making the entire waterway toll free.

No doubt there is a copy of this contract in the Lansing Office, however, if the Lansing Office does not have this copy or any previous copies, it may be possible for us to dig up some of this material by going through the minutes of the meetings of the Board of Supervisors of Houghton County, or, digging through the files of the Copper Range Railroad Company.

A. HISTORY OF THE BRIDGE (continued)

The highway traffic was taken care of by the ferries in the summer time and on the ice in the winter time. During periods when the ferries could not operate and the ice was not safe, a series of barges were strung across the channel to carry the highway traffic.

The expense of removing the damaged swing span was shared equally by Houghton County, the Copper Range Railroad, and the Mineral Range Railroad. Ten days were required to clear the southerly passage.

1906 - On January 24, steel work for the new swing span was started. The length of swing span was now increased from 180' to 290'.

On April 8, the new bridge was back in operation and has been in operation to this day.

A sidewalk was added to the east side of the entire bridge at the same time that the new swing span was being built.

1911 - Wood trusses of the Mineral Range Railroad leg of the "Y" were replaced by steel trusses.

1921 - The State Highway Department took over this structure as described in the following article from the files of the Houghton County Road Commission.

"The Houghton County Bridge today became part of the State's Trunk Line Highway System and from now on will be under the control of the State Highway Department. This is in accordance with a law introduced at the last session of the Legislature by Representative William F. Miller, Houghton, and which was passed before the Legislature adjourned this Spring.

A. HISTORY OF THE BRIDGE (continued)

The new law takes the repair, improvement and maintenance of the bridge out of the hands of the County and places the structure under control and supervision of the State Highway Commissioner, who is authorized to assume all obligations or caryy out any contracts now existing with railroads or other corporations or persons with regard to rentals, damages, use, improvement, repair and maintenance.

On Saturday, members of the Douglas-Houghton Chapter of the Michigan and National Society of Registered Professional Engineers, as guests of the Michigan State Highway Department, inspected construction work now being performed on the new Bridge spanning Portage Lake.
The tour was conducted by A. Gilroy, Project Engineer for the Highway Department.

Following the inspection, a meeting and dinner was held at the Union Building. J. F. Oravec of Crystal Falls, District Engineer for the State, addressed the group on methods of construction being carried on by the Al. Johnson Company, Contractors. This was followed by a discussion by the engineering group. Outlining the history of the existing and new Bridge, it was noted that only thru the promotional work and deep personal interests of Carl F. Winkler, Houghton County Highway Engineer, that the building of the new structure has become a reality. In 1934, during the regime of State Highway Commissioner, Murray D. VanWagner, a movement was started to promote plans for a new Bridge, however such actions were delayed due to the depressing times and other difficulities that were encountered.

Following World War II, Carl F. Winkler again resumed the pioneer work by seeking Federal financial assistance. Support of this movement came from Honorable Charles M. Ziegler, then State Highway Commissioner, his chief deputy, George M. Foster and Senators Ferguson, Potter and Congressman John B. Bennett. In January 1953, Carl Winkler's ardent insistent pioneer work began to arouse public support. The Mining Gazette carried stories in the February 5th and 7th issues of that year, while a citizens' group was formed headed by Mr. Winkler. Discouragements and set-backs were many; hearings conducted by the U.S. Corps of Engineers were frequent to determine whether or not the existing Bridge was a hazard to navigation and as to the possibility of securing funds from the Federal Government.

Coming to the aid of the committee was Admiral Lyndon Spencer, President of the Lake Carrier's Association, who definitely showed evidence that the Bridge now in place was a hazard and menace to lake traffic.
In Washington the hearing conducted by Colonel John Allen, former Laurium man and Tech Graduate, and attended by Carl F. Winkler, and representatives of Federal, State and Local Governments, assured the local committee that full cooperation could be expected from the Federal authorities.

On December 18, 1957, after a mass of promotional, survey and plan work was completed, State Highway Commissioner, John C. Mackie, broke ground at the new Bridge site at dedication ceremonies that were attended by representatives of the Al. Johnson Company of Minneapolis, the firm now engaged in construction of the sub-structure and American Bridge Company of Detroit, who were awarded the contract to furnish the steel and construct the super-structure. Howard Hill, former Calumet resident, now Deputy Commissioner-Engineering, was also present.

Appreciating the great amount of time and personal attributions carried on by Mr. Winkler, the Douglass-Houghton Chapter went on record recommending that the new Bridge spanning Portage Lake be named after Carl F. Winkler for the untiring work and engineering advice he rendered.

Members of the Engineers organization to serve on this committee are as follows:

Lyle Tonne	Hancock
W. L. Kaiser	Calumet
George D. Tramp	Marquette
Herbert Haun	Houghton
W. F. H. Jansen	Sagola

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World's Heaviest Lift Span To Be Dedicated Tomorrow

WILBER M. BRUCKER

Brucker, Secretary of Army, Heads List of Dignitaries

Michigan officially opens another "biggest bridge of its kind" tomorrow when the new Portage Lake Lift bridge will be dedicated.

Boasting the world's heaviest lift span weighing 4.5 million pounds, the bridge carries automobile, rail, and pedestrian traffic across the busy Keweenaw Waterway between Houghton and Hancock. It's the only link between the mainland and the 40-mile-long Keweenaw Peninsula. The $11 million structure was costlier, on a foot-by-foot basis, than the mighty Straits of Mackinac Bridge.

Secretary of the Army Wilber M. Brucker is the speaker at the dedication ceremonies, and Michigan State Highway Commissioner, John C. Mackie will address guests at a banquet tonight.

Constructed by U.S. Steel's American Bridge Division, the bridge was completed in less than two years. Into it went more than 7,000 tons of steel and 35,000 tons of concrete.

The unique 1310-foot lift bridge has two levels of roadway—the lower level to carry train traffic, and the upper to carry motor vehicle and pedestrian traffic. It operates in three positions. In the first or normal position the lift span is lowered all the way so that motor, rail, and pedestrian traffic can use the bridge simultaneously. The lower deck carries the rail traffic. Because there are only seven feet of clearance between span and water in this position, a second position provides a 32-foot water clearance for larger pleasure craft while providing for motor and pedestrian traffic. In this position the lower deck of the lift span is raised to the upper level of the approaches. However, the lift must be lowered before train traffic can cross.

The third position will see the huge 250-foot-long center span lifted to a height of 100 feet to allow for the passage of large ships.

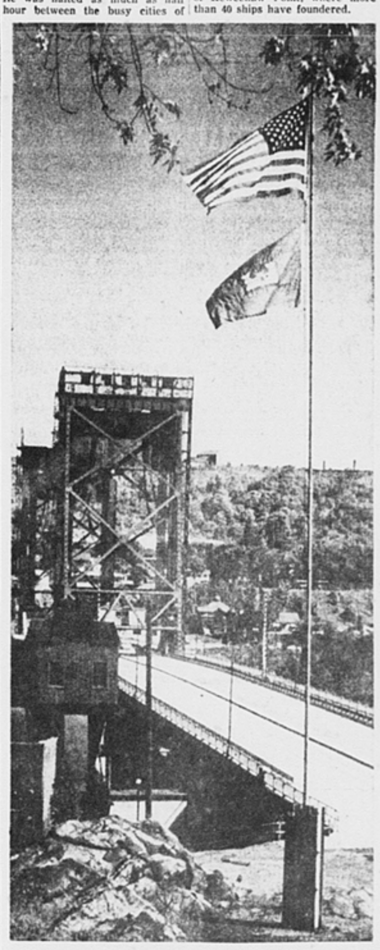
The ancient two-lane swing span which was replaced by the new lift bridge has been a source of inconvenience for many years, both to water and land traffic. Constructed in 1906 after a lake freighter had rammed and toppled its more ancient predecessor, it had a horizontal clearance of only 118 feet and water clearance of about six feet. Large modern lake carriers were barely able to maneuver through the draw while motor traffic was halted as much as half hour between the busy cities of Houghton and Hancock.

To make matters worse, the old structure had to swing completely open to allow for passage of practically every small pleasure craft. When closed, its two narrow lanes kept traffic at a snail's pace. The new lift, boasting towers 200 feet high, has four spacious lanes and convenient approaches.

"The new bridge cuts 10 minutes off the time it used to take to cover the mile between Houghton and Hancock's business districts," say pleased local residents.

Each of the 200-foot towers rest on concrete caissons sunk more than 60 ft. to reach bedrock or hardpan beneath the water of Portage Lake. A rare feat of engineering skill and ingenuity was involved in floating the vertical lift span from where it was constructed on barges about a half mile from the bridge to its position. Accomplished in August, 1959, moving the span and attaching it to the husky cables that lifted it into place required less than a 12-hour break in lake carrier traffic.

Lake carriers on Lake Superior use the Keweenaw Waterway to avoid the treacherous waters north of Keweenaw Point, where more than 40 ships have foundered.



THE CORPS OF ENGINEERS flag flies under the American Stars and Stripes from this pole in Houghton, Montezuma Park. The flag is attesting the 185th anniversary of the Corps which is an important branch of the government's military service in the Lake Superior region. Not only does it sponsor the Michigan Tech ROTC engineers but it is the incentive behind the SIPRE installation at Memorial Airport. It was also the promotional agency in the background of the new Portage Lake Lift Bridge. —Hinzman Photo.

Dedication Program

Saturday, June 25

Marshal of the Day — Carl F. Winkler

The Marine Parade, commencing at noon, will proceed westward through the bridge. It will be completed by 1 p.m. Ed Lieblein is in charge. The bridge will be cleared at 11:10.

The Official Party will be at the bridge at 2:30 p.m. The ceremonies on the bridge are to begin at 3 p.m. Main speaker is Secretary of the Army Wilber M. Brucker. Other speakers are John C. Mackie, General Itschner and Congressman John B. Bennett. Master of ceremonies will be Leo H. Roy.

For the ceremonies, groups forming on the south end of the bridge will line up at the Copper Range Depot. Groups lining up on the north end of the bridge will assemble at the Portage Equipment Company. The Houghton-Hancock American Legion will furnish a stationary color guard at the dedication.

There will be a fly-over of jets between 2:40 and 2:45 p.m. There will also be a fly-over of jets between 4 and 4:10 p.m.

Military units and other personnel taking part are as follows: 107th Combat Battalion National Guard of Ishpeming, (north side) 30th Engineers of Calumet (north side). Fifth Army personnel (band and color guard) (north side). Calumet High School Band (north side). Air Force of Kinchloe and K. I. Sawyer (north side). Hancock Naval Reserve (South side). Calumet Radar color guard (south side). L'Anse Drum and Bugle Corps (south side). 107th color guard (north side).

A Smorgasbord for guests and official party will be held at the Scott Hotel at 6:30 p.m. preceded by a social hour at 5:30 p.m.

A double-header softball game will be played at Hubbell Field between South Range Bosch and the Iron Mountain All-Stars. Game times are 7:30 p.m. and 9:30 p.m.

Sunday, June 26

Boat races begin at 2:00 p.m. west of the bridge. Admission to the reviewing stand near the Naval Reserve, Hancock, is by dedication button purchase. In charge will be Fred Lonsdorf and Ed Lieblein. The Jeffers band will entertain.

Bulletin

CARACAS, Venezuela (AP) — President Romulo Betancourt was injured slightly by a bomb explosion today in an apparent assassination plot during an Army Day parade. The bomb killed two presidential military aides.

Betancourt suffered a burned hand. He was taken to University City Clinic.

The bomb killed the head of the President's military household, Col. Ramon Armas Alfonzo. Defense Minister Jose Lopez Henriquez and his wife were reported seriously injured.

WASHINGTON (AP)—Secretary of State Christian A. Herter accused Soviet Premier Nikita Khrushchev today of interfering in this country's internal affairs by his talk about President Eisenhower's successor in the White House.

Khrushchev has several times attacked the Republican front-runner, Vice President Richard M. Nixon, and has expressed hope he would find it possible to negotiate with the next administration.

WEATHER

MOSTLY CLOUDY

West Upper Michigan, June 24, mostly cloudy and cooler today with some light rain. Clearing and cooler tonight. Mostly fair and pleasant Saturday. Northerly winds increasing to 20-30 m. p. h. this afternoon and diminishing tonight. High today 56-62. Low tonight 42-48. High Saturday 60-66.

Outlook for Sunday increasing cloudiness and warmer with a few showers likely over west Upper Michigan by Sunday night.

Copper Country - Highest temperature in 24 hours 56, lowest 46, at noon today 62.

The sun sets today at 8:54 p.m. and rises Saturday at 4:58 a.m.

	Highest Yesterday	Lowest Last Night
Albuquerque, clear	94	65
Anchorage, cloudy	64	52
Bismarck, clear	73	49
Boston, rain	84	65
Chicago, cloudy	81	60
Cleveland, cloudy	79	68
Denver, clear	70	51
Detroit, clear	87	64
Fort Worth, cloudy	98	77
Helena, clear	77	48
Honolulu, clear	82	74
Kansas City, cloudy	89	67
Los Angeles, cloudy	84	58
Louisville, cloudy	81	64
Miami, clear	87	82
Milwaukee, cloudy	76	57
Mpls., St. Paul, clear	71	51
New York, cloudy	79	69
Oklahoma City, rain	95	67
Philadelphia, cloudy	84	69
Phoenix, clear	108	77
Pittsburgh, cloudy	77	64
Portland, Ore., cloudy	84	58
Richmond, cloudy	90	68
St. Louis, cloudy	87	67
San Diego, cloudy	74	60
Seattle, cloudy	82	56
Tampa, clear	92	75
Washington, cloudy	[illegible]	[illegible]

Sugary Threat

Castro Says He'll Take U.S. Firms If Quota Is Cut

HAVANA (AP) — Fidel Castro has threatened to confiscate all U.S. business interests in Cuba if the United States cuts the quota of Cuban sugar on which it pays the island nation a bonus of 150 million dollars a year.

The Cuban Prime Minister termed a proposal before Congress to give the U.S. President standby authority to cut the quota "economic aggression" and a "knife thrust in the chest." His 100-minute speech Thursday night was broadcast over a nationwide radio hookup.

"We will not remain impassive," he said. "We will know how to meet economic aggression."

Speaking of the huge U.S. business interests in Cuba, Castro said: "In the same manner that they are there now, it may be in the future that they are not there."

American investments in Cuba before Castro came to power totaled about a billion dollars, but the revolutionary regime has taken over about a third of this, chiefly sugar and cattle lands. Properties still in American hands include the 300-million-dollar Cuban Electric Co., the 115-million-dollar Cuban Telephone Co., banks, sugar mills, mines, oil refineries and various commercial enterprises.

Most businesses still in American hands have been curtailed by Castro's regime. American imports of half a billion dollars a year have been cut in half. The electric company's rates have been cut a third.

Japan Leftists Trying To Arouse Sentiment: Making Coed Martyr

TOKYO (AP) — Japanese leftwingers today began a new series of demonstrations in an effort to whip up enough public sentiment to force nullification of the new U. S.-Japan security pact.

The first demonstration was a "people's funeral" for Michiko Kamba, the 22-year-old Tokyo University coed killed in the student assault on the Parliament building June 15. It was the third leftist memorial service held over the girl's ashes.

Sponsors of today's funeral had predicted 20,000 would turn out, but only about 3,000 showed up.

Ike, Nixon Talk On Monday's Speech to Nation

HONOLULU (AP) — President Eisenhower's conference with Vice President Richard M. Nixon by telephone may well reflect Republican concern over Democratic attacks on administration foreign policy this election year.

Eisenhower, vacationing in Hawaii after his controversial Far Eastern tour, talked Thursday to Nixon in Washington.

Eisenhower and Nixon discussed the tour, including the furor-stirring cancellation of the three-day visit the President had expected to make to Japan. Eisenhower has blamed blowup of the visit on Communist-inspired rioting in Tokyo.

The President also talked over with Nixon the television-radio report which Eisenhower will make to the American people Monday night on his Far Eastern journey. The President will speak from Washington, and his 30-minute address, starting at 6:30 p.m. Eastern Standard Time, will be carried live by most of the networks. Others are scheduling delayed broadcasts later in the evening.

ARSON SUSPECTED

ESCANABA (AP)—Police were investigating the possibility of arson in the burning Thursday of the home of Mr. and Mrs. William A. Lyon Jr. of Brampton.

Israel Criticized By UN; Nations Are Satisfied

UNITED NATIONS, N. Y. (AP) —The U. N. Security Council has endorsed Argentina's contention that the capture of Adolf Eichmann by Israeli agents violated Argentine sovereignty. But Israel still has Eichmann and obviously is going to keep him for trial.

The council late Thursday adopted an Argentine resolution criticizing the Nazi official's secret transfer from Buenos Aires to Israel and calling on Israel to "make appropriate reparation."

The mild, vague resolution did not ask for Eichmann's return to Argentina, as Argentina had demanded earlier. And Israeli Premier David Ben-Gurion already had said flatly Eichmann would stay in Israel to stand trial on charges that, as chief of the Gestapo's Jewish section, he supervised the extermination of six million European Jews in World War II.

In Buenos Aires, the foreign under secretary, Miguel Angel Centeno, said his government might consider an apology from Israel sufficient reparation.

Demos Preparing Push for Medical Care Program Bill

WASHINGTON (AP) — Senate Democrats today prepared for a big push in the closing days of Congress to try to write a medical care program for the aged into the Social Security system.

Several Senate sources said the votes were available, though perhaps by a narrow margin, to put this type of a provision into the Social Security bill which passed the House 380-23 Thursday.

Two Democratic presidential aspirants, Sens. John F. Kennedy of Massachusetts and Stuart Symington of Missouri, have said they strongly favor adding medical care benefits for retired persons to the Social Security system.

Another, Majority Leader Lyndon B. Johnson of Texas has indicated he favors this approach.

The Eisenhower administration sharply opposes such a plan, favoring instead a program of federal-state grants to finance major medical benefits for needy older persons.

Near Disaster in Portage

New Bridge Threatened; Ship Anchor Hooks 'Phone Cables

Houghton and Hancock residents were awakened early this morning by the frantic whistle of the steamer J. F. Schoellkopf, Jr. as it coursed the Portage Waterway in a westerly direction toward the new lift span at 2:30.

Headed on a collision course with the new bridge, which is due for dedication ribbon cutting ceremonies tomorrow afternoon, the ship's skipper, Capt. Albert Wilhelmy, ordered the port anchor dropped and engines reversed after repeated whistles failed to bring about any movement of the span.

The anchor, dropped near the Cohodas-Paoli dock, became entangled in two of the six Michigan Bell Telephone submarine cables which stretch across Portage Lake from the bottom of Isle Royale St.

The repeated whistle blasts of the Schoellkopf alerted local law enforcement officers, who sped to the bridge. They and other witnesses reported that the bridge made no reply to the ship's signals for entrance underneath the span.

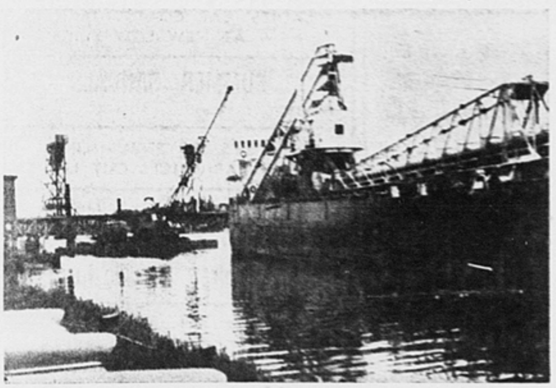
One of the officers who entered the bridge engine house reported that Operator Eugene P. Sullivan stated that he did not hear the signals.

The Schoellkopf, a self-unloader of the American Steamship Co., finally stopped parallel to the shore across from the South Shore depot.

With the ship aground in the shallow water, officials decided to cut the two cables from around the anchor, then tow it into the channel with a tug. At 10:30 the ship was able to continue on to its destination, the new Arens Coal dock in west Hancock.

The near-disasterous accident put over 1,000 phone lines out of order in Hancock. Also, toll lines

(Continued with pictures on P. 2)



THE STEAMER J. F. SCHOELLKOPF JR. came near to giving the new Portage Lake Lift Bridge a bruising christening early this morning, some 34 hours before it is to be formally dedicated at ribbon cutting ceremonies tomorrow afternoon. The vessel was forced to drop anchor alongside the Cohodas-Paoli dock when repeated signals failed to bring any response from the new bridge. (Loranger of Gazette)

Soviets May Stall Disarmament Talks 'Til After Election

WASHINGTON (AP)—U.S. officials believe the Soviet Union may soon try to suspend disarmament negotiations at Geneva on the grounds that progress toward agreement is impossible until after a change of administrations in Washington.

Authorities said that the Soviet government probably is reluctant to make a definite break-off move for a time, but developments indicate they are maneuvering in that direction.

In the 10-nation disarmament conference, Communist spokesmen at recent sessions have accused the United States and other Western powers of stalling and of failing to display any interest in real progress toward agreement.

For their part they have insisted that the West accept Soviet proposals as a basis for negotiation, and so far have rejected all efforts to draw them into detailed discussions even on their own plan.

First Congo Govt. Is Elected in Turbulent Midnight Session

LEOPOLDVILLE, Belgian Congo (AP)—Parliamentary approval of the Congo's first independent government—headed by Patrice Lumumba — today cleared the way for vast territory's freedom from Belgian rule. The transfer of sovereignty takes place next Thursday.

Lumumba at the last moment won the backing of his chief rival, Joseph Kasavubu, who had contended with him for the premiership. It was rumored that Kasavubu expected to be named chief of state.

In a cheering, tumultous post-midnight session, of the lower house of the Congo Parliament approved Lumumba and his multiparty cabinet with 74 affirmative votes.

ONT. POSTMASTER PICKED

WASHINGTON (AP)—The Senate has confirmed two Michigan postmaster nominations by President Eisenhower. They are Charles H. Hill, Ontonagon, and Irene J. Awrey, Oxford.

ACHIEVEMENT Brings Progress

Double Deck Lift Span Challenged Builders

Portage Lake Bridge Lift Heaviest in the World

Contractors on an $11-million lift-bridge in the upper peninsula of Michigan can say "well done" to a tough job Several construction operations required forthright planning and bold execution. Notable for their complexity were three of the foundation piers and erection of the towers and lift span.

The 1,310-ft ridge spans Portage Canal between Houghton and Hancock. The 263-ft double-deck lift span is flanked on each side by a 120-ft tower span, a 115-ft simple deck span and three continuous deck spans varying in length from 85 to 115 ft.

Sinking the concrete caissons for the tower piers No. 5 and 6, and pier 4 was the toughest part of the foundation work. Here's how they did it:

Sand hogs sank the 90x30x80 ft. high tower pier caissons through 30 ft of coarse sand and 6 ft of fine sand and 40 ft of compact gravel.

Construction crews built a work-bridge on sand-filled cellular cofferdams out from the south shore to Piers 4 and 5, which are in deep water. Workmen then constructed sand islands at the three sites, through which the caissons were sunk.

For each caisson, concrete crews first place a 10-ft high cutting edge of concrete; then a 4-ft layer and a 10 ft layer totaling 24 ft. Each caisson had five 10-ft-dia dredging wells.

Dredging crews sank each caisson 21 ft initially, leaving 3ft above the sand island. Then they continued sinking them in 10-ft or 20-ft-increments as concrete was added to provide weight.

When the north caisson (Pier 6) got to within 3 ft of final elevation, it stuck. So much skin friction had been built up that it wouldn't budge even when dewatered to reduce buoyancy.

Sand hogs were called in and the caisson put under compressed air It was under air for 13½ days. This time was cut to 7 hr for the south tower caisson (Pier 5).

Air domes were bolted to angles present in the concrete faces of the dredging wells. Three shafts handled muck buckets. For the north caisson, one well with two tubes handled personnel. The fifth well was sealed. For the other two caissons, three wells handled the muck and two handled personnel.

Sand hogs worked under a maximum pressure of 38 psi, but most of the time under 35 psi. A work shift included 1.5 hr under air, 4.5 hr rest and 1.5 under air. This schedule was changed to 2-4-2 hr under 28 to 33 psi, and 3-3-3 hr under 24 to 28 psi.

A touch-and-go problem developed when bedrock was encountered near the bottom of Pier 4. Sand hogs and miners had to drill, blast and remove 130 c. yd from that caisson. Small charges of 60 per cent gelatine powder, not more than 20 lb per round, were fired in 2-ft-deep holes spaced about 1 ft c-c. This caisson was under air for 14 days.

The contractor averaged 10 ft of forming, concreting and sinking a caisson per week. Sinking was on two 10-hour shifts, with other work on a single 10-hour shift per day. Maximum substructure crew totaled 170, including 80 sand hogs.

Two compressors furnished air. One delivered 1,100 cfm at 50 psi The other, 600 cfm at 150 psi. Four cranes drove sheetpiling, dredged caissons for sinking, and drove steel bearing piles for the north approach piers.

After a caisson had been founded at design elevation, engineers went down and inspected it. Concrete crews then placed an 8-ft seal of tremie concrete in the bottom of the caisson and capped it with a 6-ft or 8-ft thick reinforced concrete cap. Each of the two big caissons contained 4,600 cu. yds. of transit mix concrete.

It took a tall tower derrick plus a lot of know how to erect the 200 ft lift towers Erection crews performed the job without a hitch, under the supervision of G. W. (Tex) Twining, construction superintendent for the American Bridge Division of U.S. Steel Corp., which held a $6-million contract for towers and superstructure.

Twining's crew erected both lift towers with one 150-ton derrick. It had a 60-ft tower, 130-ft boom and 25-ft jib. It was rigged with 3,050 ft of wire rope for the topping lift; 1,700 ft of rope for the main load line; and 1,160 ft of rope for the outrigger—all operated by a three-drum hoist.

Steel crews first erected Span 8, adjoining the north tower span, by use of a crawler crane operating on the canal bank. Riggers and iron workers then assembled the tower derrick on the south end of Span 8. From this position, the derrick erected the deck trusses and floor system of the north tower span (Span7).

Workmen then skidded the derrick to the middle of Span 7, for erecting the tower. They followed the same general procedure in erecting the other tower, except that the water was deep enough to permit floating the 350-ton south tower span into place. This was a more economical procedure than was used for the north tower span since no falsework was needed.

As each tower was completed, erection crews assembled a 60-ft boom guy derrick on top. Each derrick was rigged with a 21-part boom falls and a nine-part load falls of 1-in. wire rope leading to a three drum hoist on the roadway. Later, these derricks erected the 55-ton sheaves and other machinery that operate the lift span, and helped transfer the lift span from barges to towers.

The building of the 1,310-foot Portage Lake lift bridge will have consumed three years work by December, 1960 Though the thoroughfare was opened for vehicle traffic within two years after its start, train traffic did not begin until two months later. Currently, the work on the structure and allied facilities is not expected to be completed until fall. The approaches will require additional time.

The actual ground breaking ceremony took place Dec. 18, 1957, at 3 p.m. On hand to wield the shovel of earth which marked the beginning of the work program was State Highway Commissioner John Mackie and Managing Director Howard Hill.

Representatives of the Al Johnson Construction Co., builders of the sub-structures, were present as were Houghton and Hancock municipal delegates

The actual work began as soon as the spade turned the first gravel and stamp sand.

Caisson building was soon underway with the initial one being erected on the north side. Then came the caisson near the center of the lake and, finally, the caisson supporting the regular bridge and the beginning of the two railway exits was begun.

Persons commuting between Houghton and Hancock still recall the sound of the peep whistles as they blew indicating the filling of the buckets in the compressed air of the caissons.

The placing of the foundations for the Hancock approach was early in order. Virtually all of these were completed before a start was made in Houghton.

Began Work in 1940

Carl Winkler Saw New Bridge Need

Dating back to the year 1940, C. F. Winkler, highway engineer of Houghton County, after observing the increase in traffic and the inadequateness of the bridge spanning Portage Lake between Houghton and Hancock, started preliminary plans in gathering such information as was available to proper-

CARL F. WINKLER

ly present to the War Department and the State Highway Officials the necessity of building a new bridge. Dealing with any Governmental Agency, and especially the U.S. Army, becomes a problem and delays are always long and frequent.

However, in January, 1953, the untireless efforts and preliminary work of Carl Winkler began to show some results.

Contacts with U.S. Senators Ferguson and Potter, Congressman Knox and especially our local Congressman, John B. Bennett, Admiral Lyndon Spencer, President, Lake Carriers Assn., State Senator Leo H. Roy and Michigan State Highway Commissioner, Charles M. Ziegler resulted in recognition from the War Department.

In April, 1953, Colonel George Kumpe, U.S. Engineers, visited the District and conferred with Winkler, State Highway and railroad officials, regarding the proposed project of constructing a new bridge.

This was followed by visits, by Mr. Winkler, to Chicago with officials of the Lake Carriers Assn. and in October 1953, a public hearing of the necessity of the proposed project was conducted in Houghton by the U.S. Corps of Engineers. After this hearing, the project again became stagnant and not until February, 1955, when Mr Winkler, accompanied by State Senator Leo H Roy, met with Congressman Bennett and officers from the Corps of U.S. Army Engineers in Washington, among them Colonel John Allen, formerly of Calumet, did encouraging results again become apparent which was followed by an order fromthe Secretary of the Army authorizing the approval of the budget to appropriate Federal Funds toward the cost of construction. In January, 1956, the sum of $500,000 was set-up in the Army Budget

INTERESTING FACTS

HOUGHTON - HANCOCK BRIDGE

Carrying US-41 & M-26 Over Portage Canal

ITEM	QUANTITY
Type	Double Deck Vertical Lift
Total Length	1310 Feet
Lift Span Length	260 Feet
Clear Channel Width	250 Feet
Lift Clearance — Lowered	7 Feet
Intermediate	35 Feet
Fully Raised	100 Feet
Lift Span Weight	4,400,000 Pounds
Roadway Width	4-13 foot lanes
Roadway Vertical Height	14 Feet
Tower Height	188 feet above piers
Caisson Depths — Pier 4	67 Feet
Pier 5	78 Feet
Pier 6	71 Feet
Cement, Total Used	131,212 Sacks
Cement, All Units	23,312 cubic yards
Total Number of Rivets	210,000 - Field Rivets
Total Cost	Approximately $11,000,000.
Prime Contractors	Al Johnson Construction Co. — Substructure; American Bridge Division — Superstructure.

Hot, Cold Weather Bothered Old Bridge

The old Portage Lake Bridge was bothered by both hot and cold weather.

During extremely hot weather, the approaches would expand when the wing span was opened and it was necessary to have the fire department water down the bridge to shrink it so it could be closed.

And during cold weather, ice often got into the gears and turning mechanism. It had to be hacked out before the bridge could be opened.

New Portage Bridge Means Fewer Runs For Fire Department

Construction of the new Portage Lake Bridge will mean fewer runs for the Houghton Fire Department.

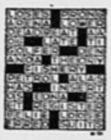
The Fire Department was called on a number of times over the years to put water on the span during extremely hot weather to shrink the Houghton approach so the swing span could be closed.

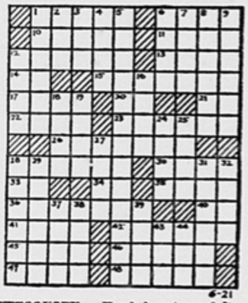
The heat would cause the bridge to expand when the swing span was opened to allow a ship to pass through.

DAILY CROSSWORD

ACROSS
1. Fish
6. Thick slice of bread
10. French river
11. Contend with
12. Learned teacher (India)
13. Harp (It.)
14. Actinium (abbr.)
15. Couches
17. Straw beehive
20. Sun god
21. Close to
22. English river
23. Tankers
28. Hangs loosely
28. Waistcoat
30. Young oyster
32. Indefinite article
34. Ahead
35. A novice
36. Scoffed
40. At home
41. More or less
42. Units of weight
45. Dry
46. Customary
47. Permits
48. Dispatches

DOWN
1. Bravo
2. An age
3. Free
4. Malayan dagger (var.)
5. Dissimilar
6. Begone!
7. Learning
8. Come into view
9. Lions, tigers, etc.
12. Just preceding
16. Appendage
18. Concludes
19. Fuel, in Ireland
24. For fear that
25. Descry
27. Inert gas
26. A feudal tenant
29. Once more!
31. Arabian gazelles
33. Weights
37. Leave out
38. Colors
30. Italian actress
43. Sister (eccl.)
44. Bounder


Yesterday's Answer


6-21

DAILY CRYPTOQUOTE — Here's how to work it:

A X Y D L B A A X R
is L O N G F E L L O W

One letter simply stands for another. In this sample A is used for the three L's, X for the two O's, etc. Single letters, apostrophes, the length and formation of the words are all hints. Each day the code letters are different.

A Cryptogram Quotation

B F U L F N B N W V D G Y K L J K L J F A X' V M J D N K V — K F B M G A.

Yesterday's Cryptoquote: GOD MADE HIM, AND THEREFORE LET HIM PASS FOR A MAN.—SHAKESPEARE.

(© 1960, King Features Syndicate, Inc.)

Voters to Say If Quincy Schools Joins Hancock's

A special school election will be held Monday, July 27, in Quincy Township to ask the electors to vote on the question of the annexation of the Quincy Township School District to the Public Schools, City of Hancock, contingent upon the raising of seven additional mills to match the millage voted in Hancock for schools operation.

The Quincy Township School has been closed for two years, and according to law, it must either reopen or annex to a neighboring district by the Fall of 1961. At the present time, the Quincy Board of Education is required by law to state whether it will reopen or annex to another district in another year. If, by the Fall of 1961, the district has neither annexed nor reopened its school, the law states that the Houghton County Board of Education must step in and determine to which school district Quincy must annex. Then the County Board of Education must proceed to effect the annexation.

The Quincy Township Board of Education has decided to annex to Hancock, and would like to do so now. The Department of Public Instruction in Lansing has given its approval, as has the Hancock Board of Education, providing Quincy raised the same millage as paid by the other sections of the Hancock district, that is, seven additional mills.

The number of children in the Quincy Township School District is too small to receive State Aid sufficient to keep the Quincy School open, and the evaluation of Quincy Township is not high enough to produce tax money to reopen the school. The school, itself, is in poor condition. It would take a prohibitive amount of money to reopen the school. The children of Quincy Township have been attending the schools of Hancock for the last two years. This election is an attempt to assure the continuation of this schooling.

Chris Woods Leaves For Engineering Job In Russellville, Ark.

Chris Woods, for three years the Al Johnson Co. project engineer on the new Portage Lake bridge will not be present for the dedication ceremonies this weekend. He left early in the week for Russellville, Ark.

Dispatched to the southern town to be project engineer on the new dam being erected there, Chris had visited the site earlier. He returned home to accompany Mrs. Woods and their three daughters, Jean, Kay and Ann, to their new residence.

The Woods Family occupied the Waarala home in Boston during their almost three year stay. They arrived when the Johnson Co. began looking over the Portage bridge site in November, 1957.

The girls enjoyed skating parties and liked their Copper Country associates. The north country was interesting to them as their dad's work has taken them to a diversity of the nation's areas, most of which have been in the south.

As project engineer, Chris has maintained that even though the Portage job was not as large as the Mackinac Straits, it had just about as many problems.

Bridge authorities have indicated that Chris had devoted more than three years of supervisory work to the bridge, longer than any other single engineer.

At his new location and responsiblity, he will be charged with harnessing a portion of the Arkansas River.

Bridge Dedication

Distinguished Visitors

(Partial list)

The Hon. Wilber M. Brucker
Secretary of the Army
The Hon. Dewey Short
Asst. Secretary of the Army
Lt. Gen. E. C. Itschner
Chief of Engineers
Major Gen. W. F. Cassidy
Corps of Engineers
Brig. Gen. John Leary
Chief of Staff, 5th Army
Col. John R. Guthrie
Asst. Executive to Secretary
Col. Harry O. Fischer
Division Engineer
Col. Deslodge Brown
District Engineer
Col. John U. Allen
U. S. Engineers
Lt. Col. H. Glen Wood
Military Asst. to Secretary
Lt. Col. A. J. Hoebecke
Aide to Asst. Sec. Short
Major John Wadsworth
Military assistant to Secretary
Capt. John R. Davies
Aide to Secretary
Captain Higgis
Spec. Packala
Cong. John B. Bennett
Philip McCallum
Small Business Administrator
Frank Ableman
Collector of Customs, Detroit
Ralph S. Knowlton
Administrative Officer, Duluth
Alfred Rosenthal
Chief Technical Liaison
Wesley Dibbern
Chief Technical Liaison
Frank Millard
Archie Frazier
Fred England
Douglass Briggs
Dr. Hudnut

Dedication Committees

General Chairman .... Milton I. Joffee
President of the Houghton-Hancock Chamber of Commerce
Marshall of the Day .... Carl F. Winkler
Co-Chairmen .... Rance Mason and Bill Ryan
Bridge Ceremonies .... Ken Dorman and William L. Kaiser
Transportation .... Capt. Wilbur K. Kreigh
Finance Chairmen .... Leo M. Roy and Jim Rich
Doll Buggy Parade .... Marty O'Connor and John Heikkinen
Banquet Chairman .... Walter F. Hansen
Smorgasbord .... John Heikkinen
Regatta and Boat Races .... Edward Lieblein
Publicity Chairman .... Ted Pearce

Kenyon college in Gambier, O., is believed to be the earliest example of what is called collegiate Gothic architecture in the United States.

ENTANGLED in two Michigan Bell Co. submarine cables is the Schoellkopf's anchors which were dropped to retard the ship's forward progress. The severed cables cut off service to over a thousand Hancock phones along with tolls to Calumet-Laurium-Keweenaw and Lake Linden. The larger cable contains 568 wire pairs and the other 507. The cables were cut from the anchor by Al Johnson Co. men using an acetylene torch. (Loranger of Gazette)

SMILES TRICKLED across the strained faces of the Schoellkopf crew this morning as the dawn illuminated the Michigan Bell Co. sign, "Submarine Cable Crossing—Do Not Drop Anchor." Attached to the ship's port anchor are two of the six cables.
(Loranger of Gazette)

ELEVEN BOYS AND GIRLS were confirmed June 12 in the South Range Apostolic Lutheran Church by the Rev. Andrew Mickelsen. In the photo are, bottom row, left to right, Helen Eskola, Dorothy Juntunen, the Rev. Andrew Mickelsen, Suzanne Mickalich and Diane Mickalich. In the second row are left to right, David Pellosma, Glen Murray, Brenda Kilpela, Shirley Mattala, Margaret Metsa, Gary Virenius and John Pulkinen. (DeMotts Photo)

New Bridge

(Continued from Page 1)

between Houghton and Calumet and Lake Linden were out of commission.

More lines were out earlier because the remaining overworked currents were hampered by repeatedly blown fuses.

William Ryan, Houghton manager of Michigan Bell, said this morning that the essential services, such as to the airport and to doctors offices, would be restored before the end of the day by using spare wires in the other four cables. It may take two or three days before the rest of the services are back in working order.

A Michigan State Highway Dept. spokesman issued a statement this morning that the lift span "is in good mechanical working order, therefore there must be some human failure."

The mechanical operation of the bridge is performed by the Copper Range Railroad Co., under contract to the Michigan Highway Dept.

Charles Sincock, superintendent of operations of the railroad and supervisor of the structure's railway deck also indicated that the bridge was functioning properly.

This morning, persons recalling the many items concerning the long history of the Portage Lake drawbridge had little difficulty recalling a similar eventful day in 1905.

On April 15, the swing span of the bridge was toppled by the Steamer Northern Wave of the Mutual Transit Co. It was pushed into the channel by the vessel which was moving to the Quincy Smelter for a load of copper. A whole year elapsed before the span was replaced.

About 20 years ago the Buckeye Steamer Maritana dropped anchor in a heavy wind near the cable crossing. Resulting damage to the cable at that time totaled $10,000. The ship, a member of the Hutchinson-operated lines, was a 3,000-ton vessel.

RESOURCES

Cash	$1,233,241.64	
U. S. Bonds	2,426,567.50	$3,659,809.14
Other Bonds and Securities		908,420.46
Loans and Discounts		4,195,371.50
Banking House & Fixtures		26,117.23
Other Assets		359,431.12
		$9,149,149.45

LIABILITIES

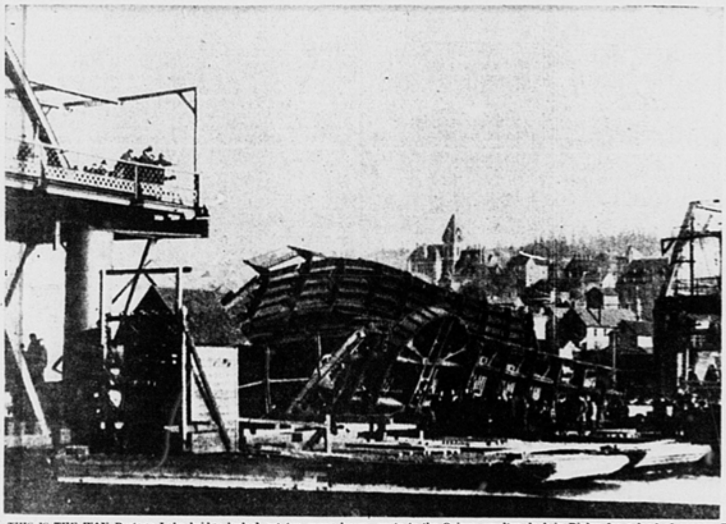
Deposits		
Demand	$4,254,433.49	
Time	3,846,595.37	$8,101,028.86
Capital Stock—Common		200,000.00
Surplus		300,000.00
Undivided Profits		225,248.52
Reserves		238,932.49
Unearned Interest		83,939.58
		$9,149,149.45

OFFICERS

Joseph A. Fisher .... Board Chairman
John W. Rice .... President
Gunnar D. Miller .... Exec. Vice President
Harry R. Cohodas .... Vice President
Kenneth D. Campbell .... Cashier
Bernard Orella .... Trust Officer
Lyle A. Ojala .... Assistant Cashier
Daniel A. Lazzari .... Assistant Cashier
Mary B. Kearney .... Asst. Trust Officer

BOARD OF DIRECTORS

Harry R. Cohodas — Joseph A. Fisher
C. Louis Fleming — H. Kenneth Homar
Leonard W. Johnson — Harold C. Lent
Gunnar D. Miller — John W. Rice



THIS IS THE WAY Portage Lake bridge looked not too many hours after it was toppled into the lake by the Steamer Northern Wave en route to the Quincy smelter dock in Ripley for a load of copper. The bump was given the draw by the steamer on April 15, 1905.

History of the Portage Lake Bridges From 1871 to 1952

A history of the bridge follows in chronological order:

1871—A charter was granted to Will Streeter of Hancock, and Peter Gottstein of Houghton, for a bridge to be no less than 14' above the water, 24' in width, with 60' passages for vessels. A sum of $50,000.00 was to be raised, but the panic of 1873 put a stop to this.

1873—A floating bridge was constructed. It was a double end scow working on a cable, using steam for power, and would accommodate 8 teams on each trip.

1875—By selling stock to citizens in both cities, $47,000.00 was raised, and a wood structure was completed by contractors Fox and Howard of Chicago. This was the first bridge to span the Portage Canal. The bridge was not used extensively from 1875-1876, because a landslide wrecked 200' of the north end. It took several months and $5,000.00 to reconstruct this north end. Because a toll was collected on the bridge, the ferry continued to operate because of friends and rates.

1878—Ferry interests were bought out and the bridge began to pay dividends.

1883—Mineral Range Railroad applied to the Board of Supervisors of Houghton County, to build a bridge about a mile east of the present structure and to connect their railroad on the Keweenaw Peninsula with the M. H. & O. Railroad at Houghton.

In order to prevent traffice from side tracking Houghton, an upper structure was built for animals, vehicles, and pedestrians, while the lower part was reserved for rail traffic.

1886—M. H. & O. Railroad constructed their leg of the south "Y" from L'Anse to the bridge. This bridge was wooden.

1891—The Bridge Company saw fit to sell their structure to the County, under threat by the County that if they didn't liquidate, the County would erect a "safe" bridge.

1895—The present steel structure was built as it stands today, except for the draw. This draw was of wood and 180' long. Provisions were made for one street-car track.

1898—Mineral Range Railroad applied to Houghton County for permission to build a new steel swing span and built it. This new swing span was 180' long.

1902—The Copper Range Railroad Company built the present steel spans of the Copper Range leg of the "Y", which is southwest of the swing span. With the Mineral Range Railroad and the Copper Range Railroad now both coming in to the bridge, a spread span was constructed. The cost of the spread span was worked out between the two railroads.

During this year, the Mineral Range Railroad sold their right to the draw span to the county, and then the County granted permission to the Copper Range Company, for use of the draw span.

A separate agreement was worked out between the Copper Range Railroad and the Mineral Range Railroad, to use the tracks across the bridge, jointly.

1905—The swing span was struck by the steamer Northern Wave at 4:30 p.m. on April 15, because the operators of either vessel or bridge, had their signals crossed. Upon impact, the vessel was stopped, but the force of the blow toppled the swing span sideways. Ferries were again brought into service and the Board of Supervisors were called to regulate traffic and to establish proper fares.

On April 17, a locomotive tender and a gondola toppled off scows and fell into the water.

A temporary wooden structure was constructed to carry the rail traffic.

The highway traffic was taken care of by the ferries in the summer time and on the ice in the winter time. During periods when the ferries could not operate and the ice was not safe, a series of barges were strung across the channel to carry the highway traffic.

The expense of removing the damaged wing span was shared equaly by Houghton County, the Copper Range Rilroad, and the Mineral Range Railroad. Ten days were required to clear the southerly passage.

1906—On January 24, steel work for the new swing span was started. The length of wing span was now increased from 180' to 200'.

On April 8, the new bridge was back in operation and has been in operation to this day.

A sidewalk was added to the east side of the entire bridge at the same time that the new swing span was being built.

st folo history of the bridge

1911—Wood trusses of the Mineral Range Railroad leg of the "Y" were replaced by steel trusses.

1921—The State Highway Department took over this structure as described in the following article from the files of the Houghton County Road Commission:

"The Houghton County Bridge today became part of the State's Trunk Line Highway System and from now on will be under the control of the State Highway Department. This is in accordance with a law introduced at the last session of the Legislature by Representative William F. Miller, Houghton, and which was passed before the Legislature adjourned this spring.

The new law takes the repair, improvement and maintenance of the bridge out of the hands of the County and places the structure under control and supervision of the State Highway Commissioner, who is authorized to assume all obligations or carry out any contracts now existing with railroads or other corporations of persons with regard to rentals, damages, maintenance.

According to the terms of the act, however, the county is not relieved of any municipal obligation under its police powers."

1929—The resurfacing of the bridge was completed, using prefabricated concrete slabs.

1948—The existing 6x6 timber cross ties were replaced with 6"-25' wide flange steel beams at about 4' centers. On these steel beams were welded 4½" "I" beam lock flooring which was filled flush with concrete.

1950—A bituminous concrete surface was placed on the concrete floor mentioned above.

1952— The entire structure was cleaned and painted aluminum.

Inasmuch as this is not a natural waterway, some historical significance to the bridge exists.

A sum of $30,000.00 was raised in 1850 by subscription from Copper Mining Companies and merchants, to dig a channel 10' deep and 80' wide. In June 1860, the first lake steamer was piloted to Hancock through the south entry. Tolls were charged by the Portage Lake and River Improvement Company.

In 1864, the Portage Lake and Lake Superior Ship Canal Company was organized and land grants totalling 400,000 acres were made by Congress to aid the company. Work started in 1868 and after two failures and two reorganizations, the north entry was completed in 1873. Tolls were charged, but the canal was a financial failure.

The Federal Government bought both south and north canals on August 3, 1891, for a sum of $350,000.00, making the entire waterway toll free.

Col. John Allen Here for Bridge Fete and Visit

Col. John U. Allen, chief of staff, Theater Army Support Command, Europe, has arrived in the Copper Country from Verdun, France, the site of the Headquarters of TASCOM. Col. Allen, a Michigan Tech graduate with the class of 1935, has brought his family to Calumet to make their local holiday headquarters with Mr. and Mrs. George Unsworth. He will leave for a new assignment in the office of the District Engineer, Washington, D. C., in July.

When the orginal local delegation went to Washington regarding the new Portage Lake project, Col. Allen, who was stationed with the Corps of Engineers in the Capitol did yeoman work on behalf of the local group to promote the new bridge.

While in France, Col. Allen was awarded the Commendation Medal for his superior performance of duty while serving as chief of staff for Theater Army Support Command. In addition, as recognition of his efforts toward furthering Franco-American relations, he was presented the Verdun Souvenir Medal by Verdun Deputy Mayor Monsieur Rochetter and was given the privilege of signing the Verdun Golden Book.

From Verdun, Col. Allen supervised a chain of supply posts linking the seaport towns of France with the main element of troops stationed in Germany.

The route of the command was first established by the U.S. Army during World War I. Verdun is located in northeastern France, in the agriculture region of the Meuse River valley. It was the scene of the famed Battle of Verdun during World War I.

Who's Who On Lift Bridge

MAIN CONTRACTORS

American Bridge Division, United States Steel Corporation, Detroit 2, Michigan, Prime Contractor-Superstructure

Al Johnson Construction Company, Minneapolis 2, Minnesota, Prime Contractor-Substructure

SUB-CONTRACTORS

Herman Gundlach, Inc., Houghton, Michigan, Sub-Contractor-Concrete.

The Cherne Co., Ind., Ironwood, Michigan, Sub-Contractor-Plumbing & Roadway Drainage.

Service & Supply Company, Lake Shore, Inc., Iron Mountain, Michigan, Sub-Contractor-Electrical.

General Railway Signal Company, Rochester New York, Electrical-Railroad Signal System.

Hoffer Glass Company, Inc., Wausau, Wisconsin, Sub-Contractor-Glass (Minor Item)

The R. C. Mahon Company, Detroit 34, Michigan, Sub-Contracter Operator & Generator, Houses (Minor Item)

Thornton Construction Company, Hancock, Michigan, Sub-Contracter Approach work, Temporary.

G. S. Zagoras Company, Pittsburgh 12, Pennsylvania, Sub-Contractor-Painting

Cloverland Contracting Company, Crystal Falls, Michigan, Electical

Gust Lagerquist & Sons, Inc., Minneapolis, Minnesota, Sub-Contractor-Tower Manlifts

H. H. Pellow & Sons, Inc., Marquette, Michigan, Sub-Contractor-Roofing (Minor Item)

D.B.A. Lewis Industrial Floors and waterproofing Co., Toledo, Ohio, Sub-Contractor-Railroad Deck.

1st Bridge Built Cost $47,000, New, $11 Million

The new $11 million Portage Lake Bridge is in the heart of one of Michigan's most colorful and historic areas—the Copper Country.

French Explorer Jacques Cartier reported in 1536 that Indians on the St. Lawrence River had told him about great hills of native copper far to the west.

Father Claude Allouez, a Jesuit Priest, was the first white man to report seeing copper along the south shore of Lake Superior in 1666.

But it wasn't until 1843 that the U.S. Government signed a treaty with the Ojibway Indians to open the district to mining. The boom was on.

More than four billion pounds of copper were taken from Cliff Mine, the first successful mine, located near Phoenix on US-41.

In the next few years thousands of persons flocked to the Copper Country and by 1852 or 1853 there was enough demand for transportation across the Portage Lake that a man by the name of Capt. Sam Eales started a ferry service.

By 1862, a number of ferries were operating across the lake, including a floating palace named the Niagara. It was a side wheel steamer.

A 100-foot long floating bridge also operated on the lake—a double ended scow that was pulled back and forth by cable.

But the many ferries operating between Houghton and Hancock couldn't handle the traffic and the demand for better service prompted the Houghton County Board of Supervisors to grand a charter for a toll bridge in 1871.

The first bridge, a frame swing span built at a cost of $47,000, was finally completed in 1875 and opened to traffic the following spring.

The tolls were five cents for foot passengers, 20 cents for saddle horses, 20 cents for working wagons and double teams, buggies or carriages with one or two horses, 15 cents for cattle or mules, 10 cents for hogs and five cents for sheep.

In 1886, a lower deck was added to the bridge for trains.

By 1890, the bridge had become a political issue and a new supervisor was elected in Portage Township on a Free Bridge platform.

The next year, the Board of Supervisors forced the bridge company to sell out to the county for $33,000 under threat of building a free bridge nearby.

The Board claimed the bridge was old and unsafe and should be rebuilt immediately but the county operated the span for four years without making any repairs.

The only tragedy on the orginal bridge occured in the 1880's when a man named George Osborn, the night collector, was murdered.

The wooden bridge was replaced by a steel truss-type swing span built in 1895. This bridge was rebuilt in 1906 after the steamer Northern Wave struck the swing span and knocked it over.

TOMMY POYNTER looks over his model of the Portage Lake Lift bridge built from small reeds, the size of toothpicks. The boy constructed the model while convalescing from a swollen foot brought about when he steped on a rusty nail. It took him 24 hours to build the bridge at his home in West Hancock. (Gagnon of Gazette.)

"Memories of an Old Timer"

1100 E. 72nd Place
Chicago 19, Illinois
June 12, 1960

Klay Vehring, Mgr.
J. C. Penney Company
Houghton, Michigan

Dear Sir:

A news picture in a paper here showing the new lift bridge linking Houghton and Hancock which is to be dedicated on June 25, is of great interest to me and inspired many memories of my boyhood in that area.

I address my letter to you because J. C. Penney store in Houghton comes to memory for it was there I received my first "Store bought" suit when we came to attend my "first" County fair at the Amphidrome. We had long heard of J. C. Penney and it was, indeed, a venture to see for oneself the mountains of clothes in the store, and we talked for a long time after about it.

My first street car ride was on a trolley in Houghton. I first saw the bright glare of an electric light on the streets of Houghton.

Even now, I still hear the clopping of Michael Messner's horses as they pulled loads of lumber and coal over cobblestones.

The sight of my first swinging bridge, the one now being replaced by this new and magnificent structure, inspired dreams of adventure to faraway places as it swung open to permit a lake steamer to navigate its opened span.

The picture of the new bridge also shows a freighter navigating under the upraised span.

Maybe now, too, some boy is standing there dreaming as he watches the ship move on.

The influence of a bridge can be far reaching and manifold. Man has yet to desire a more effective means to bring together and unite peoples as can the linking span of a bridge.

It is my hope that the new bridge will serve the people of your area and all people faithfully and well for years to come.

My very best wishes to you for success in your new assignment and prosperity to the J. C. Penny Co. in the future.

Very truly yours,
Elmer E. Erickson

THE OUTBOARD RACING REGATTA will be run on a course which will start in front of the Hancock Naval Reserve, proceed west approximately one-half mile and return along the Houghton shore, crossing back to the Naval Reserve starting point. The regatta is being held in conjunction with the Portage Lake Lift Span Bridge dedication. Bud Gustafson, 18M, from Wakefield, is among the drivers expected to enter.

WINNER of Air University's 1960 "Outstanding Airman of the Year" award, SM Sgt. Daniel Hackmeier, third from right, receives congratulations and a check from Lt. Gen. Walter E. Todd, AU commander. Looking on are SM Sgt. Robert W. Dees, left, third place winner; second place winner M. Sgt. George W. Nixon and John F. Loosbrock, right, editor and assistant publisher of "Air Force Magazine and Space Digest." Sgt. Hackmeier, formerly with the Michigan Tech Air ROTC, and his wife, Betty Faye, will be honored guests of the Air Force Assn. at its convention Sept. 21 to 25 in San Francisco.

THE NEW PORTAGE LAKE BRIDGE, linking the Michigan Upper Peninsula communities of Hancock (at right) and Houghton, is the world's heaviest vertical lift span. The claim as the "world's heaviest" is for the bridge's 4.5 million pound center span which is raised 100 feet like an elevator to allow ships to pass through.

THE CLIMACTIC SESSION which ultimately culminated in the new Portage Lake lift bridge—Here the foursome sits in Publisher John W. Rice's office in the Daily Mining Gazette building. Captain George Skuggen of the Wilson Marine Transit Co. explained how the then current drawbridge was a traffic hazard. After this session the movement for a new bridge was pushed speedily with Admiral L. Spencer of the Lake Carriers Association aiding in the procurement of the structure. From left, Publisher John W. Rice of the Mining Gazette; Carl F. Winkler, Houghton County highway engineer; Captain Skuggen, representing Great Lakes "skippers," and the late Merwin Youngs, editor, Mining Gazette.

CECIL B. LAIRD, longtime Michigan Highway engineer, was named to the newly created post of chief of highway construction in June, 1957, by Highway Commissioner John C. Mackie. He has seen service with the state since 1926, interrupted for three years, from 1943 to enter the Corps of Engineers from which he was discharged as a major. In his post, he supervises both road and bridge construction divisions.

PAUL A. NORDGREN was appointed bridge construction engineer in 1958 by State Highway Commissioner John C. Mackie. He was bridge designer for Wayne County before joining the department in 1931 and has served as bridge inspector, bridge project engineer, field and estimating engineer and assistant bridge construction engineer. During World War II, he served with the Navy Sea Bees in the South Pacific and is commanding officer of the Naval Reserves in Jackson, holding the rank of commander.

COLONEL DESLODGE BROWN is district engineer of the U. S. Army Corps of Engineers for the St. Paul District. The son of a retired Army colonel, he is a West Point graduate and has made a career of the engineering branch of service in various capacities. He has been stationed in Hawaii, the Mariannas, Korea, Caribbean and Germany as well as in several posts in the United States.

COLONEL HARRY O. FISCHER, is division engineer of the North Central Division, U. S. Army Corps of Engineers, Chicago. He served two years in Japanese prison camps following the fall of the Phillipines and miraculously escaped machine-gunning by the Japanese when their unmarked prison ship was sunk. In 1945 he returned to the United States and Fort Belvior, then went on to Command and General Staff College. He now directs vital military and water resource projects in a 12 state area surrounding the Great Lakes.

COLONEL RECEIVES VERDUN SOUVENIR MEDAL—Col. John U. Allen, (right) Chief of Staff, Theater Army Support Command, Europe, is shown receiving the Verdun Souvenir Medal from Deputy Mayor Monsieur Rochette. The Medal was awarded in recognition of the Colonel's efforts toward furthering Franco-American relations.

SIGNING OF THE GOLDEN BOOK OF VERDUN—Col. John U. Allen, (center) Chief of Staff, Theater Army Support Command, Europe, is shown signing the Golden Book of Verdun. Deputy Mayor Monsiear Rochette (left) and Mrs. Allen watch the proceedings.

State Highway Shares in Work On New Bridge

The Honorable John C. Mackie State Highway Commissioner, will share honors with the Honorable Wilber M. Brucker, Secretary of the Army, in cutting the copper colored ribbon, in the center of the lift span of the new Portage Lake Bridge on Saturday, June 25, thus officially opening the structures to both wheel and pedestrian traffic.

JOHN C. MACKIE

The Michigan State Highway Department played an important role in the development and sponsoring of the project starting in the early days when the late Charles M. Ziegler was State Highway Commissioner and continuing until the present days with John C. Mackie at the reigns.

Much can be told about the engineering and supervisory work performed during the construction of the new Portage Lake Bridge, which started in 1957.

In this connection, it is of interest to note that all engineering work carried on in the field of construction was done by engineers who received their sheepskins from Michigan Tech, all of whom are employed by the Michigan State Highway Department and are as follows:

Howard E. Hill, Managing Director of the State Highway Department in Lansing and a former Calumet boy served as the "Chief" in his capacity as Managing - Director of the Department.

Joseph Oravec as District Bridge Engineer, presided over the work, until he was transferred to Lansing to become Assistant State Bridge Engineer. Mr. Oravec was replaced as District Engineer by L. H. Gilroy who was the Project Engineer.

Replacing Mr. Gilroy as Project Engineer was his assistant Tom Weisman who was transferred early this year to the Cadillac area to become the District Engineer.

Mr. Weisman was succeeded by a Houghton boy, none other than John Michels, who is now the project or resident engineer.

Another Tech man, now called the Father of the Bridge, is Carl F. Winkler, Houghton County Highway Engineer. It was Mr. Winkler who originally fathered all of the initial promotional work that was so necessary to secure approval of the project, appropriations, and finally the construction of same. A job well done and as numerous citizens have stated, the bridge will always serve as a monument to Carl Winkler, as the man who was directly responsible, although assisted by many other national and state officials and citizens, for the final completion of the structure.

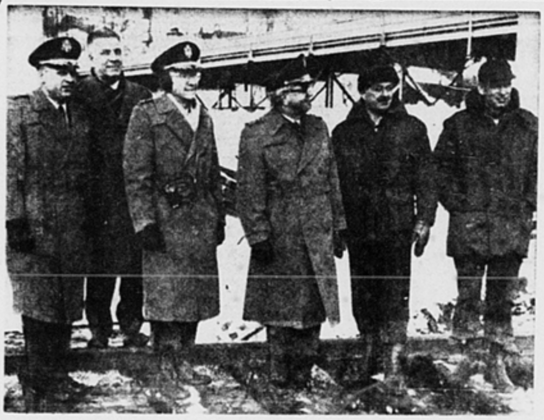
An auxiliary gas-driven generator is available for use on the Portage Lake Bridge in event of a power failure.

The 4.5 million pound center span of the Portage Lake Bridge was built on land and then floated on barges into place.

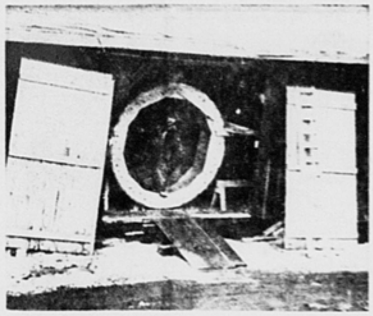
The Portage Lake Bridge opened to traffic on Dec. 20, 1959—two years and two days after construction started.

HOWARD E. HILL, a native of Calumet and a Michigan Tech graduate, held various engineering capacities with Calumet & Hecla, Ford Motor Co., Chrysler Corp. and the Corps of Engineers before joining the Michigan State Highway Dept. On Jan. 1, 1959, Commissioner John C. Mackie appointed him managing director for the department. While a lieutenant colonel in the corps of Engineers, he was awarded the Legion of Merit for excellence of design and construction of airfields which he supervised during World War II. His 18 year old son, Mike, is now a student at Michigan Tech.

World's Heaviest Span Is Completed

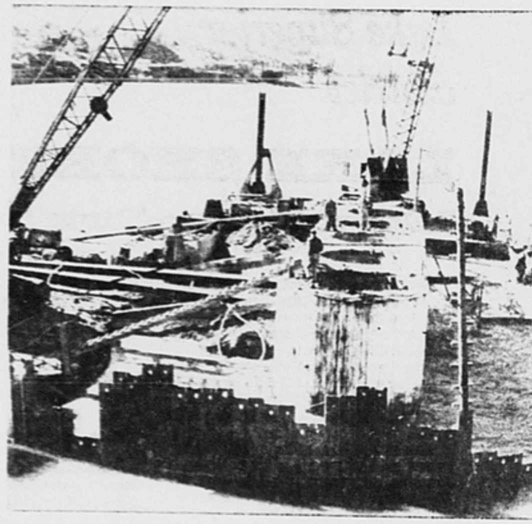


CORPS OF ENGINEERS and other officials inspected bridge work Feb. 20, 1959. Left to right are Col. L. W. Vogel of Michigan Tech; C. W. Buending, St. Paul Corps of Engineers office project engineer; Col. Deslodge Brown, divisional engineer from the St. Paul district; Gen. Rumaggi; L. H. Gilroy, district bridge engineer for the Michigan State Highway Dept., and T. R. Wiseman, project engineer with the Michigan highway men.



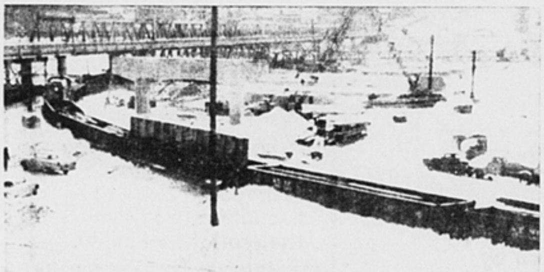
TEN WOOD FORMS similar to the above were inserted in the two caissons which made for the support of the central span. Each form was nine feet in diameter, and they were put to use in March, 1958.

SUPERVISORY MEN of American Bridge Co. arrived early in February, 1959, to begin work on the superstructure. Left to right are Eugene Mowlds, Bernie Smith and D. L. Cornett.

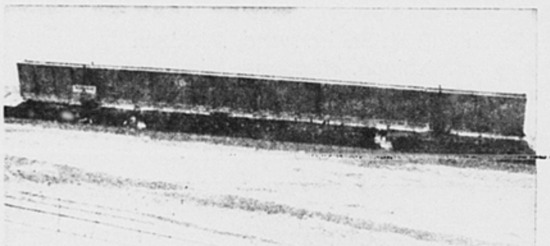


CAISSON NO. 5 is shown in October, 1958, preparatory to work by sandhogs. This caisson, with No. 6 on the north side of the project, holds the lift.

SOUTH SHORE LOCOMOTIVE carried in five of structural steel and three cars of derrick mach-ery and hoist material in February, 1959.

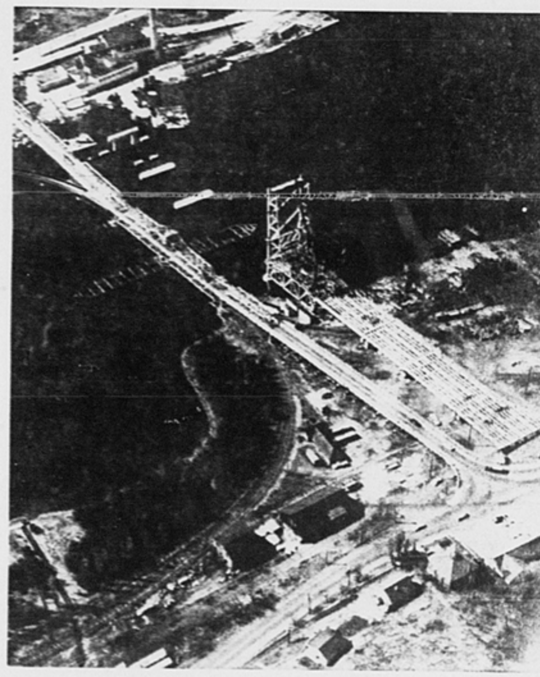


A SOUTH SHORE locomotive carried in five cars of structural steel and three cars of derrick machinery and hoist material on Feb. 17, 1959.

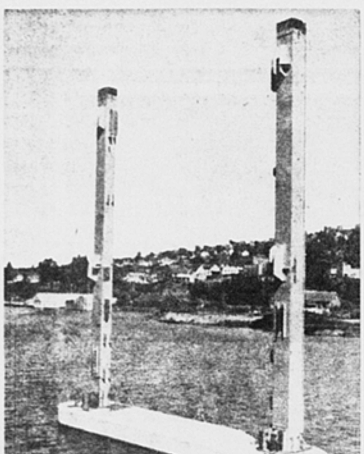


HUGE GIRDER here formed one of the spans. It took three railroad cars to carry the beam to the area in February, 1959.

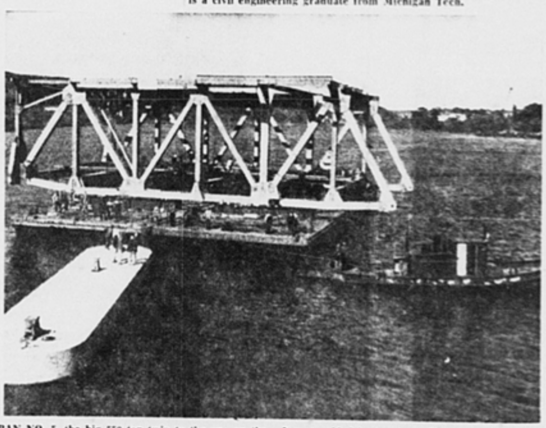
TERRENCE REED, left and John J. Michels were members of the Michigan bridge engineering group on the Portage Lake project. John is a civil engineering graduate from Michigan Tech.



ABOUT 25 PER CENT COMPLETE, the new construction dwarfed the old span alongside in early June, 1959. Ironworkers had erected 1900 tons the 700 tons called to complete the project.

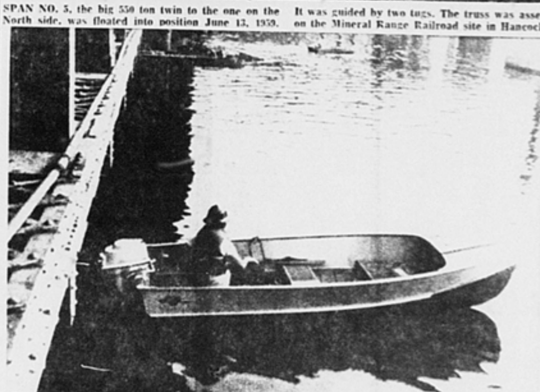


TWO BASIC COLUMNS of the south bridge tower to which horizontal span was to be attached was snapped by photographer on June 15, 1959. The lift bridge assembly rests between these and similar columns.

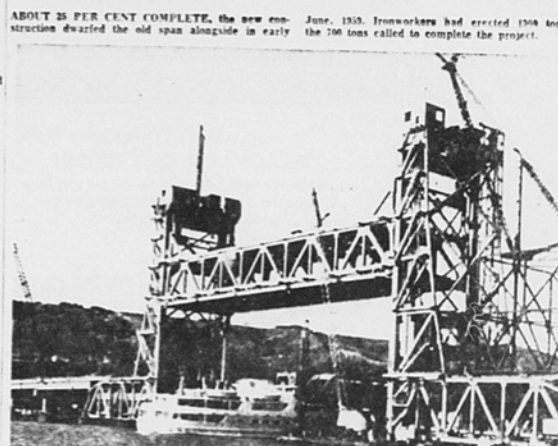


SPAN NO. 5, the big 550 ton twin to the one on the North side, was floated into position June 13, 1959. It was guided by two tugs. The truss was assembled on the Mineral Range Railroad site in Hancock.

AL JOHNSON construction engineers looked over the Portage Lake bridge progress to date on June 27, 1959. Chris Woods, left, was solely responsible for supervision of the foundation. Don Bruner, shown with him, is a traveling engineer and vice president of the Johnson firm.



BERNARD GESTEL of Dollar Bay had a rare task incidental to construction of the lift bridge. His duty was to rescue any workman who toppled into the water.



THE FIRST VESSEL to use the new Portage Lake lift span after it was floated into place was the Ranger III. It was returning from Isle Royale and had to wait at the former Van Orden coal wharf almost two hours until the span could be raised. Here it is, on Sept. 10, passing under the span at 5:15 p.

Today's Chuckle

A family man is one who has replaced the currency in his wallet with snapshots.

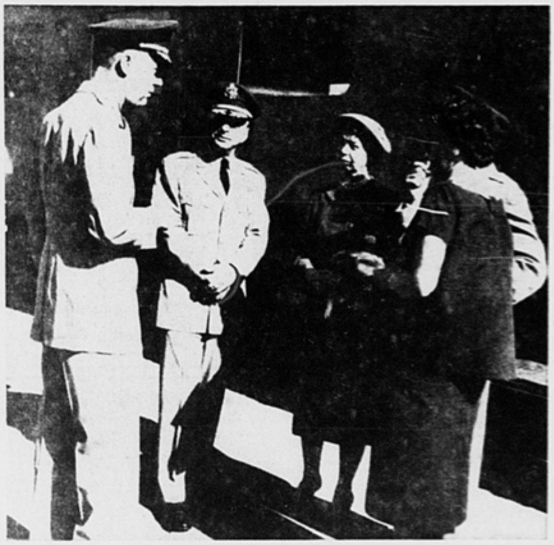
The Daily Mining Gazette

THE HOME NEWSPAPER FOR MORE THAN 100 YEARS

Largest ABC Circulation of any Advertising Medium in the Copper Country

Problems are only opportunities in work clothes. —Henry J. Kaiser.

VOL. SIXTY ONE. No. 241. | HOUGHTON, MICHIGAN | SATURDAY, JUNE 25, 1960 | TWELVE PAGES | PRICE TEN CENTS



VANGUARD of the long list of dignitaries who arrived this morning to attend the Portage Lake bridge dedication was headed by Brigadier General John Leary, chief of staff, Fifth Army, and Mrs. Leary. She is a native of the Copper Country having resided here when her father was a professor of metallurgy at Michigan Tech. The former Miss Elizabeth Ellen Houle, she left her home on Hubbell Avenue in 1919 for Arizona. Above, the couple is greeted by well wishers at the Houghton South Shore depot. (Gagnon of Gazette)

Castro Willing to Make Million Ton Sugar Bet

Says Herter Fooled On Forecasted Drop

By ROBERT BERRELLEZ

HAVANA (AP) — Fidel Castro says he is willing to make a million-ton wager on Cuban sugar production with Secretary of State Christian A. Herter.

The bearded Prime Minister made the statement in a TV talk to the Cuban people Friday night —his eighth major speech in 20 days.

It followed a statement by Herter in Washington to the House Agriculture Committee that experts predict Cuba's sugar production will drop at least one million tons soon. Herter added that this is a good time to diversify U.S. sugar supply sources. The committee has been considering giving President Eisenhower authority to cut Cuba's quota of the U.S. market.

Castro said he would be willing to surrender Cuba's share of the sugar market in the United States if his country's production in 1961 drops a million tons—provided the Cuban quota is increased by a million tons if production increases that much. Castro said the American public is "being fooled" on the sugar situation.

"We can sell sugar to the United States at a cheaper price if they want it," the Prime Minister said. "We can contribute to the lowering of the American cost of living."

The United States is still buying about 3½ million tons of sugar from Cuba, more than half the Cuban crop, and to protect U.S. producers is paying a premium of about 2 cents above the world market price. Since Castro's increasing restrictions on American investors in Cuba, there has been growing sentiment in the U.S. Congress for a cut in the sugar quota allotted Cuba and an increase in purchases from other producers whose governments are more friendly to the United States.

Castro reiterated a threat that American investments would be seized in proportion to the amount of Cuban sugar quota reductions.

"We'll exchange Cuban quota cuts for American property seizures," he said. "They cut off all our quota, we'll take all their property."

He also repeated his warning that American and British oil refineries in Cuba are obligated to refine imported crude oil from the Soviet Union, and have only a few more days to make up their minds.

Politics

L. Johnson Men Make Final Fight For Nomination

By THE ASSOCIATED PRESS

Supporters of Sen. Lyndon B. Johnson of Texas intensified their drive today to stop Sen. John F. Kennedy of Massachusetts from snaring the Democratic presidential nomination.

At the annual conference of governors in Glacier National Park, Mont., Gov. Price Daniel of Texas and Buford Ellington of Tennessee organized a Southern caucus for Sunday morning.

The aim was to assess Johnson's chances of defeating Kennedy at the national convention in Los Angeles and to stamp out talk that Johnson has swayed too far from the Southern viewpoint. Some Southerners are angry at him for piloting two civil rights bills through Congress.

In Washington Friday, Johnson supporters claimed he would have 502 votes on the convention's first ballot. They predicted 602½ for Kennedy. To win, 761 votes are needed.

NIXON HEADS GOP

In Republican developments, the Indiana state convention approved a resolution Friday endorsing Vice President Richard M. Nixon for the presidential nomination.

Nixon is expected to get another enthusiastic endorsement today in Roanoke, Va., where the Virginia Republican convention is convening.

Republican Chairman Thruston B. Morton, on the eve of the Virginia convention, predicted Nixon's victory at the national convention in Chicago.

"I don't think with the convention this close there is any chance of nominating anybody but Nixon," Morton said. "I think Gov. Rockefeller understands that."

News in Brief

SUKARNO PUTS IN OWN INDONESIAN LEGISLATORS

JAKARTA (AP)—President Sukarno today replaced Indonesia's popularly-elected 1955 Legislature with his own Parliament of 283 hand-picked members. A rash of pamphlets hit Jakarta's streets branding his action as dictatorial and in violation of the republic's constitution.

TYPHOON OLIVE MOVES TOWARD LUZON

MANILA (AP)—The Manila Weather Bureau today issued warnings for Luzon and Visayan Islands as Typhoon Olive with center winds at 170 miles an hour continued to move west and northwest in the direction of southern Luzon.

AFRICANS DEMAND COLONIAL RULE END

ADDIS ABABA, Ethiopia (AP)—The 10-day second conference of independent African states ended here Friday night with demands for the end of colonial rule by France and exclusion of South Africa from the British Commonwealth.

IKE ACCEPTS HONORARY GOLF MEMBERSHIP

TAIPEI (AP)—President Eisenhower has accepted an honorary membership in the Taipei Golf and Country Club, it was announced here today.

Near Rio De Janeiro

Brazilian 'Plane Plunges into Bay

RIO DE JANEIRO, Brazil (AP) —A Brazilian airliner with 51 persons aboard, including at least one American, plunged into Guanabara Bay Friday night while approaching Rio de Janeiro. Search teams found parts of bodies and wreckage but no survivors.

The twin-engined Convair, on a 600-mile flight from the new capital of Brasilia with a midway stopover at Belo Horizonte, was listed as missing nearly eight hours.

The crash was confirmed early today when navy search crews found the plane's wreckage floating in the bay off the island of Paqueta, about 10 miles up the bay from Rio's Dumont Airport.

Later the searchers reported finding parts of bodies and pieces of luggage that had floated up on the beach.

Among those listed aboard was Newton B. Thompson, a native of Waterville, Maine, an official of the American Bond and Share Electric Co.

A spokesman for Real Airlines said the passenger list carried other Anglo-Saxon names, including George Pfistern, Janet S. Latter and H. V. Lee. The line could not confirm their nationalities or give their addresses.

Thompson's wife told reporters in Rio that her husband had been in Belo Horizonte on business.

Earlier reports had said the plane might be carrying several Brazilian congressmen who often travel from Brasilia for weekends in Rio. It was later learned that only one congressman — Jose Gomes Talarico — had boarded the flight in Brasilia. Arriving at Belo Horizonte he learned the plane would be delayed.

"I had to be in Rio early," he told newsmen later. "I asked if I could transfer my ticket to another airline leaving sooner. The airline said it could not make the transfer. I bought another ticket and I'm alive tonight."

The airline said pilot Joao Belloc radioed the Santos Dumont Airport tower shortly before 6 p.m. He said he was approaching the landing field at 1,800 feet and was just over Paqueta Island. Then the radio went dead.

NAACP Charts Course of Battle For Civil Rights

ST. PAUL, Minn. (AP) —The National Association for Advancement of Colored People charts the course of its civil rights battle for the coming year at a closing session of its 51st annual convention today.

Expected to rank high on the list of resolutions submitted to delegates representing the 350,000-member organization are proposals backing a step-up in the student sit-in protest movement for Southern lunch counter desegregation, use of economic boycotts as a lever for integration, mobilization of Negro trade unionists and an increase in the rate of public school desegregation and Negro voter registration.

Singing, placard-carrying youth delegates to the convention picketed two St. Paul chain store outlets Friday protesting lunch counter segregation policies followed by the companies in the South.

A. Philip Randolph, president of the Brotherhood of Railway Sleeping Car Porters, an AFL-CIO vice president and head of the newly formed Negro-American Labor Council, told a convention dinner the entire labor movement bears the guilt for existence of racial disadvantages to colored workers.

Randolph said in a news conference that none of the major presidential candidates, with the exception of Gov. Nelson A. Rockefeller of New York, has made a recent major statement on civil rights. He said the others "seem to want to sweep civil rights under the rug."

Sen. Wiley Says There's No Truth To Policy Charges

WASHINGTON (AP) — Sen. Alexander Wiley (R-Wis) said today there is no truth to charges that any "lack of foresight, or clumsiness in policy planning," by the Eisenhower administration caused the collapse of the summit conference.

Soviet Premier Nikita Khrushchev, Wiley said, would have torpedoed the conference anyway, even if the U2 spy plane incident had not come just before the Paris meeting.

Wiley's stateemnt established him as a leading Senate defender of the administration's recent actions in foreign affairs. Friday he made public a letter from Secretary of State Christian A. Herter, which Wiley had solicited, in which Herter strongly rejected attacks on the administration's handling of President Eisenhower's canceled trip to Japan.

Wiley's U2 defense was scheduled as a Senate speech today, but Friday night the Senate adjourned until Monday. The prepared speech had been distributed earlier.

The speech was timed to precede release tonight of a 62-page report on the U2 incident by the Senate Foreign Relations Committee. Wiley is senior Republican member of the committee which conducted a four-day, closed-door probe of the U2 affair. He said he would have something to say later on the committee report.

Committee Chairman J. William Fulbright (D Ark) has said the 10 pages of conclusions are "soft and tender" with the administration.

Much of Wiley's fire appeared directed at a Senate speech Thursday by Sen. Mike Mansfield (D-Mont), a committee member and assistant Senate majority leader. Mansfield charged that timing of the ill-fated flight was left in the hands of obscure bureaucrats.

Sen. Appropriations Approves Military Construction Bill

WASHINGTON (AP)—The Senate appropriations committee Friday approved a $1,067,227,000 military construction appropriation bill for the year beginning July 1.

This is $191,082,000 more than the bill passed by the House on June 9.

Among the appropriations revised upward were those for Air Force projects in Michigan. They are:

Kincheloe AFB, Sault Ste. Marie $3,854,000. The House approved figure was $2,861,000.

K. I. Sawyer Municipal Airport, Marquette, $3,168,000. The House approved figure was $2,202,000.

Wurtsmith AFB, Oscoda, $2,990,000. The House approved figure was $2,127,000.

Keyes, Facing Vote Ouster, Demands Others Be Examined

LANSING (AP)—Dr. Eugene C. Keyes of Dearborn has asked the State Supreme Court to order his name placed on the Aug. 2 primary ballot as a Democratic candidate for lieutenant governor, a post he once held as a Republican.

Keyes faces possible disqualification for lack of enough valid signatures on his nominating petitions. He petitioned the high court Friday for an order directing Secretary of State James M. Hare to put his name on the ballot.

Meanwhile the State Board of Canvassers ordered Robert M. Montgomery, state elections director, to decline comment on the controversy.

Keyes' court petition said he was "wrongfully and unjustly discriminated against" by election officials. He asserted his nominating petitions were checked more closely than those of his four rivals for the nomination.

He also asked the court not to certify his rivals until their petitions gets a similar scrutiny.

State Election Fight To Focus on Jobless, Taxes: Report

GAYLORD (AP) — Michigan's election battles will focus on taxes and jobless workers, says State Republican Chairman Lawrence B. Lindemer.

The victory will go to the party that can convince voters it will do the best job of improving the employment picture and solving state tax and money ills, he said.

"There has been a Democratic administration in Michigan for 12 long years," he told a group Friday at a meeting of the Northern Michigan Republican Assn.

More than 200,000 Michigan citizens are unemployed and the federal government has classified nine population centers as depressed areas, he said.

Problems Linger On 10th Anniv. Of Korean War

By DAY INOSHITA

TOKYO (AP) — The free world was reminded today—the 10th anniversary of the Korean War—that the armistice which ended the fighting had not solved its problems.

The Communists observed the anniversary with a new demand that U.S. troops pull out of South Korea and other parts of Asia as well.

While all was quiet on the military front, North Korea, supported by the Communist world, trumpeted its demand for a U.S. pull-out in rallies, over press and radio and in a meeting with U.N. command representatives near Panmunjom, where the Korean truce was signed.

But on the Western side, Gen. I. D. White, commander in chief of the U.S. Army in the Pacific, in a war anniversary statement said, "our stand in Korea made clear to all that democracy and freedom are not mere words we speak but a concept of government and a way of life for which we will fight to death.

"The continued physical presence of armed United States, United Nations and ROK troops along the demilitarized zone and elsewhere in Korea is a mighty deterrent to further aggression. Equally as important as the maintenance of our strength is our proven determination to use it when necessary."

Reports from Pyongyang said 300,000 Koreans gathered in the Red Korean capital in an anniversary eve rally Friday and shouted "Yankee go home" demands.

IRON MOUNTAIN MAN PICKED

LANSING (AP)—Mrs. Elizabeth Briggs Fisher of Grosse Pointe Farms and William J. Cochran Jr. of Iron Mountain were re-appointed by Gov. Williams Friday to the Mackinac Bridge Authority.

After Bomb Incident

Betancourt Pushes Venezuelan Search

By RICHARD G. MASSOCK

CARACAS, Venezuela (AP)—His face swollen and hands bandaged as a result of the bomb blast that narrowly missed killing him, President Romulo Betancourt pressed a search today for those behind the plot.

Betancourt, back in Miraflores Palace after being treated in a hospital for injuries, told reporters the attack was part of a widespread plan to overthrow his government and set up a new dictatorship.

"The incident shows that the enemies of democracy—national and international—will resort to every possible means to try to establish tyranny in the country," Betancourt told newsmen.

Venezuela's borders were sealed off, air travel halted and some constitutional guarantees suspended to facilitate the search.

Defense Minister Lopez Henriquez who sat next to Betancourt and was burned when the bomb went off, alerted the country's armed forces against any attempt to overthrow the President's three-party coalition government.

Three persons were reported killed and eight wounded in the blast, which marked the third assassination plot against Betancourt.

The explosin destroyed the President's car as he arrived for an army day ceremony on the Avenue of Heroes outside Caracas.

As Betancourt's car drew alongside a green sedan parked in the line, the sedan exploded with a roar setting the President's vehicle afire.

Interior Minister Luiz Augusto Dubuc blamed the attack on supporters of Venezuelan ex-President Marcos Perez Jimenez and "foreign enemies—concretely the (Trujillo) dictatorship of the Dominican Republic."

Perez Jimenez declined to see reporters at his mansion in Miami Beach, Fla., where he is living in exile.

Messages poured into the presidential palace from business leaders, labor chiefs and student groups condemning the assassination attempt and pledging support to Betancourt.

State Lady Politico To Be in Limelight At Demo Convention

LANSING (AP)—One of Michigan's most striking and successful women politicians will hold the eye of the nation briefly on the second day of the Democratic national convention.

At the same time, delegates at Los Angeles and televiewers everywhere will see history made when the spotlights focus on Mrs. Margaret Price of Ann Arbor, Michigan's national committeewoman.

Swooping Twisters Terrify Residents In Eastern States

By THE ASSOCIATED PRESS

Tornado winds pushed out over the Atlantic Ocean today, leaving behind scattered trails of damage in the Northeast states.

Apparently hardest hit was the industrial area of Schenectady, N.Y. Unofficial reports said the damage might run to at least two million dollars.

An emergency was declared in the Schenectady suburbs of Rotterdam and Woodlawn, where the winds cut wide swaths of wreckage. Dozens of buildings were damaged or destroyed.

"It was mass hysteria," cried a woman who escaped from a wrecked grocery store. Some 200 customers fled from the structure as a roof hurled from a nearby building hit in a shower of shattering window glass.

The winds demolished buildings near Glens Falls, N.Y., skipped across southeastern Pennsylvania and hit near Jeffersonville, Va.

MORE THAN 140 LITTLE GIRLS from the four-county area staged the first parade ever to cross the new Portage Lake Lift-Span bridge Friday afternoon to begin the Bridge Dedication festivities. Hundreds of proud parents and friends lined the walk-ways to view the Doll Buggy Parade which began near Bruno's Texaco Station in Hancock and terminated at the Houghton end of the bridge. Winners will be announced in Monday's GAZETTE. Those children who have not picked up their prizes will be able to do so at Parade Chairman Marty O'Connor's office on Shelden Ave. in Houghton. (Loranger of Gazette)

WEATHER

West Upper Michigan, June 25, fair through Sunday with higher afternoon temperatures but with cool nights. West to northwest winds 10-15 m. p. h. becoming light and variable tonight. High today 63-74, low tonight 46-52, high Sunday 70-76.

Outlook for Monday, partly cloudy with scattered showers likely.

Copper Country - Highest temperature in 24 hours 66, lowest 50, at noontoday 66.

The sun sets today at 8:54 p.m. and rises Sunday at 4:59 a.m.

	Highest Yesterday	Lowest Last Night
Albuquerque, clear	92	64
Atlanta, cloudy	94	69
Bismarck, clear	77	59
Boston, cloudy	74	68
Chicago, clear	74	61
Cleveland, clear	75	57
Detroit, clear	77	52
Fort Worth, rain	93	71
Helena, cloudy	59	44
Indianapolis, cloudy	71	54
Kansas City, clear	73	60
Los Angeles, cloudy	82	58
Louisville, cloudy	79	59
Miami, cloudy	87	81
Milwaukee, clear	74	42
New Orleans, cloudy	97	73
New York, cloudy	[illegible]	66
Omaha, clear	76	57
Philadelphia, cloudy	86	68
Phoenix clear	106	79
Pittsburgh, cloudy	76	62
Portland, Ore., cloudy	63	53
Rapid City, clear	81	57
St. Louis, clear	72	68
San Diego, cloudy	73	67
San Francisco, clear	[illegible]	[illegible]
Seattle, cloudy	66	50
Tampa, cloudy	[illegible]	74
Washington, cloudy	[illegible]	[illegible]

OFFICIAL PROCEEDINGS OF THE BOARD OF SUPERVISORS OF HOUGHTON COUNTY

TUESDAY, MAY 10, 1960

A meeting of the Board of Supervisors for the County of Houghton was held pursuant to adjournment in the office of the County Clerk, in the Village of Houghton, in said County on Tuesday, May 10, 1960.

The meeting was called to order by the Chairman, Raymond J. Hosking.

The following supervisors were present and responded to roll call:

Peter Steinen	Adams
Wilmer MacLeod	Calumet
Edward Soumis	Chassell
Heino Anderson	Duncan
Wilbert Leppanen	Elm River
Lauri Lehtinen	Hancock
Eino Kotila	Franklin
Matt Maki, Jr.	Laird
Russell Hellman	Osceola
Fred J. Yeip	Portage
Cyril J. McKie	Quincy
Arthur Lantto	Stanton
Louis G. Koepel	Torch Lake
Richard T. Rowe	Schoolcraft
Lewis E. Nolan	Hancock City, Ward 1
Raymond J. Hosking	Hancock City, Ward 2
Edward Saari	Hancock City, Ward 3
Weldon Trevethan	Hancock City, Ward 4

Moved by Supervisor Trevethan and duly supported that the Houghton County Road Commission Airport bill amounting to $1,812.75 be deferred for closer examination of its invoice charges, while the several other monthly bills audited by the Finance Committee be allowed and ordered paid by warrants drawn by the Clerk and Treasurer.

Carried by the following vote:

YES—Kotila, Maki, Steinen, Yeip, Lehtinen, Trevethan, Saari, Nolan, Lantto, Leppanen, Soumis, McKie, Koepel, Hellman, Rowe, MacLeod, Anderson — 17

NO—None — 0

Name	Contents of Bill	Amount	Allowed
County Officers and Employees—Salaries		$8146.26	$8146.26
Circuit Court—Special Attorney Fees		15.00	15.00
Telephone		10.40	10.40
Probate Court—Miscellaneous		9.00	9.00
Refunds		1.00	1.00
Telephone		28.91	28.91
Board of Supervisors—Regular Attendance and Mileage		203.74	203.74
Committee Attendance and Mileage:			
Peter Steinen—1		10.00	10.00
Wilmer MacLeod—3		34.20	34.20
Edward Soumis—1		11.40	11.40
Heino Anderson—1		21.20	21.20
Eino Kotila—1		10.28	10.28
Lauri Lehtinen—2		22.80	22.80
Russell Hellman—3		31.40	31.40
Fred J. Yeip—1		10.14	10.14
Richard T. Rowe—2		21.40	21.40
Arthur Lantto—1		11.05	11.05
Louis Koepel—5		55.60	55.60
Raymond J. Hosking—1		10.28	10.28
Edward Saari—2		20.56	20.56
Court House—Light and Power		121.86	121.86
Telephone		17.97	17.97
County Clerk—Refunds		72.00	72.00
Postage		1.25	1.25
Telephone		10.71	10.71
County Treasurer—Stamped Envelopes and Postage		53.40	53.40
Telephone		10.40	10.40
Register of Deeds—Telephone		8.60	8.60
Sheriff—Postage		17.00	17.00
Power		14.11	14.11
Telephone		54.70	54.70
Jail—Kitchen Help and Prisoners' Food Supplies		416.68	416.68
Airport—Lights		111.58	111.58
Telephone		47.54	47.54
County Extension Office—Telephone		32.44	32.44
Elections—Postage		41.30	41.30
Raymond A. Smith—Circuit Court—Travel Expense		43.50	43.50
Recordak Corporation—Probate Court—Microfilm Expense		68.80	68.80
Raymond A. Smith—Newberry Expense		85.60	85.60
E. J. Hauswirth—Newberry Expense		45.29	45.29
Elizabeth Salo—Afflicted Children Transportation		35.25	35.25
Doubleday Bros. and Co.—Justice Court—Printing and Binding		29.75	29.75
Herbert Dove, Sr.—Fees		8.30	8.30
Abe Goldman—Fees		156.70	156.70
Louis C. Gerbec—Fees		84.10	84.10
Norman Trezise—Fees		122.20	122.20
Cornelius Sullivan—Fees		51.00	51.00
Merrill's Paint Store—Court House—Repairs and Maintenance		30.90	30.90
Aren's Coal Company—Fuel		338.17	338.17
Commercial Systems, Inc.—County Clerk—Supplies		8.86	8.86
F. W. Woolworth Co.—Furniture and Fixtures		2.44	2.44
Stephen D. Condon—Prosecuting Attorney—Mileage and Telephone		53.06	53.06
Edna Frandy—County Treasurer—Mileage		19.15	19.15
Commercial Systems, Inc.—Register of Deeds—Supplies		5.85	5.85
Raymond A. Smith—Sheriff—Mileage		472.29	472.29
John Costelic—Special Deputy Fees		14.00	14.00
John L. Sullivan—Special Deputy Fees		47.50	47.50
Jacob Kratt—Special Deputy Fees		31.00	31.00
The Book Concern—Printing		9.50	9.50
Kukkonen Studio—Supplies		6.65	6.65
Norman Trezise—Coroners Fees and Mileage		35.50	35.50
Lewis E. Nolan, M. D.—Coroners—Autopsy Fees		175.00	175.00
Bertha A. Perreault—Soldiers' Burials—Expense		200.00	200.00
Exilda Vivian—Soldiers' Burials—Expense		200.00	200.00
Wickley Agency—Miscellaneous—Insurance		45.46	45.46
Van Orden Agency—Insurance		1139.59	1139.59
Houghton Co. Dept. of Social Welfare—Surplus Commodities		192.24	192.24
J. T. Nachazel—Civil Defense		74.50	74.50
Standard Oil Company—Airport—Oil		54.50	54.50
Gitzen Company—Airport—Supplies		6.95	6.95
Board of County Road Commissioners—Airport—Maintenance and Operation		1812.75	1812.75
Commercial Systems, Inc.—Tax Dept.—Supplies		12.69	12.69
Addressograph—Multigraph Corp.—Equipment Repair and Maintenance		56.18	56.18
Erick Hiltunen—Mine Inspector—Mileage and Telephone		19.67	19.67
Hancock Hardware Co.—County Extension Office—Supplies		.69	.69
General Office Supply—Supplies		19.80	19.80
Frank Madaski—Mileage and Extra Clerk Hire		102.47	102.47
Wallace Keskitalo—Mileage		43.40	43.40
Kristin A. Hokens—Mileage and Supplies		25.27	25.27
Commercial Systems, Inc.—Supplies, Equipment, Maintenance and Repairs		15.40	15.40
C. C. Tuberculosis Sanatorium—County Institutional Care Fund—Medication		22.30	22.30
Keweenaw Printing Co.—Circuit Court—Printing		62.00	62.00
The Native Copper Times—Printing		8.80	8.80
The Native Copper Times—Register of Deeds—Printing		13.25	13.25
Doubleday Bros. and Co.—Probate Court—Printing		80.12	80.12
I. E. Swift Co.—Court House—Repairs and Maintenance		37.72	37.72

The first order of business the chairman called for nominations and the election of 3 Supervisors to serve on the Houghton County District Health Board for the ensuing year.

From a list of 6 nominees, Supervisors Lewis E. Nolan, Edward Saari, and Louis Koepel were by a majority vote the elected members of the District Health Board.

By recommendation of the Probate Judge of Houghton County, the Board appointed Walter Kettenbeil to serve with Judge Donnelly as members of the Board of Directors on the newly created U.P. Peninsula Adult Mental Clinic at Marquette, Michigan.

Circulated petitions were presented to the Board by a number of qualified voters of Houghton County requesting approval for Houghton County Road Commissioners to be elected by popular vote rather than the present appointive system. Embodying the petition was a joint proposal requesting the Board to consider taping and broadcasting all its monthly meeting proceedings on a local radio station. After considering the two proposals in committee, it was the majority decision of the Highways and Bridges Committee that the petitioners request be rejected, by motion of Supervisor Lehtinen.

Carried.

The Board of Supervisors approved the appointments of a special created committee consisting of Supervisors Rowe, Soumis, Lantto and Leppanen to study and advise the Sheriff in carrying out the Marine Law Enforcement Program.

Carried.

Moved by Supervisor Yeip that the following resolution be approved.

Since published statistics for Michigan on chronic diseases show an above-average incidence in this area, and as we know that the public cost of care for the unfortunate who are afflicted with one or more of these diseases is high; and since Michigan College of Mining and Technology and Northern Michigan College are jointly promoting a program with the objective of organizing the available resources of the four Copper Country counties toward a real and concentrated study of the overall problem—social, financial, moral, and general care; and further are formulating a one-day "Conference on Chronic Diseases" to be held in Memorial Union Building, Houghton, on Wednesday, June 1, Therefore be it resolved:

(1). That we extend our appreciation to Michigan College of Mining and Technology and Northern Michigan College for their interest and action in their efforts to coordinate and make the needs of the area for the express purpose of reducing the suffering and high costs resulting from chronic diseases; and that it further be resolved;

(2). That we gladly accept the invitation to be a co-sponsor of the conference to be held June 1st; and

(3). And be it further resolved that copies of this resolution be sent to the Directors of the Field Services Divisions of Michigan College of Mining and Technology and Northern Michigan College.

Carried.

After reviewing and thoroughly analyzing the Houghton County Road Commission's Airport maintenance bill amounting to $1,812.75, the Finance Committee recommended its payment along with several tardy bills. Motion to settle the bills was made by Supervisor Rowe with Supervisor Saari supporting.

Carried.

The chairman appointed Walter Kettenbeil, Director of the Houghton County Tax Division and Supervisor Wilmer MacLeod, Chairman of the Equalization Committee to attend the Michigan Tax Commission Hearing to be held at Lansing on May 23, 1960.

Carried.

Moved by Supervisor Anderson and supported by Supervisor Koepel that the Board consider and approve the recommendation of the Lands Committee to cancel all prior bids submitted for published county lands offered for sale in April and May and that another proposal asking for new bids on Houghton County lands situated in Keweenaw and Baraga Counties listing each description with minimum starting bids be published.

Carried.

Moved by Supervisor Rowe and supported by Supervisor Maki that the following new board committees appointed by the chairman for the ensuing year be accepted and approved:

ADMINISTRATION AND PUBLIC WELFARE: Matt Maki, Jr., Chairman; Fred J. Yeip, Weldon Trevethan, Richard T. Rowe, Cyril J. McKie

AGRICULTURE AND LANDS: Heino K. Anderson, Chairman; Peter Steinen, Wilbert Leppanen, Edward Soumis

AIRPORT: Edward Saari, Chairman; Russell Hellman, Lauri Lehtinen, Matt Maki, Jr., Cyril J. McKie

BUILDING: Weldon Trevethan, Chairman; Wilmer MacLeod, Louis Koepel, Arthur Lantto, Edward Saari

CONSERVATION: Eino Kotila, Chairman; Heino K. Anderson, Wilbert Leppanen, Matt Maki, Jr.

RESOLUTIONS: Arthur Lantto, Chairman; Lewis E. Nolan, Eino Kotila, Peter Steinen, Lauri Lehtinen

EQUALIZATION: Wilmer MacLeod, Chairman; Louis Koepel, Heino K. Anderson, Peter Steinen, Russell Hellman

FINANCE: Richard T. Rowe, Chairman; Fred J. Yeip, Wilmer MacLeod, Raymond J. Hosking, Eino Kotila

HEALTH: Lewis E. Nolan, Edward Saari, Louis Koepel

HIGHWAYS AND BRIDGES: Lauri Lehtinen, Chairman; Edward Soumis, Arthur Lantto, Weldon Trevethan, Russell Hellman

MINERAL LANDS: Cyril J. McKie, Chairman; Wilbert Leppanen, Lewis E. Nolan

LEGISLATIVE: Fred J. Yeip, Chairman; Richard T. Rowe, Edward Soumis

Carried.

Supervisor Maki disclosed several committee meetings scheduled for the following dates: Administration Committee: Wednesday, May 25, 1960 at 7:30—Court House. Administration and Finance Committees: Monday, May 23, 1960 at 7:30 at the Welfare Building.

Moved by Supervisor Saari that the meeting be adjourned until Tuesday, June 14, 1960.

Carried.

RAYMOND J. HOSKING, Chairman

EDWARD G. TAMBELLINI, Clerk.

Recollections of a Pioneer

Canoes and Ferries Give 'way to Bridges

EDITOR'S NOTE: The following reminiscences were given before the Keweenaw Historical Society in 1920, by James Edwards, a pioneer of the Copper Country.

Mr. President and Ladies & Gentlemen:

Your president has asked me to give you my recollections of "How we crossed the Portage Lake, before and after 1875."

I suppose he picked on me because he thought I was one of the oldest of the very few "oldest residents now in captivity." Perhaps he is right for, personally, I do not think there is a man living today who was on the Shores of Portage Lake the day I landed or was landed on the beach where Croze's woodyard is now located. There is one woman alive, who was there at that time—my sister, Mrs. Mary E. Shelden, who was landed with me.

This was before the Village of Houghton was. In fact, it was Sept. 10, 1855, at which time I was a little over 3 years old.

This subject assigned me, might be very easily summed up in seven steps:

(1) The bark and log canoes.

(2) The Mackinaw roe or sail boat.

(3) The car rigged ship yawl "Bully Boy."

(4) The steam propeller open launch Northern Light Jr.

(5) The side wheel flat boat steamer Niagara.

(6) The double ender scow with its cable the "Loviathan".

(7) The Bridge.

The first real public ferry across Portage Lake was established (if I may use such an imposing word) by a very irascible old English sailor man by the name of Capt. Sam Eales, who came to Portage Lake about 1852 or 1853, bringing with him a ship's yawl.

When the weather was fine, he would scull the yawl across the Lake and if the wind was blowing, he would hoist his "cat" and sail over. He charged his passengers two shillings each for the trip.

The Captain had as a helper and housekeeper, a man by name of John T. Martin and his Dutch wife. In the course of a few years the Captain waxed very old and turned the whole business over to John. And as the business outgrew the yawl, John went to Detroit and shortly returned, bringing with him the palatial steam propeller, Northern Light Jr, an open launch of 40 feet in length and 8 foot beam with cockpit extending the entire length and a canvas canopy.

By this time, 1858, Hancock had grown to quite a town. The "Light" made a round trip from Houghton to Hancock, back to Houghton and then to Pewabic dock and back once an hour. A small scow was used to ferry teams across.

In 1863 other smaller crafts were encroaching on Martin's monopoly, so John T. once more set forth for "below" and returned with the magnificent side wheel steamer, "Niagara". On her arrival, everyone said, surely this solves for all time the question of how to get across Portage Lake." And for many years it did. But, the time came when more teams were waiting than could be accommodated at one trip. The public began to clamor for "more".

In 1870, the feasibility of a bridge began to be discussed and in 1871, a charter was applied for, secured and an attempt made to place the stock, but the public didn't seem to care to "come forth" with the wherewithal. So, in 1873, John Martin once more filled the breach and constructed the "floating bridge" or in other words, the Leviathan, a double ender scow working on a cable, with steam for power. This ferry started from the foot of Quincy street in the Village of Houghton, the other end of the cable being on the Quincy Sands directly opposite. The boat was about 100 feet long and had a driveway thru the center of it, wide enough for two teams abreast. It also had two cabins, one on each side, nearly the full length of the boat, and could make the round trip in about 20 minutes. Still, the demand for a bridge grew.

As I said before, in 1871 a charter had been granted for a bridge. This charter was granted on February 15, 1871 by the Board of Supervisors, under Chapter 55 Compiled Laws of Michigan, to Messrs. Will H. Streeter of Hancock and Peter R. Gottstein of Houghton to build a wooden bridge across Portage Lake, from, at or near the foot of Dakota Street in the Village of Houghton to a point opposite, or nearly opposite, on the Hancock side of the Lake.

So, a wooden bridge was planned. It was to be at least 14 feet in the clear above the lake, and 24 feet wide, giving two passages of 60 feet each for vessels.

The board of supervisors established the following rate of tolls, which were about 75 per cent of tolls charged by Martin, with the exception of foot passengers; foot passengers, 5 cents; saddle horses, 20 cents; working wagons and double team, 30 cents; buggies or carriages with either one or two horses, 30 cents; cattle or mules, 15 cents; hogs 10 cents, and sheep, 5 cents.

You see the board placed sheep and foot passengers on the same footing.

Two gentlemen, Will Streeter and Peter Gottstein, organized a company with a capital of $50,000 divided into 5000 shares of $10 each, and tried to place the stock at par. The building of a bridge 1400 feet long over water 80 feet deep seemed a pretty big undertaking and the general public would not invest so the scheme languished.

In the panic of 1873, Streeter failed in business, and Joseph Ames purchased his interest in the charter, and in the same year Mr. Martin built the Leviathan on almost the identical site of the proposed bridge.

In the fall of 1874 Mr. Ames tried to interest me in the proposition. At that time, I was a young Civil Engr. with a little money. I proposed that they wait until a survey could be made, and plans and specifications prepared, so that the probable cost could be estimated, so they waited until the ice formed on the lake and I went ahead with the survey.

I found that the plan would be feasable, using piles, trestle bents and rock-filled crib. Plans were made accordingly, and our estimate showed a cost of about $451,000. By the middle of January, 1875, the preliminary work was completed. I went to Negaunee where my brother-in-law, George Shelden, was in business, to induce him to go into the enterprise. I thought he and I could place at least $30,000 worth of stock with the public and we would make up the balance necessary. He agreed, so we came to Houghton and a company was organized.

I went to Chicago and interviewed several big bridge contractors and induced them to make bids on the job. We finally made a contract with Fox & Howard of Chicago, to build the bridge and turn it over to us complete and ready for business for $47,000.

They began the work immediately and in December 1875, it was finished.

Everything progressed well, except for storm difficulties, until the last panel of the span was being constructed when trouble began. The double ender scow Leviathan's course was about 75 feet east of the end of the protection. Her cable was long and in one windstorm we noticed that she just missed the end of the protection by a few feet. Old John Martin must have noticed, too. During that night the Leviathan's cable was lengthened a few feet and the next day, when the breeze was good and strong from the east, the boat was moving at about three-quarters speed. This allowed her to drift as far to the west as possible. The corner of the ferry struck the point of the protection pier, which had not yet been thoroughly reinforced, and broke off about 20 feet of the east end of the protection and one panel of the swing span. Fortunately no one was injured. Old John Martin was some good hater all right, though he said he never knew who lengthened the cable. The board of supervisors suspended his license until he should shorten the cable.

Later, a ferry boat, Niagara, trying to make things difficult by passing through the draw as often as possible, crashed into the draw-by accident or by design. The boat was put out of commission for a while.

Public opinion forced rulings which limited boat interference. Then a landslide on the Hancock side of the structure closed the bridge for several more months so it was not really opened for permanent use until the spring of 1876.

In 1883, when the Mineral Range Railroad changed management, the bridge co. made the Railroad Co. a proposition to make the present bridge a double deck bridge, the railroad to cross on the lower deck and the teams and passengers level raised to give a clearance of 20 feet above the railroad tracks.

In 1885 the steel structure was built as it stands at present except the swing portion, which was wrecked on April 15, 1905 by the Steamer Northern Wave, when the vessel openings were enlarged to 100 feet each.

The first bridge swing was operated by hand power, one man being sufficient, except in a strong wind, when two men were required. The double deck swing was operated by steam and the last swing by gas and electricity.

Editor's Note—the steel swing bridge was built in 1895 and served the population continuously until last fall, except during a period after April 15, 1905, when the draw was wrecked by the Steamer Northern Wave. At that time the openings were enlarged to 100 feet each.

THREE BANQUET CELEBRITIES and a few of the Bridge Dedication chairmen were gathered together for an informal photo prior to the Dedication Banquet last night in the Douglass House. Sitting are Houghton-Hancock Chamber of Commerce President Milton I. Joffee, who issued the official welcome to dignitaries and guests; Gervase Murphy, the banquet toastmaster, and the Honorable John C. Mackie, Michigan State Highway Commissioner, who delivered the main address. Standing from left to right, are Bill Ryan, co-chairman of the bridge dedication committee; Marty O'Connor, Doll Buggy Parade Chairman; Walter Hansen, Banquet Chairman; Rance Mason, dedication committee co-chairman, and Leo H. Roy, Finance Chairman. (Loranger of Gazette)

Dedication Banquet Attracts 260 People

A crowd of 260 persons filled to overflowing the Douglass House Banquet hall and all adjacent dining nooks and corners last night for the kick-off banquet of the three-day dedication ceremonies for the new Portage Lake Lift Span.

After the Rt. Rev. Msgr. Thomas Drengacz, pastor of St. Ignatius-Loyola Church of Houghton, asked the invocation, banquet Chairman Walter F. Hansen welcomed the guests, then introduced the toastmaster for the evening, Gervase T. Murphy, of Calumet.

During the 'span' of the next few minutes, Toastmaster Murphy managed to 'bridge' the gap from puns to toasts with a 'lift'—before introducing Milton Joffee, president of the Houghton-Hancock Chamber of Commerce.

Mr. Joffee performed the yeoman's task of the evening – naming all the men and organizations which had contributed to the success of the bridge.

A. A. PORTER

Those who helped plan and prepare the festivities of the dedication program were also lauded by Mr. Joffee.

William Hall, accompanied by Grant Richards at the piano, entertained the assembly with three vocal solos: "The Invictus," "The Open Road" and "I Believe."

The toastmaster introduced A.A. Porter, vice president for construction of the American Bridge division of U. S. Steel Corp., who announced that the Portage Lake bridge is not only the largest of its kind, but would soon be the best known bridge in the world, because of the motion picture taken of the ground-breaking and complete building procedure by the steel company, which will soon be released all over the country and abroad. Many millions of people have seen a similar film made of the Mackinac Bridge, he said.

Chairman Hansen was next introduced by the toastmaster, to give the program for the dedication ceremonies on Saturday and Sunday.

The main speaker of the evening, John C. Mackie, Michigan State Highway Commissioner, an-

JOHN C. MACKIE

nounced that the highway department had also made a movie of the building of the bridge, including many of the tourist attractions of the Copper Country served by the new bridge. Prints of the film will soon be available free for any groups that wish to show them, he said.

Mr. Mackie, in his brief address, called the new bridge: "A graphic, tangible symbol of the faith of the people of Michigan and the nation in the future of the Copper Country and the Upper Peninsla;

"A testament to obr belief in you, and a challenge to you to use this bridge and the vastly improved economic lifeline it represents to build a better future."

The evening's program was brought to close with the benediction pronounced by Fr. Herman Page, Jr., rector of the Trinity Episcopal Church of Houghton, and with the singing of "God Bless America," by the assembled banqueters, led by Will Hall.

Normal Phone Service Expected Monday Morning

The Steamer J. F. Schoellkopf departed for lakehead early this morning after discharging its 9,000-ton coal cargo at the Arens Coal Co. wharf in West Hancock.

The vessell, a self-unloader, took about 10 hours to get rid of its load of bituminous coal at the wharf. When it cleared the Canal, it was bound for the Fraser-Nelson ship repair site at Superior, Wis.

There the craft will wait entrance to one of the drydocks for an analysis of damages to its propeller and hull.

Preliminary observation near the Arens wharf after the ship was unloaded showed damaged screw blades. The rudder was undamaged.The analysis was made when the ship was light and the stern elevated by shifting water.

The Superior layover to make necessary repairs were indicated by personnel of the ship as likely to cost some $80,000 or more.

Generally, the skipper was being felicitated for placing his ship where he did. It was indicated that he had sounded numerous blasts for an open bridge. When the lift failed to rise, he threw out the anchor in an endeavor to get the stern to the Houghton shore and protect the ship from incurring hull damage.

During its enforced stay along the Houghton shore, the craft was identified as being the largest ship ever to be delayed in that area. Its 532-foot length blocked Isle Royale and Huron Streets.

Queried this morning as to the probable cost the damage caused by the anchor dropping on the Michigan Bell cables, William S. Ryan said that it was impossible at this stage to set a figure. Trucks and equipment have been brought in from a diversity of areas in the Upper Peninsula and all are working near the South Shore depot in Houghton or the old Hodge Iron Co. site in Ripley. At these two areas, the two cables which carried nearly 1,100 circuits are being replaced. Much of the phone service to the areas north of Portage Lake was cut off although localized service in some of the areas was possible.

Ryan said that there is a possibility that the work will be completed, in the main, by early Monday morning. The two replacements will carry 200 additional circuits.

According to Michigan State Highway Department Publicity Director, Otis Hardy, the lift bridge was in excellent condition at the time the craft came into port. He attributed the lack of the vessel's raising to human failure.

Coast Guard authorities this morning indicated the likelihood of an inquiry into the anchor dropping and the failure of the lift to rise. No indications were available as to when this interrogation will proceed.

Hancock Teen Center Engages Bobby Rydell

The Hancock Teen Center has announced that negotiations have been completed for the appearance

BOBBY RYDELL

locally of one of the country's most popular entertainers and recording stars.

On Friday evening, July 1st, the young people of the Copper Country will have the opportunity of hearing Bobby Rydell who, at 17, is one of the fastest rising young pop singers in show business.

The son of Mr. and Mrs. Adrio Ridarelli, of suburban Philadelphia, Bobby exhibited an early flair for imitations of his favorite singers. His father took the nine-year-old youngster to Paul Whiteman for an audition, and this veteran confirmed the family belief in Bobby's talent by signing him to his TV Teen Club.

In the eight years since his debut, Rydell—whose name was changed at Whiteman's suggestion—has come a long way. Today audiences find him a good-looking, athletic young man, with a sunny personality to match his bright singing style.

Following his work with Whiteman, Bobby worked local Philadelphia night clubs, accompanied by his dad. For awhile he was a member of a group known as "Rocco and the Saints", along with another new popular young man, Frankie Avalon.

When Bobby was fifteen, and performing in a New Jersey club, he met Frankie Day, who became his manager. Day wisely chose to make his protege a polished performer through a rigid, grinding schedule of dancing lessons, vocal coaching, guitar and drum practice.

The Hancock Teen Center, in brining Bobby Rydell to the Copper Country is following its policy of providing top talent for the enjoyment of all teens of the area. The dance on July 1 is from 9:00 to 1:00.

CHASSELL

CHURCH SERVICE

The Rev. John Suks has announced that services at the Immaculate Heart of Mary Church will be held at 9:30 a.m. until July 24.

D. A. V. SETS MEET

There will be a special meeting of the Disabled American Veterans, Chapter No. 115, Tuesday, June 28, at 8 p.m. in the Chassell Community Center.

CELEBRATES ANNIVERSARY

Friends of Mr. and Mrs. Stanley Shebuski helped them celebrate their 40th wedding anniversary. A potluck dinner was served.

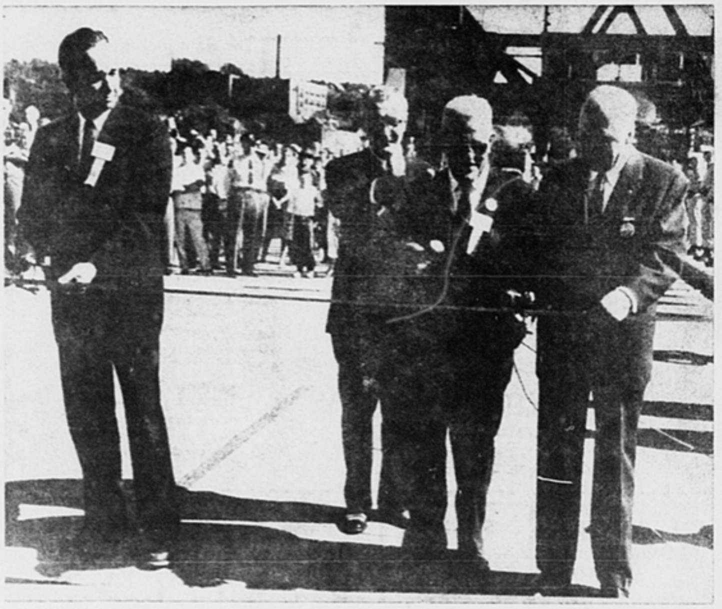
Today's Chuckle
Old-timer: One who remembers when the moon inspired only romance instead of space travel.

The Daily Mining Gazette

THE HOME NEWSPAPER FOR MORE THAN 100 YEARS
Largest ABC Circulation of any Advertising Medium in the Copper Country

The ideal wife is one who knows when her husband wants to be forced to do something against his will.
—Sydney J. Harris

VOL. SIXTY ONE. No. 242. HOUGHTON, MICHIGAN MONDAY, JUNE 27, 1960 TWELVE PAGES PRICE TEN CENTS



THE FORMAL DEDICATION RITES of the Portage Lake lift bridge took place when the traditional ribbon was cut. It spanned the four lanes and was held by Michigan Tech coeds, Lee Schirmer of Houghton and Diane Henderson of Hancock. From left, Michigan Highway Commissioner John C. Mackie, former Senator Leo H. Roy, County Highway Engineer William Kaiser and Secretary of the Army Wilber Brucker. (Gagnon of Gazette)

Sabotage Hinted in Big Cuban Munitions Blast

HAVANA (AP) — Cuban army officials today said it was premature to say anything about the origin of a munitions dump explosion that rocked Havana with the force of an earthquake, killing one person and injuring more than 50.

Fidel Castro ordered the bomb site sealed off immediately after the blasts Sunday night stunned Cubans in the capital just before 7 p.m. and shattered windows over a four-mile area.

An army communique appeared to put the damper on unconfirmed reports of sabotage.

The explosions — two small blasts and one terrific outburst — created a frenzy in the capital.

Crowds rushed wildly about the streets, some splattered with blood.

Galiano Street, Havana's shopping center was littered with glass.

One young militiaman poking angrily about the shattered glass fronts muttered: "Los Americanos, Los Americanos."

A traffic jam developed as streams of autos and crowds milled about. Many persons appeared dazed and in a state of shock.

Castro himself had a narrow escape when his car crashed into another car racing to the scene. He jumped into another car and kept going.

The Prime Minister and President Osvaldo Dorticos, who inspected the area with him, had no immediate statements.

Flying glass caused most of the casualties in the blast—the second munitions explosion in Havana Bay in three months.

The munitions dump was on a tongue of land less than a mile from where the French ship La Coubre blew up March 4 while unloading munitions, killing about 100 persons.

Castro suggested that U.S. officials were to blame for the La Coubre explosion but admitted he had no evidence to back up his suspicions. U.S. Secretary of State Christian A. Herter denounced Castro's statements as baseless and accused him of attempting to stir up anti-American feelings among Cubans.

Musician Faces Federal Quizzing In Slaying of 9

BALTIMORE (AP) — Federal attorneys confer today about their next move against a man charged in the slaying of five persons and wanted for questioning in the murder of four others.

Four members of a Virginia family are among the victims.

Melvin D. Rees Jr., 31, a dance band musician and piano salesman, is in jail at Memphis, Tenn., awaiting a July 6 hearing on the charges.

U.S. Atty. Leon H. Pierson of Baltimore said he would meet with Asst. Atty. Gen. Malcolm R. Wilkey, head of the Justice Department's criminal division.

Pierson said if Wilkey concurs, the case will be taken before the federal grand jury in Baltimore Tuesday.

The FBI explained that a federal grand jury indictment would permit Rees' transfer to Maryland merely by proving to the U.S. commissioner in Memphis that Rees is the man named in the indictment.

The FBI arrested Rees Friday in West Memphis, Ark., where he was selling pianos. The federal warrant charged him of unlawful flight to avoid prosecution in the 1957 murder of Margaret V. Harold.

Within 24 hours, he also was charged in the slayings of the Carroll V. Jackson Jr. family of Apple Grove, Va., and police indicated he would be questioned about four other murders—dating back to 1953—in a triangular area formed by Washington, Baltimore and Annapolis.

The FBI here has declined to discuss possible motive in any of the nine slayings.

Eisenhower Ready To Report on His 'Successful' Tour

WASHINGTON (AP) — President Eisenhower held long conferences today on international and other affairs with Vice President Richard M. Nixon and Secretary of State Christian A. Herter.

They discussed, among other things, the President's planned 6:30 EST television-radio report to the nation tonight on his 23,000-mile goodwill mission to the Far East. Eisenhower is reported to feel the trip strengthened U.S. ties with Allied countries he visited and was a big success despite cancellation of his visit to Tokyo.

With Herter and Undersecretary of State C. Douglas Dillon, Eisenhower talked over the international situation including the walkout of Soviet delegates today from the disarmament conference at Geneva.

Press secretary James C. Hagerty said the President and vice president discussed the outlook for administration bills pending in Congress.

The chief executive returned to the capital Sunday exactly two weeks after setting out on the trip which took him to Alaska, the Philippines, Formosa, Korea and Hawaii.

He was to have visited Japan as the climax of his tour beginning June 19 but Premier Nobusuke Kishi withdrew the invitation when left-wing and Communist-led riots against a new U.S.-Japanese security pact caused him to decide he could not guarantee the President's safety.

Stepping jauntily down the ramp from his jet airliner at Andrews Air Force Base, Eisenhower appeared tanned and rested after six days of golfing in Hawaii.

"How was your trip, Mr. President," a reporter asked.

"Oh, pretty good," Eisenhower replied.

Vice President Richard M. Nixon and Secretary of State Christian A. Herter headed a group of officials and foreign diplomats who welcomed him home.

Johnson Denies Issuing Threat To Williams

By THE ASSOCIATED PRESS

Michigan's two top Democrats spoke up on intra-party affairs over the weekend — and both figuratively got poked in the nose.

One was Gov. G. Mennen Williams. The other was National Committeeman Thomas H. E. Quimby.

Williams told a news conference at the National Governor's Conference in Glacier National Park, Montana, that he had been told Sen. Lyndon Johnson (D-Tex) had threatened to torpedo a medical bill for the aged if Williams came out for Sen. John F. Kenneday (D-Mass) for president.

Williams said the word of warning was passed to him by Mrs. Mildred Jeffrey, alternate Michigan Democratic national committeewoman, shortly before Williams came out for Kennedy for president June 2.

Mrs. Jeffrey said that he (Johnson) probably wouldn't go for the bill of the announcement (for Kennedy) were made at this time." Williams told newsmen. He added Mrs. Jeffrey got her information from Walter P. Reuther, president of the United Auto Workers Union, who said he got his from Johnson.

Johnson shot back in Washington, as soon as he learned of Williams' statement, that it was "totally untrue" and described it as "pure political convention nonsense."

Brain Injury Fatal To Parole Violator

IONIA (AP) — Victor McMahan, 23, of Benton Harbor, died Sunday in the Michigan Reformatory Hospital of a brain injury suffered in an auto accident in Chicago in October.

McMahan was serving two concurrent terms for forgery and uttering and publishing. He was sentenced to 1½ to 14 years in 1958 and returned here in December as a parole violator.

TOP MARBLE SHOOTER

EATON RPIDS (AP) — Jewell Dixon, 15, of Mc Minnville, Tenn., is the new national marble shooting champion. Dixon won the title Saturday by defeating Ronnie D. Rogers, 11, of Gainsville, Fla., in the Veterans of Foreign Wars tournament.

Flags Fly, Bands Play, Jets Zoom, at Bridge Ceremonies

Army Sec. Brucker Officially Dedicates Span in Ike's Name

At 2:45 Saturday afternoon, with 1500 spectators swarming the reaches of the new Portage Lake Lift span, and thousands more lining the streets adjacent to the bridge, the Fifth Army Band began the preliminary ceremonies as it marched up the northern approach to the bridge to the stirring strains of martial music.

The band was followed by regular Army and National Guard troops. From the opposite end of the bridge, Air Force and Naval Reserve units joined them at the center span. The troops lined themselves along the center barrier between east and west traffic lanes and stood at spaced intervals throughout the ceremonies.

Shortly after, the first motor cavalcade of State dignitaries arrived, led by State Highway Commissioner John C. Mackie and Senator McManiman.

As these gentlemen seated themselves on the speakers' platform, the L'Anse Drum and Bugle Corps, garbed in their colorful red and gold uniforms, marched up the southern approach, bugles blaring to the stirring beat of the drums.

At 3:10, the Calumet High School Band at the Hancock entrance to the bridge signaled the arrival of the six-car Lincoln Continental motorcade from the Miscowaubik Club, carrying Secretary of the Army Wilber M. Brucker, his Washington guests and other dignitaries. As the honored guests took their places on the speakers' platform, the Fifth Army Band took up the strains of the "Army Song."

Then, at 3:15, as the Color Guard presented 'Old Glory' before the speakers' platform, the Army Band playing the patriotic "Stars and Stripes Forever," three U. S. Air Force jets, in tight formation, zoomed overhead from out of the east leaving a deafening roar in their wake as they diappeared to the west.

The formal ceremonies, dedicating the new Portage Lake Lift Span, were underway.

The Rt. Rev. Thomas A. Drengaser, pastor of the St. Ignatius Loyola Church of Hancock, asked the invocation.

Master of Ceremonies, Leo H. Roy, former State Senator of Hancock, introduced each of the more than two-score distinguished guests on the platform.

Mr. Mackie was the first speaker. The State Highway Commissioner reiterated his earlier statement

Continued On Page 7)

Sam M. Cohodas Controls Largest Of U.P. Banks

Control of the First National Bank and Trust Co. of Marquette, the Upper Peninsula's oldest and largest national bank, has been obtained by S. M. Cohodas, Ishpeming.

Sam Cohodas, president of the Miner's First National Bank of Ishpeming since 1934 and president of Cohodas Brothers Co., one of the nation's largest fruit and vegetable distributing firms, purchased in excess of 50 per cent of the outstanding common stock from Young Kaufman, according to a letter sent to minority shareholders.

Terms of the sale becomes effective July 5. Negotiations leading to the transaction were carried on for nearly three months.

In his letter, Mr. Cohodas advised shareholders that they may sell their shares at the same price Kaufman received for his majority interest in the bank.

Young Kaufman succeeded his father, Louis G. Kaufman, as president of the bank in 1942. His father, who had been in the banking business in New York City at one time, served as president from 1908 until his death 18 years ago.

The First National Bank was founded by a group of Marquette pioneers in 1864.

Thousands Flee Homes as Floods Hit Gulf Coast

HOUSTON, Tex. (AP) — Swift flood waters raced through a huge section of the Texas Gulf coast Sunday sweeping some persons to their death and forcing thousands from their homes.

The floods caused by steady and heavy rains since Thursday, were called the worst disaster to hit some towns since a 1945 hurricane.

Eight persons drowned since Thursday. Two are missing and presumed dead.

Flood waters began to recede Sunday night but more thundershowers were forecast for today.

Up to 30 inches of rain fell in some areas since Thursday, forcing the Brazos River at West Columbia 10 feet above flood stage. Port Lavaca requested aid from the Navy and the 4th Army. Cots and blankets were sent to the city by helicopter and trucks.

Thousand Battle Huge Forest Fire Near Grand Canyon

By THE ASSOCIATED PRESS

Timber or brush fell today before three Western fires—two in California and one of the worst in Arizona's history.

Flames in the Kaibab National Forest about six miles from the north rim of Grand Canyon National Park had charred 7,500 acres of timber, scrub pine and brush. A thousand men were fighting it.

An uncontrolled blaze forced the closing of the southwest entrance to Sequoia National Park in central California. Approximately 2,000 acres of brush were consumed. Between 50 and 75 carloads of campers were evacuated. Control was expected today.

In the foothills north of Los Angeles, 800 men Sunday night contained a fire that in two days destroyed some 1,700 acres of watershed. Firemen mopping up the fringes hoped to have it fully controlled by tonight.

WEATHER

West Upper Michigan: [illegible]

Red Bloc Quits Disarm Meeting

GENEVA (AP) — The Soviet bloc walked out of the 10-nation disarmament talks today. The Russians and their communist allies curtly ignored a new American plan for a world disarmament treaty.

Soviet Deputy Foreign Minister Valerian Zorin and his colleagues charged the West had refused to negotiate. Zorin said the Soviet Union will place its new plan for "generally and complete disarmament" before the U.N. General Assembly.

Poland's Marian Naszkowski, chairman for the day, rejected all the Western delegates' demands to be heard and, after recognizing all the Soviet bloc delegations in turn, joined in the walkout.

The Western delegations decided to continue the meeting alone under the chairmanship of British Minister of State David Ormsby-Gore.

U.S. delegate Frederick M. Eaton then presented the new American disarmament plan, which was still under negotiation among the five Western delegations.

The plan, drafted by Eaton and State and Defense Department officials in Washington last week, provides for three carefully controlled stages of disarmament beginning with the establishment of an international disarmament control organization under the United Nations.

Walking out with the Russians were the delegates of Czechoslovakia, Poland, Romania and Bulgaria. Remaining were the representatives of the United States, Britain, France, Italy and Canada.

Zorin's announcement brought an end to the conference which first opened on March 16 and recessed for six weeks before and after the abortive summit meeting in Paris.

Added Cold War Pressures Seen By Sec. Gates

WASHINGTON (AP) — Secretary of Defense Thomas S. Gates Jr. says the Soviet Union is not likely to start a major war, but may cause cold war pressures "that might involve us in minor military actions."

But he contended during a television interview Sunday that "we're militarily ready and sound" to deal with either a small conflict or a major war.

"Our readiness is intact and sensible, and we can quickly deploy forces and augment forces if we need to do so," he said.

He urged Congress both to provide funds for a new Navy aircraft carrier and to increase the amount voted by the House for foreign aid.

The carrier "is probably one of our great limited war weapons systems," Gates said.

DULLES VISITS BONN

BONN, Germany (AP) — Allen Dulles, chief of the U.S. Central Intelligence Agency, visited Bonn briefly today. He reportedly is looking over the European intelligence setup.

Committee Hits G.O.P. Handling Of U2 Incident

WASHINGTON (AP) — The administration's handling of the U2 spy plane case lacked direction more than anything else, says the Senate Foreign Relations Committee.

The committee, after hearing testimony from several administration officials, made public its critical report Saturday night. It said the incident at least gave Soviet Premier Nikita Khrushchev an excuse for scuttling the Paris summit conference.

Committee members generally agreed that administration leaders, the White House, state and defense departments, the Central Intelligence Agency and other key agencies showed a lack of centralized control.

"At crucial points the coordination broke down," the report said. "There are few, if any, references in the record to direction and this seems to the committee to be what was most lacking in this period."

"If this direction is not to come from the White House, then it ought to be made clear by the White House that it is to come from the State Department," it added.

ND Senate Race Could Well Be Fall Barometer

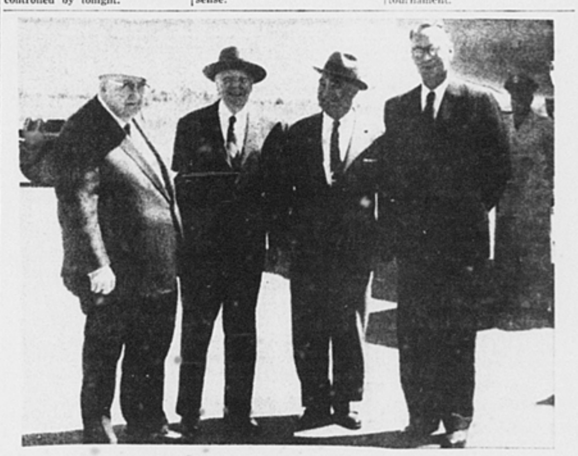
FARGO, N.D. (AP) — North Dakota's neck-and-neck Senate race comes down to the wire today, watched by the nation as a potential weather vane in the presidential election next fall.

The contest pits Gov. John E. Davis, a Republican, against Rep. Quentin Burdick (D-ND). At stake is a seat in the Senate left vacant by the death of Republican Sen. William Langer.

Political analysts are watching it closely for these reasons:

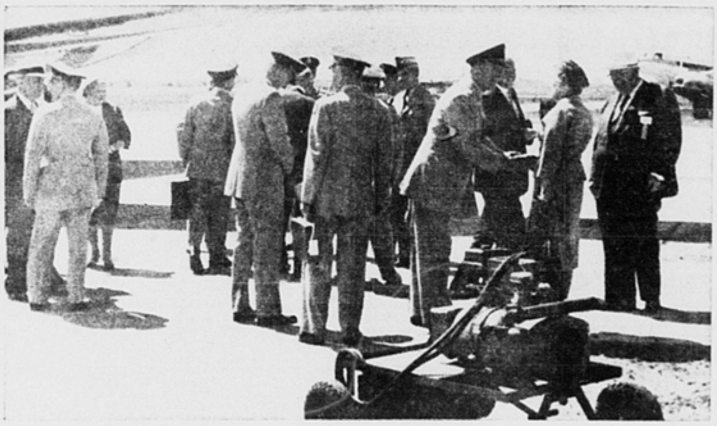
1. As a possible barometer of the farmers' feelings toward Secretary of Agriculture Ezra Taft Benson and his farm policy, and therefore the outlook in the farm belt for the Republicans next November.

2. The outlook for the GOP in a state which, until recently, has been a rock-ribbed Republican stronghold.



THIS QUARTET was snapped at the Memorial Airport after the Secretary was officially welcomed to the Copper Country by his host, Jack Rice. Next to Secretary Brucker is Frank Millard, legal advisor to the Secretary, and 12th District Congressman John B. Bennett. (Loranger of Gazette)

New Bridge Dedicated With Pomp, Pageantry



A SCENE at Memorial Airport taken soon after Secretary Brucker's plane with his guests arrived. In the foreground Mrs. Brucker is being greeted by Col. Harry O. Fischer. (Loranger of Gazette)

A GROUP PICTURE taken of the pre-dedication banquet held in Secretary Brucker's honor at the Miscowaubik Club, at which 46 were present. (Loranger of Gazette)

LT. GEN. EMERSON C. ITSCHNER, chief of engineers, taken during his offical talk at the dedication ceremonies. (Loranger of Gazette)

THREE OLD SOLDIERS, all of whom saw action in World War I are shown reminiscing. Left to right are Assistant Secretary of the Army Dewey Short, who represented Missouri in Congress for 24 years; Julius T. Nachazel, who served as an officer with the famous 77th Division, and George "Ted" Unsworth. (Loranger of Gazette)

JACK RICE host of the luncheon in honor of Secretary Brucker is shown as he concluded his official welcome. On his right is the guest of honor; on his left seated are Lt. Gen. Itschner, Herman "Winks" Gundlach and Major Gen. W. F. Cassidy. (Loranger of Gazette)

DR. ALFRED "Joe LeBeau" LaBine struck pay dirt with a couple of his famous French stories. Left to right are Cong. John B. Bennett, Carl F. Winkler, referred to as the father of the new bridge; "Joe LeBeau" in action, Gervase Murphy, Dewey Short and Secretary Brucker. (Loranger of Gazette)

IN A SERIOUS MOMENT, Secretary Brucker told the gathering how happy he was to be back in the Copper Country to renew his friendships of long standing. Shown left to right are Asst. Secretary Dewey Short, Secretary Brucker and Jack Rice. (Loranger of Gazette)

Dedication Address

Brucker Outlines 'Forward Strategy'

Secretary of the Army Wilber M. Brucker, in his dedication address from the speakers' rostrum at the center of the new Portage Lake lift span bridge Saturday afternoon, deemed it "a welcome privilege to be back home and to join with old friends and fellow citizens of the State of Michigan in dedicating this splendid new bridge."

The Secretary stated that his pleasure at returning home was heightened by the fact that "the project whose completion we are celebrating represents another notable achievement in co-operation between this great State and the Department of the Army, which I am honored to represent."

Mr. Brucker declared that the new bridge will encourage ore ships and other large vessels — all the sheltered short cut provided by the Keweenaw waterway; which they have avoided in the past because of the difficulties encountered under the old swing bridge.

Any project which contributes so many obvious benefits to the growth of the American economy also adds greatly to the defense of our nation, he asserted.

The Secretary then proceeded to delineate the new "forward strategy" adopted by this country to create a national security of "new dimensions" capable of coping with the rapid advancing Communist threat.

These dimensions he outlined as "immediacy of threat, totality, breadth and scope."

On Imediacy of Threat: "For the first time in our history, the continental United States is subject to serious destruction by foreign military aggression."

On Totality: "In other times, military power was the chief tool of a would-be conqueror. Today, all elements of Communist power — military, economic, political and psychological — are integrated in the Soviet plot to force communism on all mankind. "Our efforts to counter their potential dare not be any less," he said.

On Breadth: At the one end of the spectrum is cold war, with Communist power used to intimidate weak and helpless nations, at the same time nibbling away the free World "through coercion, black mail, infiltration and corruption."

"At the far end of the spectrum is total nuclear war," the Secretary declared. "Only a complete deterrent — with offensive and defensive capability covering the entire war spectrum — can match the threat and stop the Soviets from reaching their goal of world domination," he said.

On Scope: "To cope with the Sino-Soviets we must encompass the entire globe. No longer can we think in terms of isolation — such as 'Fortress America,'" he stated.

To meet these new dimensions, the U. S. "has adopted the 'forward strategy' designed to create — with our Allies — a stout barrier against communistic aggression at critical points throughout the world. It is the basis of our present national military policy which links the U. S. with more than 40 other nations . . . in a world-wide structure of collective security," he said.

What America will be tomorrow depends upon the acceptance by each of us of our responsibility in the light of these "new dimensions," the Secretary declared.

The liberties of all mankind depends on how well we measure up in character, courage and dedication to the tenets of our American faith, he said.

Secretary Brucker concluded his address as follows:

"As this new bridge links two physical shores here in Michigan, so must our national will and determination, our firm adherence to the principles which made this Nation great, and our willingness to make every effort and sacrifice for the cause of freedom, stand as the world's bridge between war and peace.

"It must be a bridge broad enough to accommodate the needs of all those throughout the world who look to America for leadership in the quest for true and lasting peace.

"It must be long enough to carry us to the uttermost goal of our hopes and dreams, no matter how far the journey.

"It must be lofty enough to rise above the most turbulent currents of doubt, suspicion, fear, and irresolution, which could divide and eventually destroy the Free World.

"This splendid structure of steel and masonry crossing the Keweenaw Waterway symbolizes the faith of the American people in themselves and in the future of this Nation. It is in recognition of that faith, and the spirit which sustains it — the spirit which over the years can and will erect that greater span which will bring humanity peace with justice — that I now in the name of the President of the United States — dedicate the Houghton-Hancock Bridge to the public service."

GERVASE T. MURPHY, who emceed the luncheon, was in rare form. Left to right are Dr. Alfred LaBine, Col. John Allen, Emcee Murphy and Secretary Brucker. (Loranger of Gazette)

Red Carpet Rolled Out For Secretary of Army

Secretary of the Army Wilber M. Brucker and his official party as well as other high ranking officers and his personal friends were given the "red carpet" treatment, as only the Miscowaubik Club can do it, for a luncheon at which the Secretary was guest of honor, with his friend of 30 years' standing, Jack Rice, as host.

Following the social session which gave them all ample time to renew old friendships as well as acquire new ones, the guests ambled downstairs to a beautifully decorated table set for 46 persons. Pete Boggio, the generalissimo at the club, came in for much praise from the visiting dignitaries, who proclaimed it one of the nicest affairs they had ever attended. Pete graciously accepted the acclaim and gave due credit to the culinary department as well as to the women for their gracious service.

Following the luncheon the host opened the forensics with a few words of welcome, during which he thanked Secretary Brucker for the personal sacrifices he had made to be present at Saturday's dedication ceremonies. He then introduced Gervase T. Murphy, who was in especially good form with a series of appropriate witticisms.

Dr. Alfred LaBine told a couple of his famous French stories, which, in the parlance of the theater "brought down the house."

Others who spoke briefly were Lt. Gen. Emerson C. Itschner, Asst. Secretary Dewey Short, Cong. John B. Bennett and Carl F. Winkler, with the guest of honor closing the program in a serious vain in which he described his love for the U.S.A., Michigan and the Copper Country.

The cavalcade of cars then zoomed back to Hancock, again with State Police escort, and the bridge dedication was begun.

Those in attendance were Secretary Brucker, Asst. Secretary Dewey Short, Lt. Gen. Emerson C. Itschner, Major Gen. W. F. Cassidy, Brig. Gen. John Leary, Col. John R. Guthrie, Col. Harry O. Fischer, Col. Deslodge Brown, Col. John Allen, Lt. Col. H. Glen Wood, Lt. Col. A. J. Hoebecke, Major John Wadsworth, Capt. John R. Davies, Captain Higgis, Specialist Packala, Cong. John B. Bennett, Philip McCallum, Frank Ableman, Ralph S. Knowlton, Alfred Rosenthal, Wesley Dibbern, Frank Millard, Archie Frazier, Fred England, Douglass Briggs, Dr. Hudnut, Major Gen. McDonald, Col. Raymond Hicks, Capt. Wilbur Kreigh, Carl F. Winkler, Leo H. Roy, William P. Nicholls, Bill Kaiser, Julius Nachazel, Bert Stott, Paul Dashine, Ted Unsworth, Harry Cohodas, Herman Gundlach, Gervase T. Murphy, Dr. Alfred LaBine, Dr. Forrest Larson, Ken Dorman, Dick Loranger and Ted Pearce.

AFTER SIX HOURS of action two old friends are shown saying Adios. Jack Rice is wishing the Secretary bon voyage and Au Revoir. (Loranger of Gazette)

SECRETARY OF THE ARMY Wilber M. Brucker as he was making his official dedication address on the span of the new Portage Lake Lift Bridge. (Loranger of Gazette)

UNION JACK LOWERED

LONDON (AP) — The Union Jack was lowered in British Somaliland Sunday and the East African territory celebrated a new status.

British colonial authorities wound up their 73 years of rule over the 68,000 square miles of country on the horn of Africa.

Johnson Supporters Organize in State

WASHINGTON (AP) — Sen. Lyndon B. Johnson's (D - Tex) backers in Michigan have organized but they said they aren't going to try to convert the majority of the state's delegation from supporting Sen. John F. Kennedy (D - Mass). Robert Herndon, a Dearborn real estate dealer, and Harold Mountain, a Detroit attorney, announced the formation of a Michigan "Citizens for Johnson" committee Saturday.

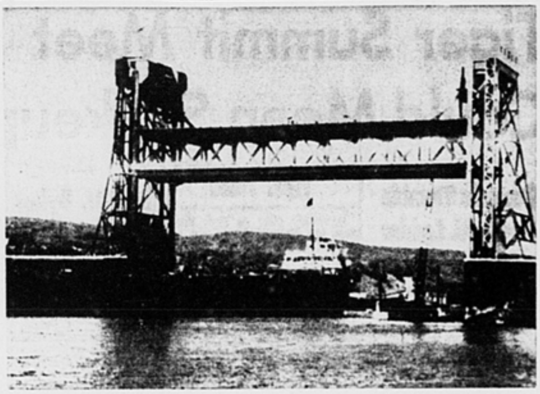
BETANCOURT RECOVERING

CARACAS, Venezuela (AP) — President Romulo Betancourt is making a good recovery from burns suffered in an assassination attempt last Friday. Doctors allowed him to get out of bed Sunday night.

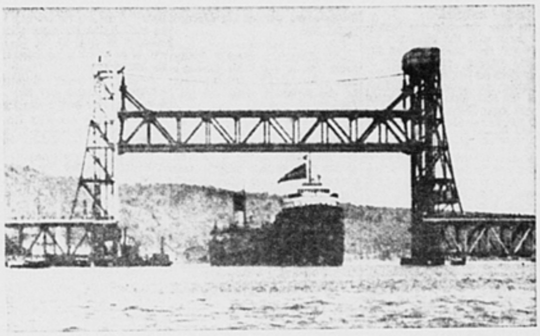
ORCHARD SALE TOLD

LELAND (AP)—Redpath Orchards — reputedly one of the world's largest cherry orchards — has a new owner. Henry Harrison, its owner for 30 years, sold the orchard to John Fisher of Muncie, Ind., vice president of Ball Brothers Inc.

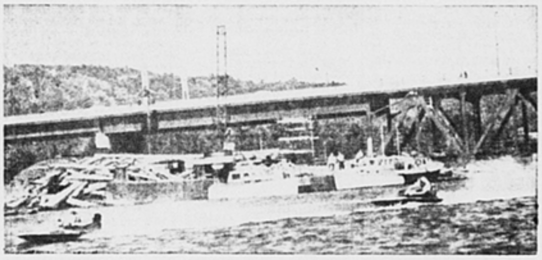
A REUNION after 30 years between Msgr. Thomas A. Drengacz, Secretary Brucker and Jack Rice. All three reminisced about the Legion convention held in Houghton in 1931 during which time Father Tom was U. P. chaplain, Secretary Brucker governor of Michigan and Jack Rice was Upper Peninsula Legion commander.



THE STEAMER THOMAS WILSON was the first ship to pass under the lift of the Portage Bridge Saturday morning. A vessel, more than 600 feet long, it has a capacity of some 13,000 tons. The oldest steward in terms of service, James Langridge is chief of the galley. The Second cook is William Sullivan of Houghton. (Gagnon of Gazette)



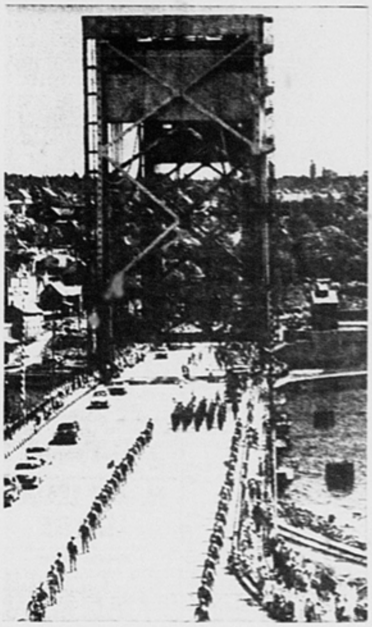
ADDING TO THE EXCITEMENT of the Sunday afternoon races was the passage of the George Sloan ore carrier of the Pittsburgh Steamship Lines under the newly dedicated Portage Lake Lift Span. Shortly after, the Ranger III passed through from the opposite direction. (Falge of Gazette)



HYDROPLANES skid around the northeast turn on the final lap of the Class D race. These two men won first and second places.

ROARING OVER THE FINISH LINE in the CDF racing runabout event Sunday afternoon are Tom Thornton and Fred Lonsdorf, capturing the first two places in the race. An estimated several thousand persons watched the races from the Naval Reserve Wharf, pleasure boats, both sides of the waterway, and the bridge. (Falge of Gazette)

OVER 200 PERSONS enjoyed themselves thoroughly at the bridge dedication smorgasbord held in the Scott Hotel Saturday evening after the ceremonies on the lift span. Pausing from their feasting long enough for the photographer to take a "shot" are, left to right, "Woody" Barkkari, Chippewa Motel owner; Mrs. Raymond Peters Northernnaire Motel proprietor; Mrs. Verna Masini; Gabe Masini, road commission project foreman, and Mrs. Helen Barkkari. (Loranger of Gazette)



THE FIFTH ARMY BAND here led the line of march southward to the Portage Lake Bridge dedication. Following the band were Regular Army troops and the National Guard. Traffic on the two right lanes were cut off for vehicle traffic, the two left lanes used for thru traffic between Hancock and Houghton. (Peterson of Gazette)

AT THE START of the dedication ceremony, when the band was playing Stars and Stripes Forever, three swept-wing jets passed overhead in an impressive, low-altitude salute. The tremendous strength of the U.S. Air Force was shockingly evident to everyone on the bridge at that moment. They returned again for another faster-than-sound pass in single file from the opposite direction.

CURTIS GLANVILLE, former music director at Houghton High School, couldn't let the un-occupied piano at the Scott go to waste, so took the occasion to "bat" out a few bars from old standards. All of which added to the enjoyment of those attending the Smorgasbord. (Loranger of Gazette)

Flags Fly

(Continued From Page 1)

that the new bridge is "a graphic tangible symbol of the faith of the people of Michigan, and of the nation, in the future of the Upper Peninsula and the Copper Country.

Lt. Gen. Emerson C. Itschner, Chief of the U. S. Army Engineers Corps., paid tribute to the contractors and builders of the new bridge, and to the people of the Copper Country who envisioned and brought into being the magnificent structure.

Cong. John B. Bennett, of Michigan's 12th Congressional District, reviewed the steps in the birth and growth of plans for the new bridge, and then introduced the main speaker of the day, Secretary of the Army, Wilber M. Brucker.

At the close of his speech (details of which appear elsewhere on this page) the Secretary paid tribute to President Eisenhower, "a man whose devotion to his national and worldwide responsibilities cannot be questioned, a man who will go down in history as one of the country's greatest Americans."

Then, in the name of the President, Sec. Brucker officially dedicated the Portage Lake Lift Span bridge "to the public service."

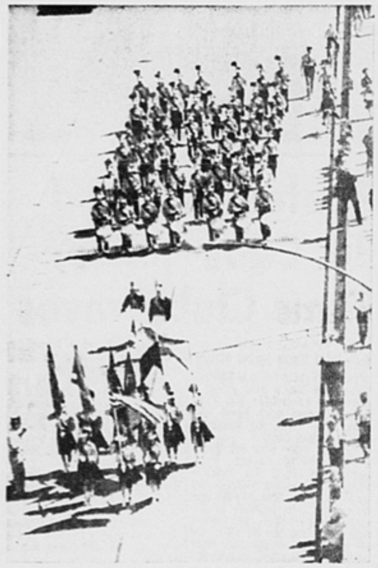
Sec. Brucker and Commissioner Mackie then performed the symbolic "cutting-of-the-ribbon" ceremony, simultaneously cutting a brightly colored ribbon with copper shears. The ends of the ribbon were held by two honorary captains of the Michigan Tech ROTC, in the lovely persons of Miss Lee Schirmer, representing Houghton, and Miss Diane Henderson, representing Hancock.

The Rev. Phillip E. Fisher, pastor of the Painesdale Methodist Church, pronounced the benediction, closing the two-hour ceremonies.

SON SALUTES FATHER

Long after the ceremonies were concluded and the span cleared of spectators, the L'Anse Drum and Bugle Corps lingered on the bridge. The reason for their tarrying became apparent when the center span rose shortly after 5 p.m. to allow passage to the B. F. Jones.

As the steamer passed under the raised span, the corps, assembled near the edge of the northern approach, played a musical salute to the Skipper of the Jones, Capt. George Skuggen. Leading his fellow bandsmen was Capt. Skuggen's son, Robert Skuggen.



MARCHING from the south end of the bridge toward the center span just prior to the dedication ceremony is the L'Anse Drum and Bugle Corps, one of the finest marching bands in the Copper Country.

EVERYTHING LOOKS SO GOOD, said John Heikkinen, left, chairman of the Smorgasbord event, it's no wonder that every body is heaping their plates. Behind Heikkinen are Mrs. William Ryan and her husband, Bill, who was co-chairman of the Dedication Planning Committee. (Loranger of Gazette)

UNSTABLE is about the best description for the tiny, semmingly overpowered craft that raced on the Portage waterway Sunday. The man who is driving on of these racing boats can feel the balance of the craft in his knees as he kneels in the cockpit. Some might say that this is a young man's sport, but that isn't always ture. One of the top drivers in the fast hydroplane races was Ted Davis, 68 years old, from Oakland, Calif. (Falge of Gazette)

ONE OF THE PRIZE WINNERS of the Doll Buggy Parade held Friday afternoon over the new Portage Lake Lift Span Bridge was little Miss Paula Heikkinen of Houghton. Note the elaborate decoration with which Paula (or perhaps her mother) designed her buggy. With over 100 youngsters entered in the parade, no wonder judges were in a dither selecting winners when there were many carefully trimmed buggies such as this one. (Loranger of Gazette)

MIRROR OF YOUR MIND

By JOSEPH WHITNEY

Is a cancer cure "just around the corner?"

Answer: Dr. E. V. Cowdry, Washington University researcher, thinks not, and described predictions of an early cancer cure as psychologically bad. Overly favorable reports tend to give people a false impression that there is no longer any need to watch for potentially dangerous symptoms in themselves. He said today's medical scientists can recognize and treat cancers somewhat better than formerly, but little progress has been made in treating very advanced cancers.

Do most people have pet peeves?

Answer: Yes, but the more mature an individual is the fewer pet peeves he is likely to have. Most of our stereotyped irritations relate to the irksome habits of other people. Psychological studies have found that persons most likely to trigger irritations and resentment are the chronic arguers, the dedicated critics, the sickness complainers, and those who push ahead of others in queue-lines. Secondary irritations include inattention and superiority.

Are delusions a form of insanity?

Answer: Not necessarily. A delusion is a false belief that is held against contrary objective evidence, and most people have a few such beliefs. For example, a person may grossly over-rate his importance and make ridiculous, unrealistic demands of others. This is a neurotic attempt at adjustment. An insane person with delusions of grandeur loses all touch with reality; he simply assumes royal prerogatives and commands other people to do his bidding.

MICHIGAN MIRROR

Non-Partisan News Letter

By ELMER E. WHITE
Michigan Press Assn.

Job security in the upper reaches of state government is a question that bothers some of the heads of state departments.

Elected officials, of course, expect to take their chances every time their name goes before voters at the polls. But many of the men holding top administrative jobs are appointed.

The Civil Service Commission has decided to make a study to find out if there is a need to put some—or all—of these appointive jobs under the classified service.

Present regulations call for keeping the top jobs unclassified and not covered by Civil Service.

The philosophy behind this is that men holding these positions would want to do so strictly on the strength of their own ability to perform required duties adequately.

Perhaps more importantly, the Civil Service Commission has assumed that appointing authorities—the Governor, state commissions or boards and the top administrators themselves—would want to hold the power to replace an administrator at will.

The Civil Service provision in the state Constitution reads as follows:

"The state civil service shall consist of all positions in the state service except those filled by popular election, heads of departments, members of boards and commissions, employees of courts of record, of the Legislature, of the higher educational institution recognized by the state Constitution, all persons in the military and naval forces of the state, and not to exceed two other exempt positions for each elected administrative officer, each department, board and commission."

But several men holding these positions, and groups with authority over them have requested that they be classified in recent years.

If and when the Civil Service Commission decides to classify top positions, a competitive examination would be scheduled for each one.

The incumbents would have to pass the exams and be among the top three contenders in order to be eligible for appointment.

Four positions for which classification requests were received, and which triggered the Commission decision to study the situation were Mental Health Director, now held by Charles F. Wagg; Deputy Mental Health Director, where the incumbent is Dr. Vernon A. Stehman; now held by James D. Ramsey, and Secretary-Manager of the Upper Peninsula State Fair, presently occupied by Ray La Forte.

A gentle chiding to certain county officials was administered recently by Attorney General Paul L. Adams.

Adams said lawyers and District Attorneys in California had contacted him recently about failure of the Michigan officials to act in some cases involving the Uniform Reciprocal Enforcement of Support Law.

The statute has to do with payment of alimony and other domestic money matters.

The Michigan Attorney General urged the county officials to take prompt action to process requests filed through the California courts—and courts in other states with which Michigan has reciprocity agreements—to avoid creating a "disadvantageous situation."

"Michigan has enjoyed prompt and effective cooperation from all state and local officials in California," Adams said in a letter to prosecutors and county clerks.

Required Military training will have a new look at Michigan State University this fall.

A recent controversy, which waxed hot and heavy at times, resulted in a shift to more academic subjects in the Reserve Officer Training Corps (ROTC) program.

In both the Army and Air Force programs, male students in the first two years of college will be allowed to substitute special courses in other departments, mainly military history, for the old "hardware" courses.

These refer to subjects which deal with the weapons and other equipment used by the military forces.

In ancient days, when there was a hail storm, the bells of the church were rung and the saints invoked.

About one in five suffers from tired eyes because of a lack of glasses when they are needed or the wearing of wrong glasses.

The first water-driven electric power plant in the United States was built and operated by Paul N. Nunn.

Uranium has been used for years as a colorant in ceramics and glass, but not until World War II did man learn how to control the reactions in order to derive a net output of energy from the atom.

"Silver from clay" (aluminum) came into ornamental use at the court of Napoleon III, but it was not until 1886 that a cheap electrolytic process of reducing aluminum from its compounds with oxygen was discovered, in both France and the United States.

The Daily Mining Gazette

The home newspaper for more than 122 years

Houghton, Michigan, Vol. Eighty-three-320 | Wednesday, Sept. 29, 1982 | 30 Cents

New state budget is skintight

LANSING (AP) — Waving a skintight new budget and a letter of credit from five Japanese banks, state officials will be off to New York in about two weeks to borrow $500 million for Michigan schools and local governments.

"If all goes well we will be able to make payments Nov. 1," state Budget Director Gerald Miller said Tuesday evening after lawmakers heaved the final parts of the new state budget into place.

"This is the tightest, most constrained budget ever," Miller said of the $[illegible] billion spending plan for the fiscal year which starts Friday.

The total state budget, counting specifically restricted money, federal money and other [illegible] not under the state's control, reaches about $10.[illegible] [illegible].

With Michigan's constitution requiring a balanced budget, some lawmakers expect executive orders from the governor to cut spending will be needed later in the new fiscal year to keep the state out of the red.

The state is still about $50 million in the red for the fiscal year which ends Thursday, Senate Fiscal Agency Director Theodore Ferris said, but Deputy Budget Director Douglas Roberts pledged the budget will be balanced.

The 1981-82 fiscal year budget was $4.[illegible] billion but was wracked by $778 million in spending cutbacks.

The logjam that stalled final budget work for five days was cleared away when House Republicans backed down from their opposition to a bill providing some $36 million in aid to Detroit. GOP members, who Democrats accused of political games, said they had not realized Detroit has suffered more than $60 million in state aid cuts this year.

With only minor changes in the bill — including a promised audit of the Detroit money and $200,000 shifted from the Detroit Institute of Arts to the state library system — a House-Senate conference committee unanimously adopted the measure early in the day.

Good afternoon

CAPSULES

AN UNDERGROUND nuclear weapons test code-named Borrego was detonated at the Nevada Test Site just after dawn today. The test had a yield of between 20 and 150 kilotons and was conducted without incident, according to the Department of Energy.

ELEVEN CHILDREN of American-Vietnamese parents are scheduled to leave Vietnam on Thursday for reunions with American fathers they have not seen for years, U.S. officials said today.

A FORMER employee of John Lennon was arrested on charges of stealing letters, paintings, electronic equipment and unreleased tapes from the slain ex-Beatle's apartment, New York City police report. Fred Seaman, 29, of Brooklyn Heights, has been charged with grand larceny and virtually all the stolen property has been recovered.

Gusty

Mostly cloudy and windy tonight with a chance of thundershowers. Continued cloudy Thursday. Details on Page 2.

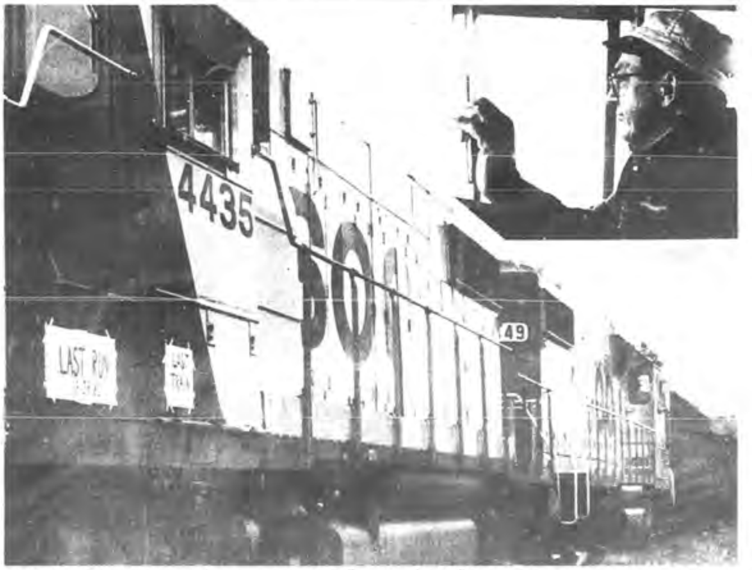
Lottery

The winning number in Tuesday's Michigan Daily drawing is 625. The Daily 4 number is 9282. Lucky cards are the three of clubs and the nine of clubs.

Index

Smile

Little boys who constantly whine probably become groan men.



LAST RUN — The last train to service the Copper Country left Houghton Tuesday morning as people waved and took pictures along the tracks. The Soo Line Railroad's removal of the L'Anse to Dollar Bay run ends 110 years of service. But engineer Joe Finck (inset) doesn't believe it was the last train. He hopes the train will return — with the cars. (Photos by Elizabeth Hayhow)

Soo Line trainmen bid adieu

By ELIZABETH HAYHOW
Gazette writer

HOUGHTON — "Last train last run, 9-28-82," said the sign on the side of the Soo Line train as it chugged its way along the Dollar Bay run.

The train picked up a few cars and left for L'Anse late Tuesday morning, ending 110 years of railroad shipping in the Copper Country.

As the train and its five-member crew followed the colorful countryside to Dollar Bay and back, people came out of houses and businesses with cameras to wave goodbye. The two weekly runs from L'Anse to Dollar Bay were regular, and Engineer Joe Finck appears to be familiar with folks along the track as he waves and blows the horn.

But the crew expects that the train will be back someday. "You think this is going to be the last run?" asked Finck. "I don't. ... I hope we come through here someday with the cars."

The Soo Line Railroad [illegible] operations on the L'Anse to Dollar Bay run because a $172,000 state subsidy runs out Thursday. The temporary subsidy was given to Soo Line in February after the Interstate Commerce Commission granted the company permission to abandon the line because of a reported $181,000 a year loss. Soo Line first requested abandonment in 1976.

The five crew members have worked for a total of 173 years for the Soo Line Railroad. Finck, of Marquette, began in 1946; conductor Paul Oliver of Marquette began in 1946; rear brakeman Clarence DesJardins of Marquette began in 1947; fireman George Hakenson of Houghton began in [illegible]; head brakeman James Green of Marquette began in 1950.

"We're the five oldest men working out of Marquette," Oliver said.

The crew has worked together about three or four months. "They keep breaking us up," he said.

As the five with the most seniority, the crew will work on the Marquette to Baraga run, "unless there's something better," Finck said. "We get the best jobs."

"[illegible] worked our tail off to keep [illegible]," Oliver said. But when permission was granted to abandon the line, "that was the end of it," he said. Oliver said that the Soo will stop at L'Anse twice a week from now on. But he doesn't see service resuming in the Copper Country unless the copper market picks up or if heavy industry moves in.

The crew appears matter-of-fact about the Soo Line pulling out of the Copper Country. "There's not much we can do about it," Hakenson said. "They've been trying to close down for five years. We just have to go where the work is. That's all."

Hakenson, the only crew member who doesn't live in the Marquette area, plans to move to Marquette but has had problems selling his house in Houghton. It's been on the market for eight months.

Besides the small groups of people watching along the tracks, there are [illegible] a few people [illegible] "train [illegible] [illegible]" [illegible] the last [illegible].

[illegible] tape recorder on the [illegible] outside the freight [illegible] the train to do some [illegible]. It makes a quick run down [illegible] pick up another car. He worried about losing the recorder. But the train returns with the recorder intact. "I [illegible] prepared all week for this," he [illegible].

Continued on Page 3

Chronic offender

Jack drifts aimlessly

EDITOR'S NOTE: Jack is not one person, but a both fictional and realistic composite of the characteristics juvenile workers see every day in the lives of youth who end up on the wrong side of the law. Caseworkers say that in homes where parents take an active role in their children's lives, the first offense is generally the last. Chronic offenders typically come from situations much like Jack's.

(Third of a 5-part series)

By JIM GOFFIN
Gazette Writer

Jack spends most of his free time down on Main Street. With his friends. Jack has always spent more time with his friends than with his parents. He didn't decide to make it that way. It's just the way it is.

At 15, Jack's main interests are neither his home or his school. Being home is more often than not a hassle. He says his mother is too emotional, always wanting to know where he's been and what he's been doing. Jack's father isn't around much anymore. Although on a probation curfew for getting caught shoplifting, Jack comes in when he wants to.

After watching his parents marriage fall apart, Jack isn't too hot on the idea of getting tied down himself, and his father agrees with him. Although Jack has a few girls that he sees regularly, there are no steady relationships.

Jack has no marketable skills and although he would like to find a good job when he gets out of school, he isn't sure what kind of job or what his school work has to do with success or failure in whatever he gets into. Jack can't really see himself improving his position, although he talks about the vague things he's going to do.

"School isn't worth the hassle," Jack says. With no real goals or plans for a career of any kind, it seems a waste of time for Jack to try to stick out the grind at school. Jack's friends know what he means.

"I might graduate and get a job," Jack often tells his mother and probation officer. "Maybe I'll go into the service. If I quit school I can always take the GED test for my diploma."

Maybe and might are words Jack uses [illegible] [illegible] [illegible]

[illegible]

> Maybe and might are words Jack uses a lot.

[illegible]

Jack's [illegible] always [illegible] without working. His father has worked off and on when Jack was growing up [illegible] long [illegible] [illegible] about careers with Jack [illegible] helped him make any plans.

Jack has never had responsibilities at home. "There really isn't much to do," he says. He's right. There are no projects to work on and little improvements are being made at home with the limited money that comes in. Jack has had a string of part time jobs to earn a little money for the things his mother can't afford, but has found there are other ways to get by. Usually those ideas brought Jack back into probate court.

For all his outward self assurance, Jack is just not sure about a lot of things, and has learned that his parents have enough problems without having to deal with his.

He may be living at home, but in reality Jack is on his own and he knows it. He talks about buying things and going places, but Jack really just wants to belong to a family. One that doesn't exist right now.

Jack's probably getting ready to leave a home that has only been a house. When he does get married and has children of his own, he may try to pull himself and his family out of the cycle of underachievement and dependence that has been a part of his heritage. He may decide to be close to his children, just spend time being a dad.

Maybe.

New inn rapidly rising

By JIM GOFFIN
Gazette Writer

HOUGHTON — Houghton's new Main Street Inn East is going up fast and co-developer Jerry DeMotts says the $1.3 million seven-story hotel is going to be a shot in the arm for area employment, downtown businesses and the city's tax base.

DeMotts and Ken Ruotsala of Ironwood are developing the 52-unit hotel/restaurant complex that is scheduled to be completed in March. All rooms will face Portage Canal — fitting into the city's waterfront development plan. DeMotts said the inn will "provide the city with a scenic entrance to its business district."

The second floor may be started as early as next week because of the modular nature of its construction. Concrete floors will be brought in by sections and lowered into place. The room's window sections also come in sections with heating and air conditioning units already in place, DeMotts said.

Here's what the new inn will be like:

- A 20' x 20' two-story high lobby will be tucked between the Shell gas station and an existing apartment building. On its east side, a two lane ramp will take cars to the rear parking lot. A valet service will be provided.
- The 52 units will face the canal; there will be no windows on Shelden Avenue. There are different sized rooms, some as large as 500 square feet, adjoining suites, kitchenettes and hospitality suites.

GOING UP — This is an artist's conception of the Main Street Inn East now under construction on Shelden Avenue. Viewed from the canal side, the seven story hotel is designed to face the city's waterfront development with 52 rooms and a 225-seat restaurant on the top floor. (Drawing by Hitch, Inc.)

- The inn's restaurant will seat 225 people and have a "chef of prominence" that will make the restaurant "second to none," according to DeMotts. He said his nephew works for a hotel chain based in Toronto and will be helping him to obtain the restaurant's chef.
- A gift shop and gourmet store will be in the complex. The gourmet store will handle hard-to-find gourmet cheeses, chocolates and other delicacies.
- About 58 people will employed at the inn, 46 fulltime and 14 part-time.
- The all-block and concrete building is designed to be "super-safe and super-quiet," DeMotts said. There will be eight-inch block walls between rooms.
- A doorway will join the inn's basement with the basement of the existing apartment building on Shelden Avenue. That basement will be renovated and become a storage and laundry facility.

DeMotts said the inn will be locally built and furnished. "We intend to purchase as much as possible locally," he said. "We're taking pride in keeping as much money as possible in local hands."

The lead construction company for the project is Michael Oja of Hancock. Hitch Engineering is the engineering consultant and the Superior National Bank is the leading financial institution.

Continued on Page 3

Legislature OK's drunken driving laws

By NANCY BENAC
Associated Press Writer

LANSING, Mich. (AP) — Motorists who tip the bottle before they hit the road had better beware.

Legislation to crack down on Michigan's drunken drivers sped through both the House and Senate Tuesday and headed for the desk of Gov. William Milliken for signing into law.

The legislation sets up stiff new license suspension provisions and increases law enforcement powers for prosecution of imbibing drivers.

First-time drunken drivers would have their licenses suspended for at least six months and up to two years.

During that time, motorists could apply for a restricted license for travel to work, school or substance abuse treatment programs if they had no other means of transportation. A restricted license would be marked to show approved routes and times of travel.

Second-time offenders would have their licenses revoked for at least one year, and third-time violators would be guilty of a felony punishable with a minimum five-year license revocation.

No restricted licenses would be available for second- or third-time offenders.

When the bills first passed the Senate last spring, they included stiff mandatory jail terms for imbibing drivers, but those provisions were removed in the House.

Sen. Stephen Monsma, D-Grand Rapids, who sponsored two of the three bills, said they still contain "teeth," even though they were watered down in the House. "It would improve the tools that police and prosecutors have," he said.

All three bills cleared the Senate without opposition Tuesday and two passed the House unanimously. Only Rep. Ernest Nash, R-Grand Ledge, opposed a third bill.

Once signed by Milliken, the laws likely would take effect in April.

Breakdown on budget:

LANSING (AP) — Here is how Michigan's $4.6 billion general fund budget will be distributed in the fiscal year starting Oct. 1. Federal money and other funds over which the Legislature has no control, bring the total budget to about $19.5 billion.

—Social Services, including welfare, $1.68 billion, down from $1.8 billion this year.

—Mental Health, $537.7 million, up from $509.2 million.

—Public Health, $95.3 million, up from $86.4 million.

—Department of Education, $23.9 million, down from $24.7 million.

—Aid to K-12 schools, $290.9 million, down from $480 million this year. But the decrease will be offset almost entirely by a rise in restricted appropriations from the school aid fund.

—Four-year universities, $608 million, up from $576.4 million. The discrepancy comes because $117 million cut from the current budget will be restored and $80 million of it is coming from the 1982-83 appropriation.

—Community colleges, $127 million, up from $121 million this year. Schools will get another $7 million through other legislation to make up for a cutback in this year's budget.

—Data processing, $36.3 million, up from $34.5 million.

—Construction projects, $25 million, down from $63.1 million.

—Debt service, $113 million, down from $150.2 million.

—Civil Service, $6.2 million; about the same as this year.

—Governor's office, $2.3 million; down from $2.4 million.

—Legislature, $50.1 million; up from $46.5 million.

—Management and Budget, $77.9 million, up from $57.2 million. The increase includes $26.6 million already appropriated for State Building Authority rent.

—Department of State, $8.6 million, down from $12.4 million.

—Treasury, $42.4 million; down from $46.1 million.

—Attorney General, $14.3 million; up from $13.3 million.

—Civil Rights, $7.8 million; up from $7.3 million.

—Corrections, $229.6 million, up from $211.5 million.

—State Police, $120.4 million; up from $115 million.

—Military Affairs, $8.8 million; up from $6.1 million, mainly because a new program was transferred to the department.

—Judiciary, $54.5 million, up from $51.8 million.

—Agriculture, $18.3 million; down from $18.6 million.

—Commerce, $72.5 million; up from $68.8 million.

—Licensing and Regulation, $12.6 million, up from $12.4 million.

—Labor, $32.1 million; up from $36.5 million.

—Natural Resources, $45.5 million, down from $48.2 million.

Amendments jeopardize bill

WASHINGTON (AP) — Some senators are stubbornly refusing to withdraw pet amendments from a stopgap spending bill, jeopardizing chances that Congress will pass on time the measure to keep the federal government running after Oct. 1.

On Tuesday, the Senate did no substantive work on the omnibus bill, which must be passed by midnight Thursday, the start of the new fiscal year.

Majority Leader Howard H. Baker Jr., R-Tenn., pleaded in vain with senators to reduce the number of amendments so the bill could be voted upon swiftly.

Formal Senate debate was to begin today. The House passed a version of the measure last week.

Baker had hoped to limit amendments to:

—A Democratic move, led by Sen. Edward M. Kennedy, D-Mass., to attach a $1 billion House-passed measure to create 200,000 temporary public service jobs.

—An attempt by Sen. Howard Metzenbaum, D-Ohio, to liberalize unemployment benefits.

—A move by Sens. Dale Bumpers, D-Ark., and Gordon J. Humphrey, R-N.H., to cut off money for the controversial Clinch River breeder reactor in Tennessee.

The number of amendments "has grown to about 40 and threatens to go even higher," an exasperated Baker told his colleagues Tuesday night. "Everything else on that list ought to wait."

Senate Appropriations Committee Chairman Mark O. Hatfield, R-Ore., said it was "not conceivable under any circumstances" that the Thursday midnight deadline could be met if all the amendments were pursued.

In the time remaining, the Senate must complete action on the bill.

Summer tax considered

By NANCY PEARCE
For the Gazette

CALUMET — Calumet Township and Calumet-Laurium-Keweenaw Public Schools are considering a summer tax collection so that the school doesn't have to borrow money.

Each year the district must borrow money to pay its bills because it doesn't receive tax money until December or January. A summer tax collection could eliminate high interest rates on borrowed money, school officials said at a recent meeting of the Calumet Township Board of Trustees.

"We did not get any money in August," Supt. Don Hon said. The district had to borrow $600,000 which will cost the school $71,000 in interest.

"I don't know how much longer schools in Michigan can go on borrowing this kind of money," he said.

No decision was made in regard to summer tax collections. "Hopefully we can come up with something that will benefit the taxpayers, the schools and the township," Hon said.

Township and school officials also discussed the closing of the public library. "People assume that it is the school's responsibility to support the library," Hon said. "It is not the high school's responsibility alone."

Hon said the township has been the only supporter of the library. The school needs about $8,000 to maintain library services. Hon suggested that other government units could chip in to support it.

Township Supervisor Paul Lahti agreed. "Calumet Village ought to reach out and help regardless of their financial situation. If the township gets involved, then the village ought to get involved."

Township attorney Jerry Vine suggested charging a user fee for books taken out of the library to help maintain services. Hon suggested a $1 or $2 charge for a library card as another alternative.

The township [illegible] financially to give the library the $8,000, Lahti said. But Hon said he was optimistic. "We're not planning alone on this. We're [illegible] and we're going to come through."

New inn to provide excellent view

Continued from Page 1

The inn is also designed to be expandable, according to DeMotts. The [illegible] building [illegible] to the west of the inn may be demolished at a later time to make room for a wing that will [illegible] rooms, four conference rooms and a [illegible].

Financing for the structure is nearly complete, with only the Urban Development Action Grant (UDAG) of $300,000 yet to be made. The developer [illegible] Small Business Administration loan [illegible] local bank loans have been confirmed. The UDAG grant will be in Washington on Sept. 28, DeMotts said, [illegible] [illegible] complete. Though [illegible] the building is now guaranteed, changes may have to be made if the UDAG loan fails to come through.

The quality and completeness of the inn depends on the UDAG loan, DeMotts said. "If the UDAG loan doesn't come through we'll have to modify."

The grant is administered by the city, which loans the money to the developers and collects interest for its own projects.

For DeMotts, the development "didn't happen overnight," but was the culmination of six years of planning for a development on the site. He hired Ken Rautala and he developed the final plan in 1982, he said.

DeMotts said all the institutions he and Rautala worked with have bent over backward to help him take the inn from the drawing board to reality. That planning was culminated Aug. 10 when Gov. William Milliken formally announced the project as part of his visit to Houghton. DeMotts said the city's support at that meeting was a big boost.

Last choo-choo

Continued from Page 1

A teacher from Ripley School who calls himself "an anonymous [illegible]" played hooky from school so that he could be present for the last run. He's the one who taped the signs on the side of the train. He remembers when the last passenger train left the area in 1968.

The Portage Lake Lift Bridge looms up in the distance as the crew takes care of the business of running a train and chats. For its trip to L'Anse, the train carries four cars of slag (waste rock), a tank car, two cars of crossing planks and — of course — the [illegible] one on each end of the train.

The engine room hums with activity. The maximum speed for this train is 42 mph, but not on this track. The maximum speed from Dollar Bay to the bridge is 25 mph. The train slows down as it crosses the bridge and squeaks as it rounds its curves.

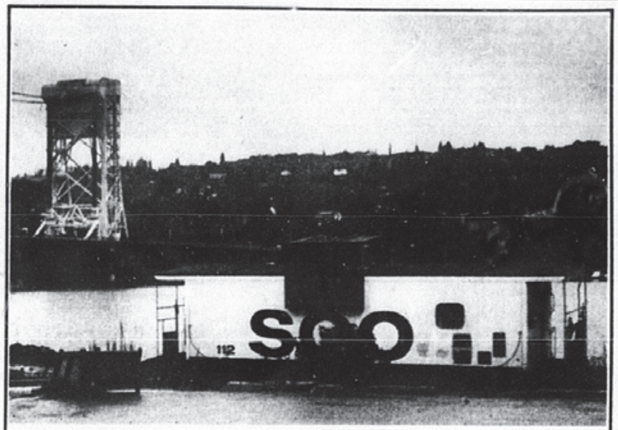
It stops in front of the original freight station in Houghton, built in 1883, down by U.P. Lumber on the lake. After a quick trip to pick up one last car and some switching, the train heads down the track toward Baraga.

"It's like losing an old friend," Dennis said.

The Daily Mining Gazette

The home newspaper for more than 122 years

Houghton, Michigan, Vol. Eighty-three-319 — Tuesday, Sept. 28, 1982 — 30 Cents



THAT LONESOME whistle may have been heard in the Copper Country for the last time today as the Soo Line freight made its last run to Lake Linden and return. Trainmen bid goodbye from the tailend caboose, pictured here after clearing the Portage Lake Lift Bridge. (Gazette photo by Bob Hallinen)

Substitute still sought

Train service ends

By BARBARA SWIFT
Gazette writer

HOUGHTON — Engineer Joe Fink blew his Soo Line train whistle as he passed through Copper Country towns this morning for the last time.

After a 110-year era that began when railroads serviced copper mines here, the Soo Line Railroad Co. shut down operations on its line running between L'Anse and Lake Linden this morning.

The action ends railroad shipping entirely in the Copper Country, forcing a number of companies along the line to switch to trucking.

A $175,000 state subsidy runs out Thursday. The temporary subsidy was given to Soo Line last February after the Interstate Commerce Commission granted the company permission to abandon the line because of a reported $181,000 a year loss. Soo Line first requested abandonment in 1976.

The steel railroad tracks are expected to be left in place this winter, keeping alive speculation that the Copper Country Rail Steering Committee can find an alternate method for rail to service businesses and companies — including the Michigan Tech industrial development site in Hubbell — along the 30-mile stretch, according to Dick Dunnebacke, executive director of Operation Action U.P.

"It's definitely a loss for winter," said Bob Gravitter, chairman of the committee and vice president and general manager of Horner Flooring Co. of Dollar Bay, one of the largest users of the line. "But it's not a dead issue yet."

Dunnebacke said the committee will continue to search for an alternate carrier, to locate investors, or to convince the state to purchase the line outright.

One possibility is to convince legislators to change the method by which the state funds its transportation system.

"If we don't switch from a fixed cent per gallon to a percentage of the price on gasoline," Dunnebacke said, "our state roads and airports and everything else are doomed.

"If everybody rallies, there may be some small amounts for preserving railroads," he added.

Less than $8 million of the state's $90 million comprehensive transportation fund is spent on railroads, compared to approximately $45 million for bus systems, even though "railroads generate jobs far more than buses do," he said.

Dunnebacke said the committee's initiative has been to convince the state to put money into purchasing lines rather than subsidizing. "We always felt we needed a short line" which would mean smaller crews and less expense, Dunnebacke said.

Ed Koepel, vice president of operations and finance at Michigan Tech, said the apparent loss of rail service does not jeopardize the start-up of the university's technology park in Hubbell. Rail shipping, however, would have "enhanced its usefulness and flexibility."

Koepel speculated that a loss of rail shipping could damage the Copper Country's potential for new industrial developments.

Tired of repeated delays by the state Department of Transportation, the U.P. Rail Planning Committee in May issued a report recommending a low-interest, long-term loan fund for floundering U.P. railroads. The fund would have been used to help companies renovate existing assets such as rail tracks, but would not be used to pay operating expenses.

Old Farmer's Almanac:

Frigid winter ahead

DUBLIN, N.H. (AP) — The Old Farmer's Almanac, the 191-year-old yellow and black weather bible ready to hang in pantry or privy, predicts a frigid winter for the East and a mild one for the West.

The 1983 edition of the nation's oldest continuously published periodical, issued today, says it makes forecasts based on both "the latest scientific technology" and a secret formula locked in a black box in the almanac's offices.

But Abe Weatherwise — a pseudonym for publisher Rob Trowbridge and editor Jud Hale — cautions that the April 4 eruption of the Mexican volcano El Chichon could throw off this year's forecasts because the almanac went to press before the volcano's effects could be assessed.

Weatherwise predicted severe cold waves rolling across the East in January, February and March after a mild and sunny December.

The West may face a serious drought as a result of a warm and dry November, then rain and relief in December and a cold snap at the end of the year, he said. The Middle Atlantic region should expect a wet spring and possible flooding.

The publishers claim an accuracy rate of 80 percent, and the U.S. government took them at their word at least once. During World War II, all copies of the magazine were confiscated after German spies were captured off the East Coast consulting its forecasts.

The Old Farmer's Almanac's most recent success was predicting last winter's bitter cold wave. The forecast was for a major snowstorm and cold wave in the East and South during the Christmas-New Year's holidays. The forecast was a bit narrow, though: The cold wave spread into the Midwest and lasted through January.

The almanac is not to be confused with a younger publication called simply the Farmers' Almanac, which is only 166 years old. The Farmers' Almanac, which also claims 80 percent accuracy, did not predict last winter's killer cold wave.

Israeli Cabinet approves probe

By The Associated Press

Israeli forces evacuated the port of Beirut today and the Cabinet in Jerusalem approved a full-scale judicial inquiry into the conduct of the Israeli government and army during the massacre at two Palestinian refugee camps in the Lebanese capital.

In another development, the Palestine Liberation Organization's top military commander, Brig. Saad Sayel, was reported killed by up to 30 men firing automatic rifles and rocket-propelled grenades in an ambush in eastern Lebanon's Bekaa Valley, the Christian Voice of Lebanon Radio said.

About 100 Israeli troops and seven armored vehicles formed a column and departed the Beirut port area at about 12:15 p.m. (6:15 a.m. EDT).

Lebanese army units and members of the Italian peacekeeping force took charge of the port. The Italians also were deployed in the Chatilla refugee camp and at the nearby Kuwaiti Embassy and airport traffic circle.

The 1,200 U.S. Marines in the multinational peacekeeping force are refusing to land until all Israeli units evacuate west Beirut.

The Israeli Cabinet's decision to open an inquiry into the massacre at the Sabra and Chatilla camps was reported by Deputy Prime Minister David Levy, who told reporters in Jerusalem: "The government set no limitations in any area. Everything is open to examination — the political level and also the other level," meaning the army.

Education summit spurned

By JACKIE TOMCHAK
Gazette writer

LANSING — Gov. William Milliken has rejected State Rep. Don Koivisto's proposal to call an education summit meeting on school finance.

In a recent letter to the 110th district representative, Milliken said he believes the state's current method of financing schools is equitable and that education's problems today stem primarily from the condition of Michigan's economy.

Koivisto wrote the governor Aug. 31 requesting that Milliken call a meeting of legislators, state education officials, school administrators and other education-related groups to discuss alternate methods of financing schools.

In making the proposal, the Mass City Democrat termed the problem of school finance "critical" and said he thought it should be dealt with in an emergency fashion.

But Milliken vetoed Koivisto's proposal.

"There is a need to address the problem of financing our education programs; however, I do believe the principles behind the state formula for financing schools are equitable," the governor said in a Sept. 16 letter.

"Unfortunately, because of the difficult economic time we are experiencing, the state has been unable to provide the resources necessary to properly fund the formula," the letter said.

Milliken said in the letter that he thought the legislature and governor's office should address unemployment compensation and transportation funding.

Koivisto expressed disappointment at the governor's decision.

"I don't think the formula is equitable at all," he said. "I think as long as we're relying strictly on property taxes, we're going to continue to have this problem."

Koivisto said he plans to approach the state's new governor next year with the same proposal.

"Both Headlee (Richard) and Blanchard (James) have said they think education is in a mess. Hopefully, we can get something done," Koivisto said.

Schools throughout the state have experienced financial difficulties within the past few years due, in part, to cuts in state aid to education.

Although a number of districts have attempted to seek additional revenue through millage increases, voters, for the most part, have been reluctant to approve property tax hikes.

Locally, the most recent bid for a millage increase was made last month by the Public Schools of Calumet-Laurium-Keweenaw. The district was seeking a three-mill increase. The issue, which had been rejected in two earlier elections, was defeated by voters again in August.

Parents that fail ...

Runaway daughter too much for mom

EDITORS NOTE: The parents who agreed to take part in these stories are only a small sample. They do not reflect the attitudes and problems of all parents whose children wind up in probate court. They do reflect many of the problems and characteristics that juvenile court workers say are found in the homes of the kids that are chronic law-breakers. The names used are fictional.

By JIM GOFFIN
Gazette Writer

Somewhere along the line, Ruth began to lose control of her daughter.

Ruth's daughter Sue had always been strong-minded. She was a cute girl, who Ruth said belonged to a group that didn't belong. "They were the tough guys, they didn't get into extracurricular stuff."

"Deep down, though, I think they wanted to belong," Ruth said.

At 14, Sue began disappearing for days. At 15 she was pregnant. She quit school just short of her sixteenth birthday. After the baby was born, she moved out.

Ruth said she had thought of trying to have Sue put in a foster home, but unless she broke the law, "there was nothing we could do," the troubled parent said.

"She always felt she could make it on her own," Ruth said. "To this day

> "She always felt she could make it on her own," Ruth said. "To this day she says she doesn't want any rules, she doesn't want anyone telling her what to do."

she says she doesn't want any rules, she doesn't want anyone telling her what to do. She doesn't see the need for family. Until she grows up she won't understand this."

Ruth and her husband have two teenagers at home now. During the years when Sue was growing up, the couple both worked, with Ruth handling most of the discipline.

"I was the one to make up most of the rules," she said.

Continued on Page 3

Delinquent's dad let son run wild

By JIM GOFFIN
Gazette Writer

Bill grew up in a home where his father encouraged him to be independent and his mother worried about his constant scrapes with the law.

"I worry about all (my children)," Betty said. "With Bill, nine out of 10 times, the worry was well-founded."

Betty is divorced now. She and her husband didn't agree on much, especially when it came to raising their children. That became evident when Bill started breaking the law.

"He has very sticky fingers, he doesn't think it's wrong to take anything he wants," Betty said.

"He started stealing in kindergarten. He really got into a bad group of kids, smoking, drugs. He moved out a while ago," she said.

Bill lives with his unemployed father now. At sixteen he is still in school, but says he wants to quit. He is on probation, having been arrested for malicious destruction of property. He is not involved with any school activities.

"School never appealed to him," Betty said. "He gets very bad grades. He has a learning disability.

"He has the attitude now that if he quits school and gets a job, everything will be all right," she said. "It's a fan-

> "His father encouraged independence, even from his mother. He said, 'you do your own thing anyway you want to do it.' "

tasy life. He never follows through on anything. He's involved with himself and nothing else."

Bill was raised by parents who never agreed on how to handle his frequent thefts.

"My husband and I have two opposite views," Betty said. "My husband would say, 'my son wouldn't do that' when he got into trouble. Even if you could prove he did it, (my husband) wouldn't accept it," she said.

Continued on Page 3

'Flat tax' proposals tackled

WASHINGTON (AP) — A dozen bills to radically change the federal income tax system are facing Congress amid growing evidence they would mean tax cuts for the rich and higher taxes for millions at lower and middle incomes.

Officials from the Treasury Department and the Congressional Budget Office were to testify today as the Senate Finance Committee begins hearings on the "flat-tax" plans that would end most deductions and simplify rates.

Earlier this year, tax experts from both agencies said that such revamping of the system would shift a greater share of the tax burden onto those less able to pay.

Further evidence of such a shift was presented Monday by Joseph A. Pechman, a tax authority with the Brookings Institution. A flat tax would simplify tax laws, improve compliance and help ensure that two people in the same circumstances pay the same tax, he told reporters.

However, he added, such a tax "would reduce average tax liabilities for all income classes over $50,000 and increase average tax liabilities below $50,000. At the very top of the income scale, the flat tax would reduce average tax liabilities by 30 percent to 40 percent."

A similar conclusion was reached earlier this year by Joseph J. Minarik, an analyst with CBO, who said a typical flat-tax plan would raise taxes by $243 a year on a $25,000-a-year family, and cut taxes for a $250,000 family by $27,700.

Nevertheless, the concept of a flat tax is popular among lawmakers and, according to polls, among the public as well. President Reagan has expressed interest; Treasury Secretary Donald T. Regan has said a flat tax would be fairest of all systems, and presidential counselor Edwin Meese III has said the present system is "immoral."

Under the flat-tax concept, most deductions would be repealed and — after a total tax exemption for the poor — most people would pay the same share of their income to the government, regardless of how much they earned. One variation that has drawn a lot of attention is not a flat tax at all but would wipe out most deductions and tax most people at a 14-percent rate but impose a "surcharge" on those at upper income levels.

Good afternoon

NEWS CAPSULES

DERAILED TANK cars loaded with liquid natural gas burned out of control in the middle of Livingston, La., today, igniting houses and forcing the evacuation of all 2,000 residents, authorities said. "The flames are tremendous," said a sheriff's deputy. "You can stand a half-mile away and hear the roar."

THE TENNESSEE Valley Authority declared a site alert for about two hours early today at its huge Browns Ferry nuclear plant at Athens, Ga., after a control room alarm panel failed, a spokesman said.

A 41-YEAR-OLD man was arrested today and charged in the abduction of a bank president's infant son, who was released after payment of a $50,000 ransom, authorities said. Travis Alvie McCann of Mesquite, Tex., was taken into custody at his home shortly after midnight.

THE 80,000-TON U.S. aircraft carrier America left Portsmouth, England, five days ahead of schedule for the Mediterranean, a U.S. Navy spokesman said today. The carrier and its battle group of more than 15 warships will "temporarily augument the 6th Fleet in the Mediterranean area."

TWELVE LEFTIST guerrillas who held two Cabinet ministers and dozens of businessmen hostage for eight days in Honduras left Panama City for Cuba today aboard a Panamanian air force plane, a radio station reported.

Windy

Mostly cloudy and windy with a chance of showers tonight and Wednesday. Details on Page 2.

Index

Lottery

The winning number in Monday's Michigan Daily drawing is 848; the Daily-4 number is 6953. Lucky cards are the seven of spades and queen of diamonds.

Smile

A real test of will power is to have the same ailment some person is describing to you — and not mention it.

Michigan Tech

Michael Prast <mdprast@mtu.edu>

Portage Lake Lift Bridge

Anderson, Alan (MDOT) <[redacted]> Thu, Feb 7, 2019 at 3:39 PM
To: Emma Beachy <[redacted]>
Cc: Michael Prast <[redacted], Tess Ahlborn <[redacted]

Emma

Nice to hear of the efforts you are putting in here to recognize the Portage Lake Lift Bridge.

Some unique things about the bridge are:

-This is the heaviest lift span ever constructed at its time (and may still be). The lift span weighs 4.5 million lbs.

- The span is counterweight balanced to within a few thousand lbs in each tower. The balance is completed by adding or subtracting weight from a chamber in each counterweight.

-The Machinery that runs the bridge is up in the tops of the towers (this is not necessary a good thing as access for maintenance and replacement is not the best). Most lift bridges have machinery at the road level or below.

-The bridge is a double deck which was originally designed for trains on the lower and cars on the upper. Now the lower is utilized for snowmobiles in the winter and over height loads in the summer.

- The lift span can be set at the intermediate position to allow for higher clearance for marine traffic. The intermediate bridge seats are movable.

- The original bridge costed $11,000,000 to build. The last rehab was $8,390,000.

I have a good source you should contact about the original construction of the Bridge. He is the engineer who oversaw the construction of the bridge for MDOT, John Michels. I talked to him today and he is willing to talk with you about the original construction. He is 91 years young and his memory is exceptional. You can reach him at 1 (517) 484-8372.

He could talk with you of the features of this bridge that make it significant to Civil engineering.

Some items to touch on with him would be:

1. Construction of the foundations. The caissons where set in the water and workers went down inside of them (into a pressurized chamber) and hand dug material out of them. As material was dug out from under them the caissons settled down into the subsurface of the canal until it reached the proper position. You could talk to him about details of this.
2. The lift span was assembled on a barge and floated into position for fastening onto the lift cables. The barge has then filled with water to settle the span and allow the weight of the span to lift the counterweights that had previously been constructed while hanging from the towers. (The lift cables run from the span over a sheave in each edge of the towers and then down to the tops of the counterweights.) . This operation could be looked at like one of the first “Bridge slides” ever completed.

The bridge was built in 1959. The last rehab of the bridge was in 2015. The last rehabilitation project was considered to be a 50 years fix on some of the components replaced (lift cables, balance chain rehabilitation, shaft replacements and structural repairs) and a 20 yr fix on others (electrical upgrades, deck patching, spot painting and substructure patching).

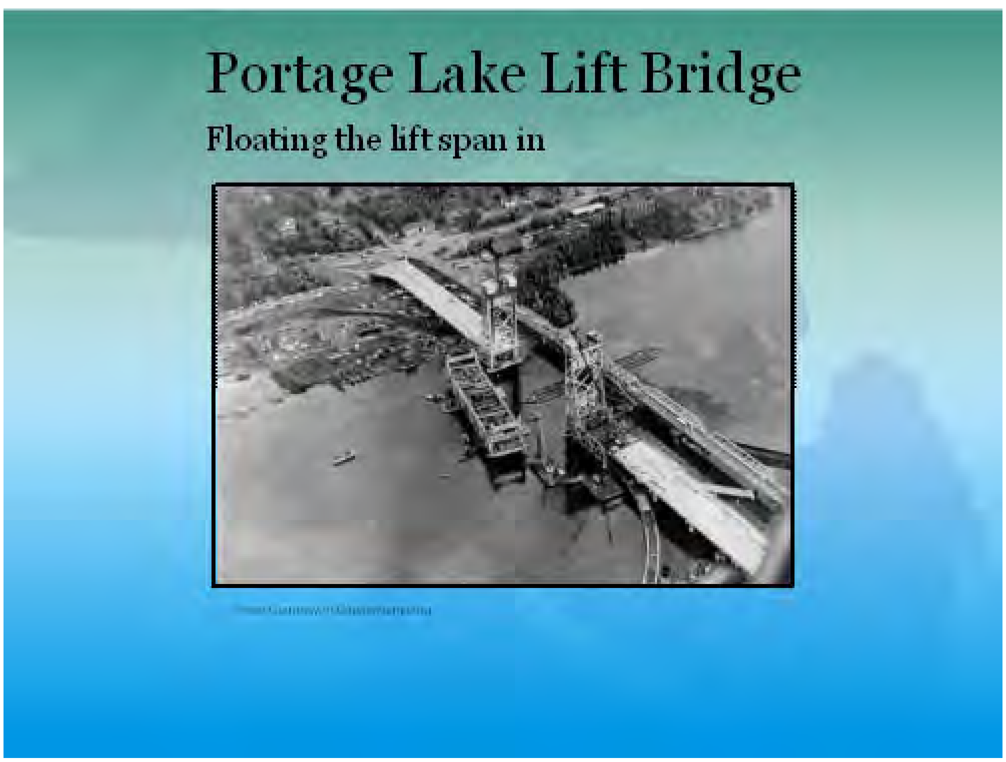
During the rehab, the counterweights were pinned into position (hanging from the towers with the original hangers and pins), the lift span was then jacked with hydraulic jacks from the lower bearings. Once the weight was off the wire ropes (lift cables) they were disconnected from the span and the span was lowered onto the lower bearings. This work was done with and all night closure of the bridge. Then thru the remainder of that winter all the wire ropes were replaced and the balance chains were taken down, rehabilitated and rehung. In the spring, another all night closure was needed to jack the lift span, connect to the new wire ropes, lower the span enough to lift the counterweights off the hangers, unpin the counterweights and allow the bridge to operate with the bridge machinery.

Another item of note here: the purpose of the balance chains is to act as a counterweight of the wire ropes. When the bridge goes up and down there is a different portion of the wire ropes on either the span side of the sheave or the counterweight side of the sheave. The Balance chains act to combat and imbalance during lifting operation. Different proportions of the chain either hang from the counterweight or from the tower, depending on where it is in its lift and this is in tune with the portion of wire rope that would otherwise cause and imbalance.

Another "cute" fact is: A person can move the lift span with the use of a strap or pipe wrench to rotate the main shaft out of the electric motor up in the tower. This is due to the mechanical advantage of gearing that is in the machinery drive train and the fact that it is counterweight balanced.

This bridge has significance in civil, mechanical and electrical engineering.

Below is a picture of the lift span being floated in during the original construction.



Also attached is a picture of the machinery room in one of the towers.

I'll send more things if I think of them. Let me know what kind of follow up questions you may have.

Let me know that you got this email so I know it goes thru.

Regards

Al Anderson

Construction Engineer MDOT

[redacted]

[redacted]

[Quoted text hidden]

3 attachments

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image001.wmz
203K

oledata.mso
71K

DEC 22 1959

Today's Chuckle

If you make a right turn from a left lane, you are probably just careless and reckless and not what the fellow behind you called you.

The Daily Mining Gazette

THE HOME NEWSPAPER FOR MORE THAN 100 YEARS

Largest ABC Circulation of any Advertising Medium in the Copper Country

VOL. SIXTY ONE. No. 83. MONDAY, DECEMBER 21, 1959 TWO SECTIONS. TWENTY PAGES PRICE TEN CENTS

The most common disguise of envy is in the praise of what is subordinate.

—Washington Allston.

Automobiles Roll Across New Portage Lake Bridge

HUBERT PETERSON, left, of the Houghton Canal Rd., drove the first car to line up at the barricade on the new Portage Lake Lift Bridge Sunday morning. With him stand serviceman Alvin Wakeham and Hancock Police Officer Matt Kobe. Wakeham, who was riding with Peterson, became the first serviceman to cross the bridge and was treated to a free meal at Millie's Cafe in South Range. When the barrier was lifted, Peterson was among the very first to cross over the new lift in an automobile. (Gagnon of Gazette)

Over 14,000 Motorists Cross in Twelve Hours

The new Portage Lake vertical lift bridge opened for public use Sunday morning at 8 a.m.

Hancock and Houghton police officers were on duty to regulate traffic over the four-lane roadway. Michigan Highway Department personnel moved the barricades from the new bridge to the entrance to the old structure.

The first recorded motorist to cross the structure was Hubert Peterson of the Houghton Canal. He was travelling to Houghton from Hancock. He had driven to Hancock to meet the Greyhound bus. With him was Alvin Wakeham of Stanton Township, be returning to the Copper Country from Colorado. He was dined at Millies' in South Range for being the first serviceman to cross the bridge. The treat was on the house.

Second recorded car to cross the structure was that of Robert Jarvis of Mason.

The bridge is already becoming a speedway, according to Hancock Officer Matt Kobe who found it necessary to check Hancock bound traffic. So fast was the traffic it was impossible to stop the first cars going north from Houghton.

Although the opening was historic, there was no official fan fare. The dedication ceremonies will be held in June when state dignitaries will visit the district.

Immediately after the barricades were removed, the old and new engine houses began a series of salutes. Auto drivers, also, saluted the bridge with their horns as they passed over the lift. Pioneer tower man and engineer, George Jacobson, tooted the three longs and two shorts from the old bridge tower and he was answered by a blast from the new bridge engine house.

Cloverland Contracting Co. had its supervisor, Lyol Huddleston, on the lift span to lower it prior to the opening. It had been kept aloft to allow vessel passages. The warning bells and lights flashed throughout the lowering as will be the custom when the lift is elevated or lowered for marine traffic.

The new bridge has automatic gates, so there will be no need of watchmen. The gate tenders have been Roy Carpenter, Clarence Simmons, Douglas Simmons, Bernard DeMars, James Sullivan, Joseph Heineman, Leonard Christofferson and Edward Raymond. The bridge crew's supervising foreman is Bernard Huss. As soon as the new bridge is used by railway traffic in about six weeks, he will move the pilot house activity from the old to the new bridge engine house. The men who will work there, according to seniority are George Jacobson, Albin Lehto, Bod Neher, Eugene Sullivan and Alfred Rivet.

The new structure replaces the old bridge which goes back to the early 1890's.

Traffic over the newly opened bridge was reliably estimated at almost 15,000 cars for the first 12 hours. Figured by Engineer George Jacobson, actual counts during several periods showed from 95 to 115 cars passing both ways. Figuring 100 cars in a period and multiplying the 12 periods in an hour by 100 gives a figure of 1,200 cars. Multiply this figure by 12 hours from 8 a.m. to 8 p.m., gives approximately 14,400 cars within 12 hours.

One of the reasons for the large number of cars was the tendency for many people to cross the bridge several times during the day. One fellow admitted that he used the bridge eight times Sunday.

Though the traffic lights were confusing at first, the lights now permit traffic to move onto the bridge in a systematic manner.

Truck, Bus Crash Kills 9 Persons, 20 Head of Cattle

TUCSON, Ariz. (AP)—A Greyhound bus and a cattle truck traveling on the wrong side of the road collided about eight miles east of here Sunday killing nine persons.

The bus driver and six passengers were killed along with the truck driver and his relief man. Also killed were thirty head of cattle, mostly calves. Some other animals were maimed and had to be shot.

Highway Patrolman Jimmy Williams said truck driver James R. Stewart of Del Rio, Tex., apparently missed a "keep right" sign where the road divided for repairs. The truck, he said, was on the wrong side when it struck the Los Angeles-to-New Orleans bus.

The double-decked truck was hauling 67 steers from Jackson, Miss., to Arlington, Ariz.

Killed besides Stewart were:

Ronald Philip Spence, Las Vegas, Nev. and Hawthorne, Calif., relief truck driver.

Harvey Boyd, 44, El Paso, Tex., driver of the bus.

Florence Minium, 65, Kingsville, Tex.

Johnny Lee Rodden, 7, son of Mr. and Mrs. Charles Rodden, Redondo Beach, Calif.

Benito Casanova, 35, Guanajuato Oriente, Cuba.

Carmen, 53, his wife.

Carol Hall Reed, 38, 304 Chestnut St., Pensacola, Fla.

Pearl Grogan, 64, Los Angeles.

"God bless that man who told us to sit still and shut up," said Delois Gaines, 39, a restaurant worker from Los Angeles. "If it weren't for him, we probably would have hurt each other trying to get out."

Near Springfield, Ohio, a teen-aged girl was killed and 34 others injured when another Greyhound bus skidded on an icy highway, overturned and rolled into a ditch.

Late News

PLANS CRACKDOWN

HAVANA (AP) —Setting Cuban against Cuban in an island-wide spy system, Fidel Castro has promised an even tougher crackdown against his enemies.

PLANS CONSUMERS WAR

WASHINGTON (AP) —The government today opened a drive to recruit millions of consumers in a war on false advertising and fraudulent selling.

STRIKE TALKS RESUME

GRAND RAPIDS (AP) — efforts to halt a strike of 150 union drivers and mechanics of Grand Rapids City Coach Lines, Inc., resume today. The strike started last Tuesday.

DAG HEADS FOR AFRICA

STOCKHOLM, Sweden (AP) — U. N. Secretary General Dag Hammarskjold left by air today for a tour of 21 African territories and countries.

Pretty Brunette New Queen of Iran

TEHRAN, Iran (AP) — Pretty young Farah Diba became the new Queen of Iran today amid hopes that she will provide a son and heir for the throne.

With radiant smiles the 21-year old brunette with brown eyes and light olive complexion married Shah Mohammed Reza Pahlevi in a Moslem ritual in the marble palace.

She thus became Queen Farah Pahlevi.

It was the first marriage for the young Iranian commoner, who until recently was a student in architecture in Paris. It was the third marriage for the Shah, who at 40 still hopes for a son to succeed him.

The couple sat and stood through a Moslem ceremony and the signing of the marriage contract in the glittering Hall of Mirrors. Members of the family, members of the government and their wives and the diplomatic corps of Teheran look on.

The bride wore a flowing bluish, pearl gray wedding gown. Farah forsook the traditional white in favor of a shade specially designed for her by Yves Saint Laurent, head of the Paris house of Dior. The shade is just a bit off white in pearl grey with a slight tinge of blue.

The Shah wore a full ceremonial dress of dark imperial blue trousers and a navy blue coat covered with medals.

The capital was in a gay, festive spirit. Flags flapped in the breeze. Many buildings were decorated with bunting and the national colors.

The Shah divorced his first two wives because they failed to bear him an heir to the throne. The first wife, an Egyptian princess, bore him a daughter, Princess Shanaz.

Confederate Vet Loses Lengthy Battle for Life

HOUSTON, Tex. (AP)—The last of the faded ranks of the Blue and the Gray, Walter W. Williams, lay in state today in a gray and gold uniform symbolizing his beloved Confederacy he served nearly a century ago.

The nation's flags flew at half-staff by executive order in honor of the Civil War's last survivor, his comrades and the soldiers of the Union.

"With millions of Americans throughout our land, I pause in respectful silence," President Eisenhower said in a statement released by the White House.

Williams won countless battles against serious illness in recent years. He died Saturday of complications that followed his fourth attack of pneumonia since summer.

Relatives placed his age at 117.

"The wounds of the deep and bitter dispute which once divided our nation have long since healed, and a united America in a divided world now holds up on a larger canvas the cherished traditions of liberty and justice for all," the President said.

"No longer are there the Blue and the Gray. All rest together as Americans in honored glory. An era has ended."

Tributes also came from many other public officials, along with messages of sympathy from citizens of all walks of life.

Accused Poisoner Heads for 'Vacation'

SALZBURG, Austria (AP)—The Czechoslovak consulate general said that Jaroslav Nemec, accused of trying to poison staff members of the Munich office of Radio Free Europe, is on vacation and it is not known if he will ever return here.

Neighbors Aid Family Resigned To Starvation

FORT WORTH, Tex. (AP)—Hope mingled with tears of appreciation today in the eyes of Marie Mackey because of a policeman was touched by her plight.

Policeman R. L. Haddix went to the Korean war-bride's apartment Sunday after alarmed neighbors reported the incessant crying of children.

"It was terrible," said Haddix. He found the tiny mother cuddling two whimpering little girls, Beverly, 2½, and Judy, 1½. The babies wore only underwear. Marie's husband had been gone four days.

"They hadn't eaten for two days," said Haddix. "She was just resigned to die with her girls."

So Haddix went to a grocer. He had $3.82. The grocer matched it. A customer pitched in. And Haddix left with $10 worth of food.

Police radios buzzed. A captain told his men to give money for his usual present to Marie Mackey and her girls. A cop brought a Christmas tree. Patrolmen took up money in local barrooms. Radio stations took up the cry.

And Marie Mackey watched the parade of gifts come into the home of Mr. and Mrs. George Somers who gave her refuge. Then Sunday night carolers from the First Congregational Church sang of Christmas.

A tear rolled down the cheek of Marie Mackey who had found warm friends far from her native land.

Eisenhower Gets Warm Welcome On Madrid Visit

MADRID (AP) — Hundreds of thousands of cheering Spaniards today gave President Eisenhower the biggest welcome this country has roared out to a foreign visitor in modern times.

Flag-waving crowds lined the streets and hung from trees and jammed balconies as the President rode into Madrid with Francisco Franco at his side. Eisenhower is the first top Western leader to visit the Spanish dictator, who wore his generalissimo's uniform.

Spectators let loose one roar of cheers after another as Eisenhower, standing upright with outstretched arms, rode by in a bubble-top limousine.

Franco, who had arrived at the airport 11 minutes before, stood with the President as the national anthems were played. Then he presented his daughter, the Marquesa de Villaverde, with her husband.

Franco considers this presidential visit a tribute to his support of the Western Allies against communism. It is a far cry from the atmosphere of a few years ago, when the United Nations held the Franco regime to be a menace to peace. Today the United States has some of its best forward bombing bases in Spain.

His Cash 'Drawers' Were a Bit Heavy

MINEOLA, N.Y. (AP) — When detectives questioned John K. Whitfield about a tavern burglary, he raised his hands to protest his innocence. Down slipped his trousers. Officers found in his pockets $20 in coins weighing down his beltless trousers. He admitted taking the money from a bar and was held Sunday for grand jury action.

New Tax Measure Awaits Signature Of Gov. Williams

LANSING (AP) — Michigan's new 87 million dollar revenue package gave legislators nothing more than a breathing spell in their struggle to solve the state's nagging money problem.

It also fanned speculation that Gov. Williams might try for a seventh-term next year in an attempt to clean up the financial mess before he bows out.

Bills setting up the new money program adopted Friday by the Legislature — a combination of taxes and the veterans trust fund —were ready for the governor's signature today. To become law, they must be signed by Friday noon.

Williams labeled the measures "inadequate and miserable" but promised he would not veto them. The alternative, he said, would be "utter financial chaos."

Summit Meet Invitation Sent To Khrushchev

PARIS (AP) — President Eisenhower sent a letter to Soviet Premier Nikita Khrushchev today inviting him to the first of a series of summit meetings, to "consider international questions of mutual concern."

Similar letters are going from the British and French chiefs of government, as a followup to their Western summit conference over the weekend.

Eisenhower said this meeting agreed it is desirable that the East-West summit session "convene from time to time in each other's countries to discuss the main problems affecting the attainment of peace and stability in the world."

The Big Four, in their invitations to the Soviet leader, ruled out the participation of divided Germany, Red China, and India.

Eisenhower said goodby to Paris after a brief meeting today with British Minister Harold Macmillan, French President Charles de Gaulle and West German Chancellor Konrad Adenauer. He flew to Madrid.

The ceremonies of his departure from Paris were unusually brief. Mounting the steps of his orange-nosed jetliner, after the playing of the Star Spangled Banner and the Marseillaise he turned and said "goodby."

Still Miles Apart: Saari

White Pine Offer Rejected by Union

The union bargaining committee, according to Gene Saari, International Representative of the United Steelworkers Union, rejected the White Pine Copper Company's newest offer, which included a 10 cents per hour increase in pay and additional fringe benefits, Sunday afternoon at the White Pine Elementary School.

Saari is quoted as saying, "We are still miles apart."

Included in the fringe offer were additional group insurance benefits for about 1,000 workers and their families. The company also offered to reinstate two policies, one calling for time and a half pay for working more than eight hours a day. The other is for the company to collect dues for the union through payroll deductions. The Company termed the offer a modification of a proposal submitted to the union early in October.

The Union is asking about a 22 cents per hour increase in a package covering a wage boost, hospitalization and holiday pay. All other points in the company offer would be unacceptable Saari stressed.

Saari also stated that the union's demand of White Pine was that it should be similar to that of the Kennecott firm. This largest of the nation's Copper producers reached an agreement recently with the Steelworkers, granting wage and fringe benefits estimated at the 22.2 cents figure, after 126 days of idleness.

In a statement released Sunday evening, Representative Saari indicated that Sunday afternoon's meeting was attended by more than 700 White Pine union members.

The negotiations were reviewed before the assembled workers and the position of the bargaining committee was stated, followed by a unanimous rejection of the company's offer.

The members then voted to sustain the bargaining committee's action by a unanimous approval. Furthermore the members agreed that in the event there are further proposals which the bargaining committee feels are unacceptable, it does not need to call a meeting of the workers. The members agreed to sustain the bargaining committee action without a meeting.

ORIGINAL OFFER

Following are some of the salient facts included in the White Pine Company's original offer, according to Union Representative Gene Saari.

The original company offer contained no wage increase, asked for the elimination of the dues checkoff and restricted the availability of [illegible] vacations.

Saari also said that the terms asked that the employe pay the first $25 cost of any hospital bill before the hospital insurance became effective. He added that it provided for no work over eight hours and wanted to give the company the right to stagger work shifts. Changes in grievance procedures also were requested.

After the strike began, Saari related the company added a five-cents an hour wage clause to its offer. This was rejected by the bargaining committee.

Princess Margaret's Ex-Beau Townsend Reportedly Married

BRUSSELS, Belgium (AP) — Princess Margaret's onetime suitor, Peter Townsend, was married in Brussels today to Marie Luce Jamagne, 20, daughter of an Antwerp tobacco tycoon, a friend of Townsend reported.

The friend said the ceremony was performed at noon.

The engagement of Townsend, 44, and Marie-Luce, his secretary, was announced by her mother Oct. 9.

Townsend's romance with Princess Margaret broke up four years ago. He had been divorced. The Church of England forbids marriage of a divorced person so long as the other party to the divorce is living. The former Mrs. Townsend is living, and Princess Margaret bowed to the rule.

Detroit Apartment Blaze Routs 95

DETROIT (AP) — Fire at an eight-story apartment house forced 95 persons to grope their way to safety in smoke and darkness today. No one was seriously injured.

Residents of the Graylawn Apartment House fled in their night clothes when flames in the brick structure's basement filled the building with smoke.

Three residents and five firemen were given first aid for minor injuries and smoke inhalation. They were released after treatment.

Describing the evacuation, Fire Chief Laurence Daly said, "They didn't panic. I think that's the only thing that prevented loss of life."

Damage to the apartment house was estimated at $30,000 by Fire Marshal Glenn Thom. The fire was brought under control in about two hours.

Cause was not immediately determined.

Assailant Strikes; Christmas Is Out For 4 in Family

OSPREY, Fla. (AP)—A Christmas tree glitters today in an isolated home, but two youngsters will never open the four gaily-wrapped packages beneath the boughs.

An unknown assailant murdered Clifford Walker, his wife, and their two small children Saturday at their rural home.

The bodies of the parents and a 3-year-old son lay on the floor not far from the Christmas tree until discovered Sunday.

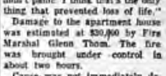
Officers theorize the killer was a friend of the family who tried unsuccessfully to rape the mother. They believe the murders occurred when the father and children arrived home from a friend's house.

The victims were Clifford and Christine Walker, both 23, their son, Jimmy, and a 2-year-old daughter, Debbie.

The parents and son had been shot in the head. No murder weapon was found, but three 22-caliber cartridges lay near the bodies.

The girl's body was found face down in a half-filled bathtub, and Sheriff Russ Boyer said the killer apparently held the child under the water until she drowned. The girl also had been shot, officials reported.

WEATHER



West Upper Michigan, Dec. 21, mostly cloudy with little change in temperatures through Tuesday. A few light snow flurries mostly near Lake Superior through Tuesday. Winds light and variable becoming southeasterly 8-15 m. p. h. Tuesday. High today 22-28 degrees. Low tonight [illegible]. High Tuesday [illegible].

Out look for Wednesday, considerable cloudiness, with little change in temperature with occasional light snow flurries mostly near lakes in northern sections.

Copper Country - Highest temperature in 24 hours 21, lowest 14, at [illegible] today 17.

The sun sets today at [illegible] p.m. and rises Tuesday at [illegible] a.m.

Total snowfall to date [illegible] a year ago [illegible] inches.

	Yesterday Highest	Last Night Lowest
[illegible]	[illegible]	[illegible]

Today's Chuckle

Nothing is more restful than a warm, crackling fire in the living room—if you have a fireplace.

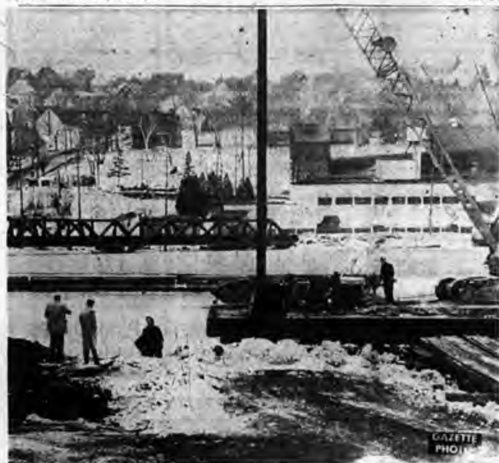
The Daily Mining Gazette

THE HOME NEWSPAPER FOR MORE THAN 99 YEARS

-Largest Trading Area Circulation, Daily or Weekly, in the Copper Country

To leave no interval between the sentence and the fulfillment of it doth beseem God only, the Immutable.—Samuel Coleridge.

VOL. FIFTY-NINE. No. 82. HOUGHTON, MICHIGAN, THURSDAY, DECEMBER 19, 1957 SIXTEEN PAGES PRICE SEVEN CENTS



NATO Support of Missile Bases Triumph for President

HOUGHTON CONFERS WITH LANSING—Yesterday's bridge banquet at the Douglass House gave considerable opportunity for local people to confer with Lansing highway department officials. From left, Deputy Engineer Howard Hill, formerly of the Calumet area; Highway Commissioner John C. Mackie, Former Houghton Mayor Charles McManiman, and Michigan Tech President John R. Van Pelt.

PARIS (AP)—President Eisenhower today was credited with a personal triumph in winning unanimous NATO support for the principle of establishing European missile bases and nuclear war head stockpiles.

The President was reported to be unquestionably pleased by the outcome of a situation which could have turned out disastrously for American prestige.

Eisenhower arranged to return to Washington on his plane, the Columbine III, late today. He was due in the U. S. capital about 6:30 a.m. Friday.

The President and Secretary of State Dulles, who is going home by way of Spain, are scheduled to make a 30-minute radio-TV report to the American people on the conference Monday night. All major U. S. networks will carry it.

Eisenhower's aides described him as happy about the outcome of the conference—but no one in the American delegation was claiming an all-out U. S. victory.

Only three nations — Britain, Turkey and the Netherlands—have agreed to accept missiles, and the principle still needs to be pinned down to actual base sites. Norway and Denmark have rejected the 1,500-mile rockets and West Germany probably will also.

The communique also stated NATO's willingness to "examine any proposal from any source" for controlled reduction of arms of all types.

The chiefs of government said they had decided to "coordinate" the development, research and production of the best modern arms, including the IRBM, in Europe. The communique added that the countries which are "very advanced in technique" will assist other members of the alliance in research and production.

This meant a pledge by Britain and the United States, primarily, to help the other allies.

THE CENTERLINE OF THE NEW BRIDGE between Houghton and Hancock, top photo, just left of the upright steel beam on the barge. In the picture the stakes are shown left of center. The white chalk mark on the pier of the old bridge is the new bridge's center. Construction started officially on Wednesday, and is scheduled to be completed within three years. The Al Johnson Construction Co.'s pile-driver is at the right. In the lower photo, symbolizing the forthcoming link between Hancock and Houghton, Mayor Leonard Lahti of Hancock, right, and Mayor Carlos Wenberg of Houghton, left, join hands in a gesture of unity. Michigan State Highway Commissioner John C. Mackie stands with the ground-breaking shovel in front of a background which soon will be only a memory.

Construction Starts On Portage Bridge

With all the solemnity due an event that occurs once in a lifetime, the mayor of Hancock, Leonard Lahti and the President of Houghton, Carlos Wenberg, shook hands as John C. Mackie, State Highway Commissioner, turned the first shovel of earth for the construction of the new $10 million Houghton County Bridge.

"This is a historical occasion," said Lahti.

"The new bridge will be a living monument to the efforts of all of us to bring our highway system not only up to date but fully capable of handling traffic for years to come," said Wenberg.

'WILL BENEFIT US ALL'

"I break this ground, ladies and gentlemen," began Commissioner Mackie, "to start work on our new bridge project which will benefit us all. It is an occasion long overdue, and when the structure is completed the scenic wonders of the Copper Country will stand out with still greater relief against a backdrop of skyblue waters and azure skies."

The Al Johnson Construction Co. will build the foundations of the structure, and its approaches, and will paint the steel after it is completed. The steelwork will be done by the American Bridge Co. Construction is scheduled to be completed in three years.

About $1 million worth of equipment has been brought in by the Johnson company. There is a 30 ton motor crane, a 2½ yard Manitowac, a two yard Link Belt and a 1½ yard Koehring. The company also has brought in two big barges, a 50-ton lo-boy, two 2-ton semi-trailers and six large compressors of capacities ranging from 315 to 1,100 cu. ft.

The company has eight large projects in operation throughout the United States. This is only one of them.

Company supervisory personnel are O. A. Johnson, vice president and general superintendent; C. F. Woods, chief project engineer; Ma Dumas, office engineer; Grant Fallon, office manager; H. W. Wenum, carpenter superintendent; Harry Erickson, carpenter shop foreman; Andrew Anderson, carpenter and pile foreman; Ronald Arbogast, Mechanical Superintendent; Don Bremberg, steel superintendent.

SKELETON WINTER CREW

Besides the supervisory personnel, there are about 25 workmen now employed, and when it is operating at full capacity, the firm will have 125 men, most of whom will be hired from the local labor force.

It is pointed out however that during the winter the company will operate with only a skeleton crew and there will be a minimum of work performed.

Herman Gundlach Inc. will furnish all the ready-made concrete for the foundation and approaches. Gundlach is building a large plant in Ripley that will employ more than 25 men and will continue to operate after the bridge has been completed.

IN GOOD HANDS

The Al Johnson Construction Co. is one of national repute. It has projects going on the St. Lawrence Seaway in the building of the Iroquois dam and locks, the dredging of the Detroit Harbor to Canada and five other immense projects throughout the nation.

The exact type of approaches to the bridge have not yet been fully determined though several blueprints have been submitted for long and serious study. The state highway engineers will soon have a master plan that will be presented the Johnson Co.

At the conclusion of the ground breaking ceremony, Houghton's President Carlos Wenberg sighed, "At last we are on our way."

Late News Dispatches

WILLIAMS, MACKIE PROTEST FCC ACTION

LANSING (AP)—Action by the Federal Communications Commission taking away a radio wave length alloted to the State Highway Department has drawn a joint protest from Gov. Williams and Highway Commissioner John C. Mackie.

FBI NABS EX-CONVICT IN BANK ROBBERY

DETROIT (AP)—The FBI said today it has arrested a Tennessee ex-convict in the $4,500 robbery of the First State and Savings bank of Grand Blanc, Mich.

HOFFA WIRETAP CASE GOES TO JURY

NEW YORK (AP)—A federal court jury has the case of James R. Hoffa, president-elect of the Teamsters Union, and two others charged with conspiring here to illegally tap telephones in the Detroit Teamsters building.

Vicious Twisters Hit South Illinois, Death Toll Mounts

MURPHYSBORO, Ill. (AP)—Vicious unseasonal twisters tore through southern Illinois, "Tornado Valley" late Wednesday, leaving a tragic toll of death, injury and destruction.

Nine fatalities were reported in this southern Illinois area and another in eastern Missouri. More than 100 persons were hurt—at least 80 in Murphysboro and Mount Vernon, Ill., alone—and scores of homes flattened. Unofficial estimates placed property damage in the millions of dollars.

Although destruction was greatest in Mount Vernon, which counted 75 to 100 homes destroyed or badly damaged, the twisters created the worst human misery in Murphysboro.

Here eight persons died and at least 35 were hospitalized. Thirty homes were destroyed—15 by fires which followed the tornadic winds.

In addition, nearly a score of other towns reported injuries or damage by the violent late autumn weather.

The tornado which struck Murphysboro shortly before 5 p.m. was described by a journalism professor as a giant fist smashing through the city, killing, maiming, destroying.

James L. C. Ford, of Southern Illinois University in Carbondale, said as he watched the black funnel-shaped cloud form, "there came a roaring like an express train."

A hailstorm followed, with stones the size of eggs, Ford said.

"Suddenly trees were smashed like tenpins," Ford said. "I saw a row of five houses crushed as though by a giant fist. As soon as the roar of the storm passed, there was another blast of sound—the wailing of fire engines.

"There was no panic. People were numbed, standing around shaking their heads. It looks like this will be a pretty sad Christmas for our folks."

Thus this Southern Illinois section again has offered tragic evidence of the reason it is called "Tornado Valley." Mostly because of twisters which regularly churn through the area, the Weather Bureau ranks Illinois as a whole the country's over-all leader in tornado deaths.

LANSING MAN KILLED

IMLAY CITY (AP) — Wilson J. Scott, 34, of East Lansing, was killed Wednesday when his car skidded 126 feet into a Grand Trunk freight train engine.

Say Arms Cost Not Included in Foreign Aid Bill

WASHINGTON (AP) — Officials said today no money for arming West Europe with intermediate range rockets is budgeted in the $3,940,000,000 foreign aid bill being readied for Congress.

They said several hundred million dollars may have to be added to the request to pay for the 1,500-mile-range Jupiter and Thor missiles—if the European nations decide they want them.

The 15-nation North Atlantic Alliance summit conference at Paris Wednesday accepted unanimously the principle that NATO as a whole should have the weapons. Britain and Turkey agreed to accept them. Only the Netherlands among the continental European allies said yes immediately. However, the United States is not expected to have intermediate range missiles ready to deliver overseas until late next year.

Meanwhile, diplomats dealing with the foreign aid program expressed some confusion over President Eisenhower's reference to the Export-Import Bank in his opening speech at the NATO meeting Monday.

Eisenhower, saying the United States was stepping up its economic aid, listed some proposals in the works. Among other things, he said: "We will ask the Congress to increase the lending authority of the Export-Import Bank by an additional two billion dollars."

The diplomats here said the puzzling thing about this Eisenhower reference was its inclusion with some foreign aid proposals, such as a request for a 625-million-dollar development loan fund.

Tennessee Demo Dies of Coronary

WASHINGTON (AP) — Rep. Jere Cooper (D-Tenn), chairman of the tax-writing House Ways and Means Committee, died Wednesday night after suffering an attack of coronary thrombosis. He was 64.

Cooper's death puts Rep. Wilbur D. Mills (D-Ark) in line for chairmanship of the important committee, which originates all tax legislation in Congress.

The party lineup in the House now stands at 230 Democrats and 200 Republicans, with 5 vacant seats, including Cooper's.

Jupiter Launched, But Fails to C Full Distance

CAPE CANAVERAL, Fla. (AP)—The Army test-launched a fiery, thundering Jupiter rocket from the missile test center near here Wednesday night.

From the moment of flaming takeoff until the torch dimmed out high in a starry sky some four minutes later, it appeared to be a most successful launching.

But the Defense Department said later that the missile failed to complete its full flight because of technical difficulties.

What that meant in terms of range, speed and accuracy was not explained.

The Jupiter is an intermediate range ballistic missile designed to deliver a nuclear warhead upon a target 1,500 miles distant. In one launching a Jupiter traveled 2,300 miles.

Fireman Killed in Missouri Blaze

JEFFERSON CITY, Mo. (AP)—A downtown variety store, quickly cleared of Christmas shoppers, was destroyed Wednesday night by fire. One fireman was killed and two others were injured.

Damage to the variety store building and two adjoining structures was estimated at half a million dollars.

Killed was Frank Otto, a Linn, Mo., volunteer fireman who happened to be in town and offered his services. He apparently was overcome by smoke.

The fire apparently started in litter on a loading dock in back of the store. Employes and shoppers escaped without difficulty.

ALL FUR NOTHING

NEWPORT, Ky. (AP) — Ethlyn Haney of nearby Ft. Thomas has her coat back, the $500 fur was returned by mail to the cafe where it was stolen. Attached to the box was the note: "It don't fit me. Please return to owner."

With Help of Girl Scouts

U.P. Sailor Is Santa to 51 Orphans in Italy

MARQUETTE (AP) — Chief Radioman Fred Soyring is Santa Claus as far as 51 Italian orphans are concerned—even if he did have to call on Girl Scout troops in three cities to help provide their mountain of Christmas gifts.

Soyring, who serves with a U. S. naval communications group at Naples, Italy, lives near an orphange for girls. His brother, State Police Trooper Russell Soyring of the Marquette post, reports that Fred decided to find a way to give the girls a happy Christmas.

He explained his plight to Girl Scout units in Lansing, Mich., Portland, Ore., and Kansas City, Kan. By the time the girls finished sending gifts each of the orphans had enough toys and clothing to last many months.

Lansing Girl Scout officials said each of the city's troops "adopted" one or more of the orphans and made gift packages.

Soyring, a native of Gwinn, Mich., and a Navy veteran of 19 years, sent a letter of thanks to the Lansing scouts in which he revealed that the most popular gift was a skipping rope.

"There was only one in all the packages that came," Soyring said, "and now every time one of us walks past the orphanage one of the girls is out in front skipping rope."

Lansing Girl Scout leaders also received other letters of gratitude from Italian scouting officials.

U. P. Girl, 2, Dies Of Rare Disease

ESCANABA (AP) — Just before Christmas last year Mr. and Mrs. Jerome Deloria learned that their daughter, Susan, 2, was a victim of the Tay-Sachs disease, a rare ailment which had previously claimed the life of their 2-year-old son. The Delorias took Susan to France, hoping for a miracle cure at the Shrine of Our Lady of Lourdes. But Susan died here Tuesday.

GIRL, 6, KILLED

PONTIAC (AP) — Six-year-old Joy King of Orchard Lake was killed Wednesday when struck by a car as she ran across the street after getting off a school bus. The Motorist was not held.

WEATHER

SNOW AND COLDER

THE WEATHER ELSEWHERE

AT THE GROUND BREAKING CEREMONY for the new Houghton County Bridge were notables from all points of the Copper Country and from down state. Though it was a very chilly and damp wintry day, the participants fully realized the impact the new bridge will have on the economy and welfare of this area. These men reflect the enthusiasm of the occasion. They are from left, Patrick M. Thornton, Hancock; Joseph Oravec, Ironwood, District Bridge Engineer of the state's Highway Department; O. A. Johnson, Vice President and General Superintendent of the Al Johnson Construction Co.; John C. Mackie, State Highway Commissioner, and Howard Hill, Deputy Chief Engineer of the Highway Department.

THE LAURIUM CHAMBER OF COMMERCE was well represented at the ground breaking ceremony for the new Houghton County Bridge Wednesday afternoon at 3:30 p. m. It was a special occasion for them in another respect. Howard Hill, Deputy Chief Engineer of the State Highway Department, was formerly of Laurium and is an honorable member of the chamber. Here to note the great event are, from left, Clem O'Neil; William Kaiser, County Engineer; Joseph Kline, President of Laurium; Howard Hill; Cliff Seppala, a brother-in-law of Hill; George Zimmerman; Lodi Mihelich; D. J. "Doc" Massoglia, State Representative, and Earl Nordine. On hand to greet his brother, Howard Hill, was Fred Maki, also of Laurium.

New Bridge Will Be a Marvel Of Engineering

According to Highway Commissioner John C. Mackie the new Portage Lake drawbridge will be an ambitious structure. It will be constructed at a location about 135 feet west of the present site and will parallel the present bridge.

It will be a lift span and the old bridge will be removed once the new structure goes into operation.

The new bridge will be 1310 feet long and will consist of 11 spans. The center span will be a vertical lift of 253 feet which will provide a clear opening of 250 feet for vessels.

It will be the first vertical lift bridge on the state trunkline system and will be a compliment not only to the Copper Country and the Upper Peninsula but also to the state.

The most unique feature of the new bridge's construction will be the arrangement whereby small craft will be able to pass under the bridge without halting highway traffic. When trains are not using the lower level of the center span, it will be raised to the level of highway traffic which will then travel on the train deck.

When trains cross the canal the center span will be lowered so that the train tracks will fall in line with the tracks on the other sections of the bridge.

Another unusual feature of the bridge is that the rails will be separated from the steel of the bridge itself by insulation in order to permit the functioning of the electric railroad signal system. This is accomplished by the use of bushings, washer and rail bearing pads made of rubber fabric. The new bridge will have automatic gates and barriers, and will require three operators, whereas the present bridge has nine men on duty each 24 hours.

The bridge will have four lanes of traffic. There will be two 26-foot roadways with a divider strip between.

Somewhat similar to the present bridge will be the two pedestrian walkways, one on each side.

The deepest caisson to be sunk will be 78 feet below the water surface. The total height from the bottom of the caisson to the aviation light atop the engineering tower will be 278 feet.

The project will require 6,800 tons of steel and 22,000 cubic yards of concrete. The American Bridge Co., a division of U.S. Steel Corp., has the contract for furnishing, fabrication and erection of structural steel involved in the construction. The bid sum is almost $6,000,000.

The Al Johnson Construction Co. contract is for $4,075,000. The contract is for substructure, approaches and miscellaneous construction.

Actual construction was started Wednesday. Completion is set for late summer, 1959.

MARTIE MEYERS, center, stands aghast at the $10 million cost of the new Portage Lake bridge. Here, as a member of the Houghton County Road Commission, he voices his surprise to G. T. Murphy of Calumet, head of the Upper Peninsula Development Bureau. From left, Murphy, P. M. Thornton, last evening's emcee, Meyers, Joseph Masini, road commission member, and William Milford, commission member.

"IT TOOK A LONG TIME TO GET THIS BRIDGE," Houghton County Highway Engineer Carl F. Winkler is saying to Joseph Oravec, Upper Peninsula district and bridge engineer with the state highway department. At right, O. A. Johnson of the Al Johnson Construction Co., the bridge builder, is conferring with Captain George Skuggen of the Wilson Steamship Line. Skuggen is the man who expressed Lake Carrier sentiment in the statement, "The present Portage bridge is a menace to navigation."

Canada is the sixth leading industrial nation of the world.

100 Celebrate, Laud Groups at Bridge Banquet

"In observing the ground breaking this afternoon you saw the culmination of many years of hope and hard work. It seemed to me that this could properly be termed an auspicious day. I can certainly say that this is a happy day for the Copper Country, for ever since the introduction of the automobile we have become more and more aware of the inadequacy of our present bridge."

With these words, Patrick M. Thornton, the master of ceremonies at last night's Portage Lake bridge ground breaking ceremony banquet, led the parade of platform people assembled, with guests at the Douglass House, to mark the turning of the first shovelful of ground marking the official start of work on the new bridge. Almost 100 people attended the function.

The event took place last evening after a cocktail hour and a tenderloin steak banquet. Hosts were the American Bridge Co., the Al Johnson Construction Co., the Gundlach Co. and the Thornton Construction Co.

"It took some long and consistent work to achieve our objective of this bridge. In our efforts we had the cooperation of Captain George Skuggen of the Wilson Line's Steamer Frank Denton, Col. John U. Allen of the Corps of Engineers and many others, including Congressman John B. Bennett, Senator Leo Roy, Carl Winkler, Houghton County Engineer.

"After all other hurdles had been cleared the former Highway Commissioner of Michigan, Charles M. Ziegler, came in to do his part, as did George M. Foster, the deputy commissioner," Thornton said.

The toastmaster then introduced a number of celebrities. Missing from the banquet was Frank Batchelder of Houghton. It was recalled that he was an important instrument in the engineering work involved in the construction of the draw which was toppled in 1905 by a Mutual Transit Co. steamer. He had a lot to do with some of the early engineering work of the Copper Range Railroad.

Also missing from the banquet was Carl Sanders, the contract engineer with the American Bridge Division of the U. S. Steel Co. He couldn't make the trip because of bad flying weather between Lansing and Houghton.

O. A. Johnson, the vice president of the Al Johnson Construction Co., was enthusiastic about his firm's prospective work on the bridge. Quite significantly, he said, "But, I am not going to tell you too much about what we are going to do. Just wait until the bridge is constructed. I am sure we can show you much more then."

Paul Frair was next called upon for remarks on the part of his firm, the Gundlach Co. In appropriate terms he indicated appreciation that his company will make some contribution to the outstanding structure.

Howard E. Hill, deputy commissioner in charge of Michigan Highway Department engineering, talked in glowing terms of the new thoroughfare. As a former Calumet resident he voiced pride in the fact that the Portage Lake district received the award.

Carl Winkler's talk was especially effective. Said he, "I never thought I would live to see this all-important day." He paid tribute to another man who greatly helped the project, William Schacht, former Copper Range mines' head at Painesdale. The Lake Carriers Association was also honored for its aid.

Giving the invocation was Rev. Fr. Lester Bourgeois, pastor of St. Joseph-St. Patrick Church in Hancock. The Rev. Lloyd Dalquist, pastor of the First Presbyterian Church, Houghton, gave the benediction.

BAD WEATHER — Yesterday's fog, rain and snow made for poor weather conditions between Detroit, Lansing and the Copper Country. As a result, a number of key men expected to be in the Portage district for the bridge dedication did not arrive. Here, Highway Commissioner John C. Mackie and his pilot, Marion Green, look at weather forecasts in an attempt to determine whether they should try to return to Lansing after last evening's banquet.

BARAGA

John Payne Named Justice of Peace

John Payne of Baraga has been appointed Justice of the Peace by the Baraga Township Board for a term ending July, 1959. The office has been vacant since the last election when Raleigh Draper did not file for re-election.

Northwoods Mill Resumes Operation

The Northwoods Mill at Baraga, resumed operations on Tuesday morning.

They have been closed down for several months, due to having no logs on the premises.

Bridges - Portage Lake Lift Bridge

Portage Bridge

In 1860-65 a ferry operated between Houghton & Hancock and then up to 1875 a ferry and a pontoon bridge served the two communities. In 1875 a heavy timbered wood bridge was built with a turntable in the middle and this structure served horses & buggies and wagons and pedestrians.

In 1897 a Steel Bridge was built replacing the wood structure (which had been a toll bridge).

In April of 1905 The ship Northern Wave smashed into the middle section (turntable) and toppling it into the lake. It was rebuilt and restored to service in 1907.

In Dec. 1959 the new Houghton County Portage Lake Bridge was opened for traffic and dedicated in June 1960. It began its building in 1957 and completed in Dec. 1959.

COPY OF ORIG.

CONSTRUCTION HISTORY

HOUGHTON-HANCOCK VERTICAL LIFT BRIDGE

STATE PROJECT NO. UBI of 31-10-1

C4 & C5

FEDERAL NO. U175(22)

1961

Reviewed By: P. A. Nordgren --------

I. T. Field 10-1-62

L. H. Gilroy 10-16-62

T. R. Wiseman 10-22-62

Submitted By: J. J. Michels

Project Engr.

CONSTRUCTION HISTORY

HOUGHTON-HANCOCK VERTICAL LIFT BRIDGE

STATE PROJECT No. UB1 of 31-10-1, C4 & 5U

FEDERAL No. U 175(22)

1961

Composed by:

J. Michels, Proj. Engr., 1961
L. H. Gilroy, Dist. Engr., 1961

Submitted by:

John J. Michels

PROJECT DATA

State Project No. - UB1 of 31-10-1, C4 & 5U-1960

Federal No. - U 175(22)

Location - In Houghton County, Michigan on routes US-41 and M-26 (relocated) crossing Portage Lake between the cities of Houghton and Hancock, along a line approximately one hundred and thirty-five feet west of the existing bridge.

AGREEMENTS

I. U.S. Government

Since the new structure crosses a federal waterway it comes under the jurisdiction of the Federal Government who is represented by the District Engineer, U.S. Army Corps of Engineers, St. Paul District. The Federal Government, acting through the Secretary of the Army, persuant to the provisions of Section 3 of the Truman-Hobbs Act of Congress, approved June 21, 1940, as amended, did under date of March 25, 1955, authorize the construction of the Houghton-Hancock bridge over the Keweenaw Waterway. This was the result of investigations which showed that the old bridge was an unreasonable obstruction to navigation because of inadequate horizontal clearance.

The total cost of the bridge was borne by the United States and the Michigan State Highway Department, and such cost was determined in accordance with Section 6 of the above act, dated June 21, 1940. Such apportionment of cost for Federal participation is based on the difference in cost of constructing an equivalent bridge and of constructing the proposed bridge at the same site. The cost to be borne by the United States was determined from estimates to be 36.7%. That borne by the Highway Department and B.P.R. was 63.3%. The total estimated cost to be apportioned was $10,775,250. Upon completion of the work and after actual costs are known, a reapportionment will be computed and an adjustment will be made, as to the proportionate shares of the respective parties.

II. Railroads

A formal agreement with the Copper Range Railroad of Houghton, Mich. and the Duluth South Shore and Atlantic Railroad of Marquette, Michigan was entered into on December 26, 1956. This agreement was necessary to set forth conditions of construction, ownership and operation of the new bridge which carries both railroads on its lower deck.

Highlights of this agreement are as follows:

1. The Department will construct the complete structure and the Railroads will grant permission to enter on railroad property for purposes of construction.

2. The Department will adopt grades, designs & specifications for the new bridge, subject to approval of the Railroads.

3. The Highway Department will undertake and perform work through contractors. Each railroad may, at project expense, place a competent engineer to inspect all work and place, at its own expense, any assistants necessary.

4. The Railroads, at there own expense, will perform the following:
   a. Change Railroad communication lines.
   b. Furnish and install all track materials on land approaches.
   c. Furnish all materials at project expense for railroad section on bridge.

AGREEMENTS: (continued)

5. The Highway Department will salvage all old railroad materials and the Railroad will credit the Department 50% of similar materials.

6. Insurance coverages and conditions as set forth.

7. The Railroad shall secure R.O.W. for relocation of its tracks.

8. The Railroad will grant R.O.W. to the Department and easements for highway purposes.

9. The ownership of the new bridge will be invested in the Highway Dept. except track and appurtenances on the bridge and approaches which shall belong to the Railroads.

10. The operation of the lift span shall be invested in the railroad, including hiring and supervision of labor. This agreement has been renegotiated and as of March 1, 1961, the Highway Department is operator of the bridge.

11. Cost of operation will be ½ by the State and ½ by the Railroads.

12. The Railroads shall at the completion of the project, and at their own expense, maintain and repair those railroad spans which carry, solely, railroad traffic, substructure units, the floor system of the lower anchor spans and all trackage and the interlocking system. The Department will maintain and repair the bridge operating equipment.

13. In the event of damage to the lift span and its foundations due to passage of ships or aircraft, the Department will replace or repair the damaged portions; the cost to be 3/5 by the Highway Department and 2/5 by the Railroads.

14. The Railroad waives all claims for damages against the Department because of interruption in railroad traffic.

15. Also included are supplemental specifications covering the bridge contractors.

Summary:

This agreement, which covered most items very throughly, did leave the item of operation and maintenance questionable. This proved to be a source of trouble when the railroads took over operation. It is felt that in all future agreements of this type that this subject be listed in detail, specifically stating who will perform maintenance items and operation functions, with each item handled separately.

UTILITIES

Utilities involved in construction of the new bridge were the U.P. Power Company of Houghton, the two railroads previously mentioned, the city of Hancock and the village of Houghton.

Considerable work was required of the Power Company in laying of new submarine cables across the lake, approximately, 200' west of the new struture. Old cables in the vicinity of the old bridge were abandoned. It was necessary to construct a new terminal station on the north shore to receive the new cables. The relocation of numerous power poles on both sides of the lake was also required. All of this work was done by the Power Company.

UTILITIES (continued)

Relocation of a sewer line and a blow-off line from the Power House, located on the Houghton side, was necessary to allow construction of the railroad piers. This work was done under contract 5.

Relocation of one fire hydrant at the Houghton approach was accomplished under contract 5 in cooperation with the village of Houghton.

The Copper Range Railroad relocated their telephone lines in the vicinity of the approaches as previously set forth in the Tri-Party agreement.

The city of Hancock did relocate a water main to Ripley to allow construction of the ramp under the north bridge approach.

PROGRESS RECORD

Work progress for contract 4 was subject to much correspondence during the summer of 1959 which saw the major portion of the superstructure erected. It will be noted by examination of the pre-construction progress schedule, as submitted by the American Bridge Company, that only two contract completion dates were given for all work. This proved to be a source of trouble in coordinating contract #4 &.5. It made it difficult for the substructure contractor to plan his work and left the Department without grounds on which to expedite work according to dates. Although additional schedules were compiled throughout the project, with rather loose dates arrived at, we feel that this matter should have been decided at the time of the letting.

Progress on contract 5, the substructure, was fairly well according to plan. However, the contractor experienced some delay in placing of the highway deck, and this was due to American Bridge not having structural steel in place and riveted up. This, in turn, caused slight delays in getting railroad traffic on the new bridge and also dismanteling the old bridge. Extensions of time were asked and granted for this reason and also for some extra work requested by the Highway Department. It may also be stated that failure to have structural steel in place also slowed the painters and made it necessary for them to extend their completion date. The contractor himself did experience delays due to their own work, but did try to expedite work with additional men and overtime work. Overall, this contractor performed his work well and in a reasonable time.

PERSONNEL

A. State J. F. Oravec - Dist. Bridge Engineer

1. Project Engineers
   - L. H. Gilroy, from Nov., 1957 to Jan., 1958
   - T. R. Wiseman, from Jan., 1958 to Jan., ~~1959~~ 1960
   - J. J. Michels, from Jan., ~~1959~~ 1960 to Jan., 1961

2. Inspectors and Engineering Aides
   - T. R. Reed - Baraga
   - D. C. Laurie - Laurium
   - W. C. Maki - Lake Linden
   - F. C. McMullin - Ontonagon
   - B. F. Deter - L'Anse
   - Charles Barnes

Kero ?

PERSONNEL (continued)

B. Contractor

1. Contract #5 - Johnson Construction Co.

C. F. Woods,	Project Manager	from	Nov., 1957	to June, 1960
Gust Simms,	" "	"	June, 1960	to Oct., 1960
Grant Fallon,	" "	"	Oct., 1960	to Jan., 1961
Moe Dumas,	Office Engineer	from	Nov., 1957	to June, 1960
Grant Fallon,	" Manager	"	Nov., 1957	to Oct., 1960

2. Contract #4 - American Bridge Co.

G. W. Twining -	Erection Supt.	from	Feb., 1959	to Feb., 1960
B. Smith -	" Engr.	"	" "	" " "
Nick Mowlds -	" "	"	" "	" " "
Alex Vizenau -	" Supt.	"	June, 1960	" Aug., 1960
John Bell -	" "	"	Aug., 1960	" Jan., 1961

STAKEOUT

Layout of the new structure was divided into two separate systems. One, being a rectangular traverse layout of bridge abutments and piers and the other being a base line method for all railroad piers on the south side.

This work was accomplished by State personnel and started in November of 1957. The location for all bridge piers and abutments was first established by locating the bridge centerline from P.O.T. points previously set from a base-line established under the old bridge in 1936. This base-line was 135' east of the proposed bridge centerline and parallel to it. Abutment and pier reference points on land were established on centerline at the stationing shown on the plans, by measurement from P.O.T.'s. Additional points were placed back, north and south of the bridge site to better establish the centerline and to be used during construction.

Reference points for piers in the water, were placed on the east side of centerline by establishing a base-line on the sidewalk of existing bridge, and to the west, by establishing points where the reference lines intersected land. Distances between points were thoroughly checked during the winter months by direct measurements taken on the ice. Some points to the west were approximately 6,000' from the new bridge centerline.

Layout of the railroad piers on the south side was done by establishing a base line at right angles to the bridge centerline at station 10 + 64.00. Two points for each pier were located on this line. One point to locate the reference line across the pier, the other to locate the line with the pier. Intersection of these two lines gave the exact position of the reference point. Two transits were required to set location at time of construction, and this method worked very well.

The stake-out presented numerous problems as far as clear vision

STAKEOUT (continued)

for lines is concerned, with a good portion of it being among buildings and tree plantations.

Bench marks were "looped" from one side of the lake to the other with no changes made from elevations shown on the plans.

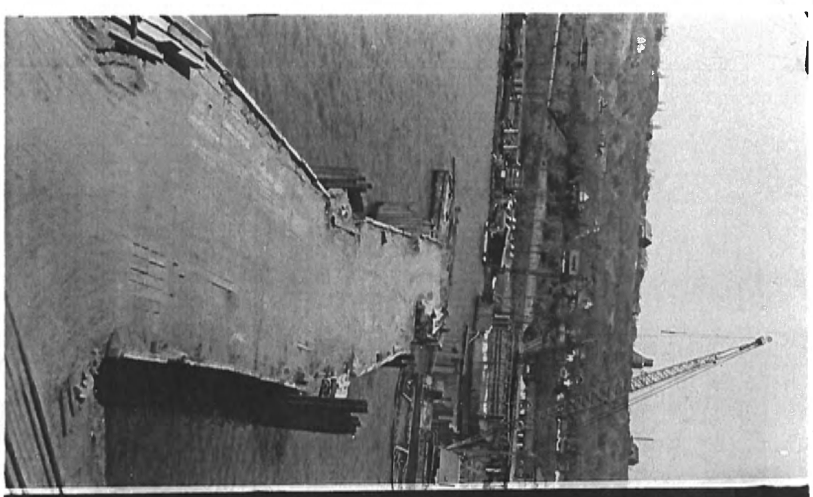
Original approach and pier unclassified excavation cross-sections were taken just after completion of the stakeout with bridge centerline as a base-line.

Channel cross-sections were taken parallel to centerline at 25' intervals, east and west of centerline. A steel cable was stretched across the lake at each station and soundings were taken along this cable, using a row boat.

SET-UP OF EQUIPMENT

Offices for both contractors were of the house trailer type, and located in the northeast quandrant near the old copper Range Depot. The Johnson Construction Co. rented three additional buildings in this immediate area for a carpenter shop, machine shop and warehouse. The American Bridge Co. moved in four temporary wooden buildings 10 x 20', mostly for personnel and tools. These buildings were set up under the north approach spans. The steel contractor used an area one-fourth mile west of the bridge, on the lake front, as a yard for storage of structural steel and erection of the lift span. No equipment was set up on the Houghton side because of the limited space there. Access to the areas mentioned above was by city streets. No space was required for aggregate storage because both contractors used ready mixed concrete from nearby Ripley.

TEMPORARY WORK BRIDGES



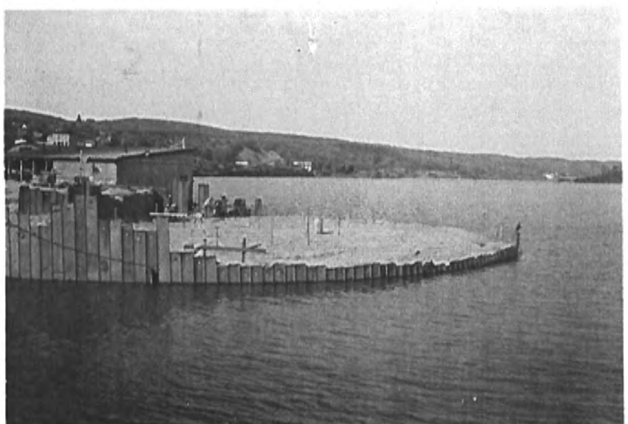
No. 3 UB1 of 31-10-1, C5U
View of entire bridge site
taken from top of power house.
5/ 7/58 JFO

TEMPORARY WORK BRIDGES (continued)

A temporary work bridge was necessary for piers on the south side for caissons #4&5. This bridge, which was approximately 200' long was constructed of three cylindrical sheet piling cells filled with sand for piers, with the superstructure composed of three plate-girder spans with a timber deck. The work cells were removed at the completion of the bridge work.

SAND ISLANDS

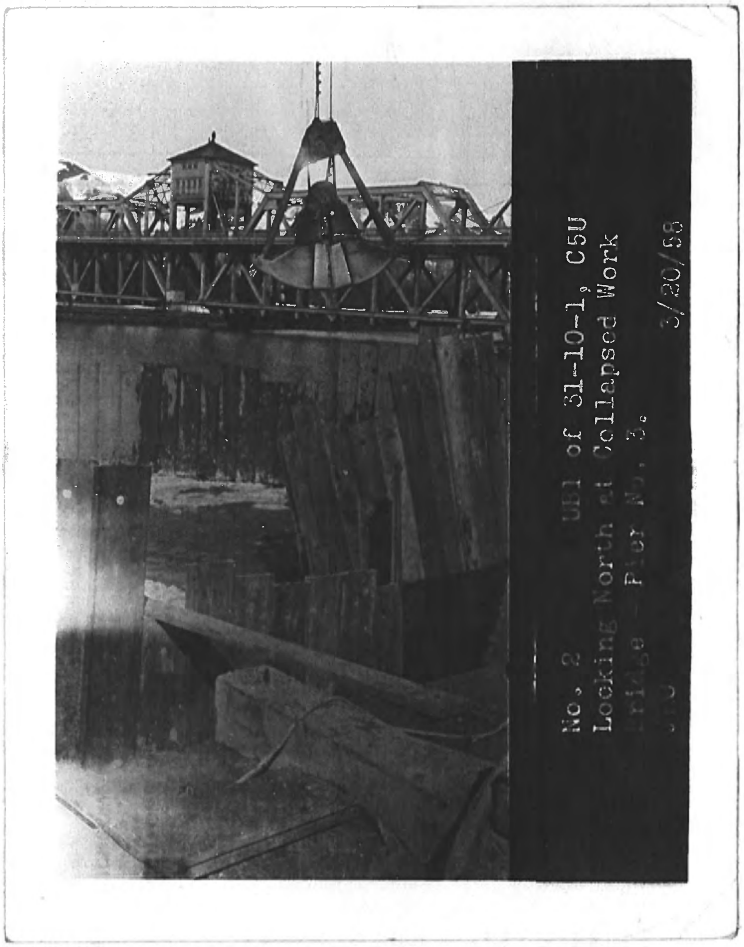
The contractor chose the sand-island method to sink caissons for piers 4,5&6. These sand island or work cells were constructed of cylindrical sheet piling shells filled with sand. A single circular cell was built for pier #6 and it was 106 feet in diameter The sand-island for piers 4 & 5 consisted of a series of cells all constructed together.



No. 6 UB1 of 31-10-1, C5U
Looking west over No. 5
sand island.
8- 7-58 LHG

The average depth of thes cells was 40 feet, with fill sand obtained from a borrow pit at Ripley, one mile away.

While placing fill in #4 island the south wall failed, which made it necessary to pull the sheet piling and redrive it. This failure was evidently caused by failure of the sheeting due to the internal pressure of the sand.


No. 2 UB1 of 31-10-1, C5U
Looking North at Collapsed Work
ridge - Pier No. 3.
3/20/58

SAND ISLANDS

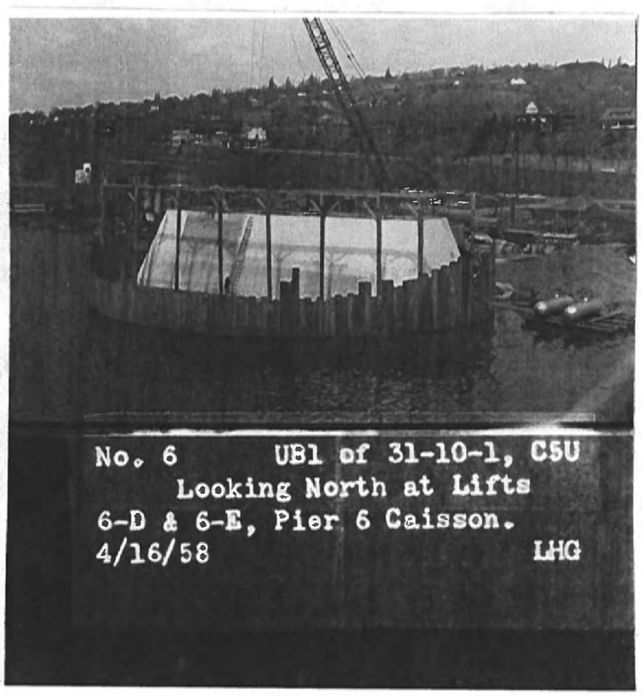
During construction of caissons 4 & 5, the toe of the sheet piling failed and considerable fill material was lost. It was necessary for the contractor to haul in 15,000 cyds. of mine rock to be placed against the outside toe of the sheet piling to hold the cell in place. This failure of the cell was caused by rupture of a "T" section along a row of rivets by shearing of the web due to internal pressure. Because of this incident, the contractor was not able to extract the sheet-piling in this area and it was necessary to have a diver cut off the piling at a joint below elevation 571.5'. No damage was done to either caisson by the cell failures. After the completion of Piers 4 & 5 and for a period of four months through the winter of 1959 these substructure units were checked twice weekly for movement. None was observed so the cells were removed.

During construction of the cell for pier #4, a sunken scow, 100 x 25' loaded with sandstone was found. This can be observed on the plans as a high spot on the river bottom, within the outline of pier #4 caisson. It was deemed necessary to remove the entire scow, with payment to the contractor on a force account basis. Total cost amounted to $3,687.66.

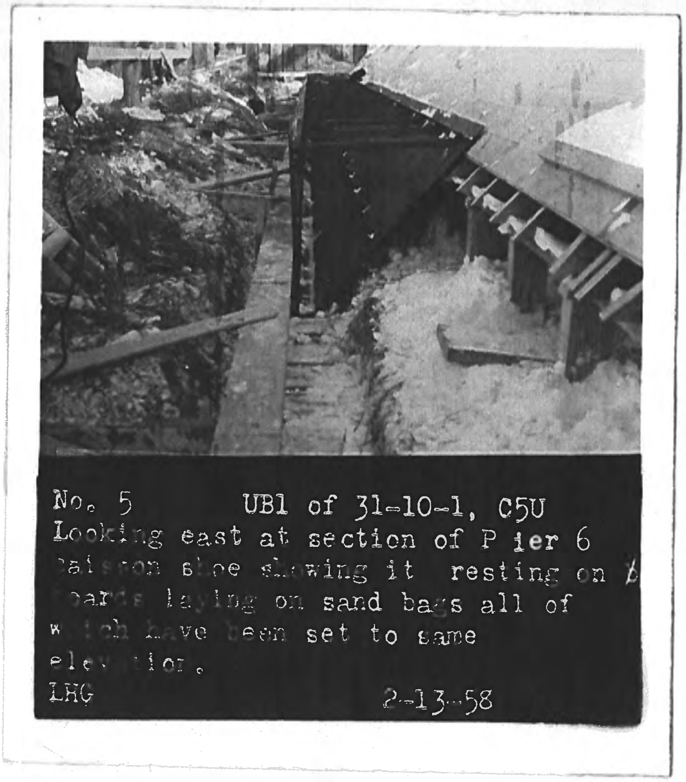
CAISSONS

Piers 4,5,& 6 of the structure are caisson type piers, piers 5 & 6 being the main tower piers. Pier 4 supports the south end of the south tower truss.

The plans showed the more conventional steel type caissons which are floated into place and filled with concrete but the contractor was allowed to use an approved alternate type of caisson if he so desired. The Al. Johnson Co. elected to build the caissons of reinforced concrete by using the sand island method. With this method an artificial island is constructed and the caisson is built on the island and sunk down through it. These islands consisted of a circular sheet piling cofferdam 106' in diameter filled with material from a nearby borrow pit. The sheeting used was 70' in length. Upon completion of the caisson the sheet piling was pulled and the fill material removed from the river.



CAISSONS (continued)



The only steel in the caisson other than the reinforcing steel was a steel cutting edge 3' high at the bottom of the caisson. The caissons were constructed in 10' layers. The forms were made of 2" tongue and groove lumber.

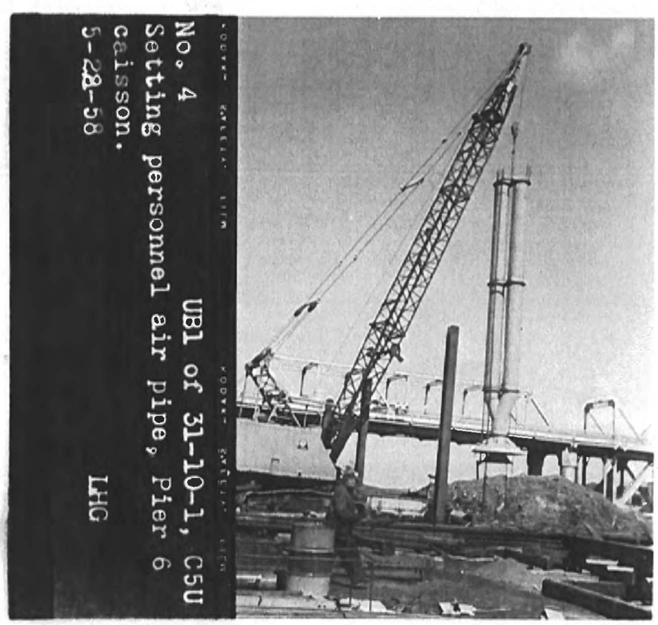
CAISSONS (continued)

The first step in building a caisson was to set the steel cutting edge on planks which were laid on bags filled with sand and placed around the perimeter of the caisson. These planks and sand bags, together with shoring, supported the caisson until sinking operations were ready to begin. This did not take place until the first 20' of the caisson had been formed and poured.

To sink the caisson, material was removed from beneath by excavating thru five circular dredge wells in the caisson. In addition to excavating with a clam bucket, material was also removed by means of an air lift pump inserted in the dredge wells. Air jets were also inserted along the outside of the caisson to assist in sinking it. When the caisson had sunk until only a foot or so remained above the sand island, dredging was halted and additional layers of the caisson were formed and poured.

During sinking operations a constant check was kept on line and grade to insure that the caisson stayed in its proper location. Not much difficulty was encountered in accomplishing this.

Piers 5 and 6 are resting in a layer of hard cemented gravel while pier 4 is resting on bed rock. When the caisson was within 3 or 4 feet of its final position open dredging was halted and air locks were inserted in the dredge wells sealing them so that men could go in under compressed air and complete the remainder of the excavation and cleanup. This pressure varied from 32 to 40 pounds per square inch.



CAISSONS (continued)

When air locks were fastened in pier 6 dredge wells the contractor pumped down the water in the dredge wells rather than use a diver to perform this operation. This took 3 days and during this time an adjacent pier of the existing bridge settled approximately an inch. It is believed this was caused by removal of the fines from the material under the pier as a result of the continuous pumping in the caisson. No further settlement occured and operation of the old bridge was not impaired.

Pier 4 caisson was started while pier 6 was being built but pier 5 was not started until after pier 6 was completed. The reason for this being that the sheeting from pier 6 sand island was used to build pier 5 sand island.

Because of the fear of losing pier 5 island, at this time, work was discontinued on pier 4 caisson and concentrated on pier 5 caisson. This was successfully completed on November 17, 1958 after which work was resumed on pier 4 caisson. This, in turn, was successfully completed December 10, 1958.

During pneumatic dredging operations 50 to 60 compressed air workers were used on around the clock shifts. Each shift consisted, usually, of ten men. These men worked for 2 hours then were off for 4 hours, then worked another 2 hours. A hospital lock and change house was set up on a barge and located adjacent to the sand island where work was going on. A hospital attendant was on duty at all times to take care of any workers who became ill with caisson disease or the "bends", as it is more commonly called.

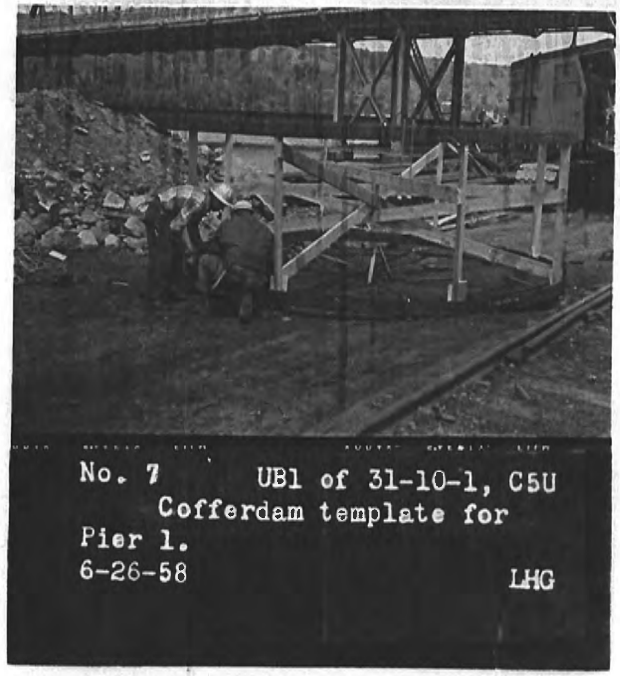
After reaching final penetration, the bottom of each caisson was sealed with a 13' tremie seal. The caisson was allowed to fill with water and the tremie concrete was placed with a regular tremie tube. The top of each caisson was topped with a 8' concrete cap which carries the structural steel. The top of all 3 piers is at elevation 606.0.

Pier 4 contains 3,006.0 cyds. of concrete and extends to elevation 535.2. Pier 5 contains 4,745.6 cyds. of concrete and extends to elevation 524.0. Pier 6 contains 4,643.2 cyds. of concrete and extends to elevation 526.6.

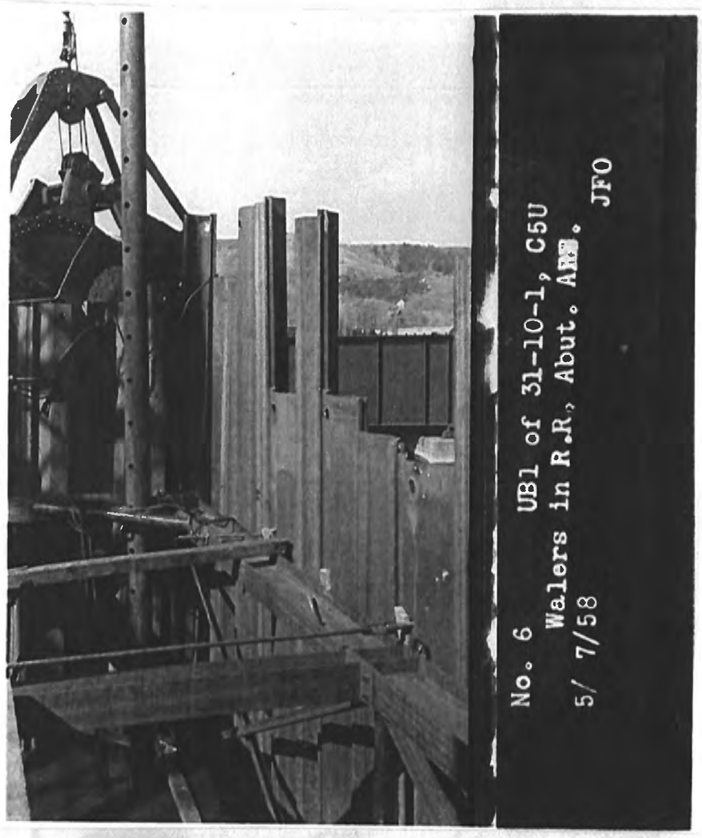
COFFERDAMS

Cofferdams for underwater foundations, other then the caission piers, were constructed of steel sheet piling. These cofferdams were of the rectangular type for piers 3,7 & 8 and were circular in shape for piers 1,2,9 and 10.

COFFERDAMS (continued)



Rectangular cofferdams for underwater foundations required construction of two I - Beam waler frames for the upper and lower part of each cofferdam. These frames were held together with pipe verticals and formed a template. Each template was set in position with a floating crane and held in position by adjustable spud legs in each corner. Sheet piling was then driven around the perimeter.



COFFERDAMS (continued)

Cofferdams for Piers 7 & 8, which were on land, were of the same construction as described above, except that walers were of 12 X 12" timber. Also, these cofferdams were not as deep and only required one frame at the top.

No. 3 UB1 of 31-10-1, C5U
Driving cofferdam sheeting, Pier 7.
8-18-58 LHG

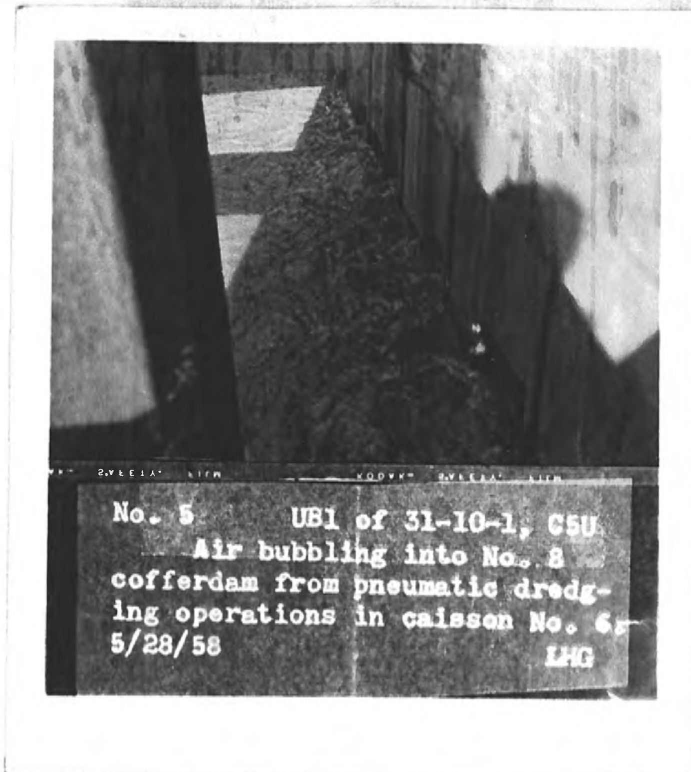
PILING

Piling was required for the following substructure units: Piers 7,8,9 & 10.

Treated timber piling was required for the pile clusters adjacent to piers 5 & 6. All bearing piles were steel H-piles, 14" and furnished by the Department at the bridge site. The lengths of these piles consisted of 93 pieces 60' long and 62 pieces 48' long. Bearing piles were set with a McKiernan Terry 9 B 3 and driven by a McKiernan Terry D E 30 Diesel hammer which proved to be efficient in operation. Required bearing for H piles was 55 tons.

During the driving of piling for piers 8 & 10, it was observed that air was passing from pier #6 caisson and escaping in these cofferdams.

PILING (continued)



This made it necessary to check bearing on these piles at a time after they were driven to see if bearing had changed. All piles were found to have the required bearing. The bottom of the excavation for pier 8 settled approximately one foot from driving piles. The Contractor backfilled and compacted the material up to the seal coat elevation.

Pier 9 piles obtained only 40 tons bearing in the estimated length of 45' and had to be spliced to secure 55 tons minimum bearing. Eleven protective pile clusters were designed to be placed opposite piers 5 and 6. Piles were treated timber 80' long, with a penetration average of 20'. Each clump was wrapped six times with three-quarter inch close link chain and securely spiked to the piles.

PILING (Continued)

Revision F of the bridge plans increased the number of pile clumps. The number of piles in the clumps nearest the piers lessoned the angle formed between the line of the faces of the proposed clusters and the channel lines and specified that the sand from the sand islands for piers 4 & 5 be placed in the low spots in the bed of the lake, in the vicinity of the pile clusters, adjacent to pier 5 to provide better support and penetration.

Division B changed the outer two rings of timber piles in each pile clump from verticle to batter so as to increase the stability of the pile clusters. Cluster piles were driven with an air hammer using swing leads and a Manitowac crane mounted on a floating barge.

CONCRETE

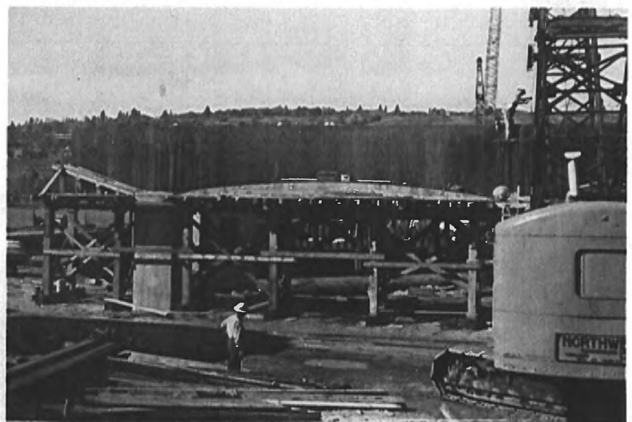
This work consisted of constructing all sub-structure concrete, concrete deck slabs and concrete sidewalks on the highway approach span, tower spans, lift span, and also the floors of the operators' house and generator house

CONCRETE (continued)

1. Forms

a. Substructure

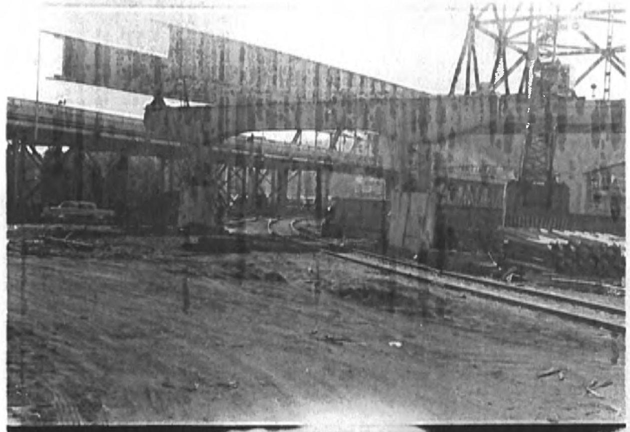
Form panels for the substructure concrete were of standard construction except for abutment wingwall forms which required special construction, as they were curved. These form sections were constructed in the contractors carpenter shop where curved wall sections could be laid out. A good job was done on these form panels with the result that the curved sections had a uniform appearance. The Contractor braced all forms well and no movement, during placing of concrete, took place for the whole project.



No. 8 UB1 of 31-10-1, C5U
Forming Pier 1 beam.
9- 9-58 LHG

The upper half of pier 9 consisted of a concrete encased steel beam girder supported by concrete columns. This pier required special work in forming.

CONCRETE (continued)



This method of construction for pier 9 was required because there would have been insufficient underclearance for railroad traffic, had the pier been completed as other piers, before transfer of traffic to the new relocated line.

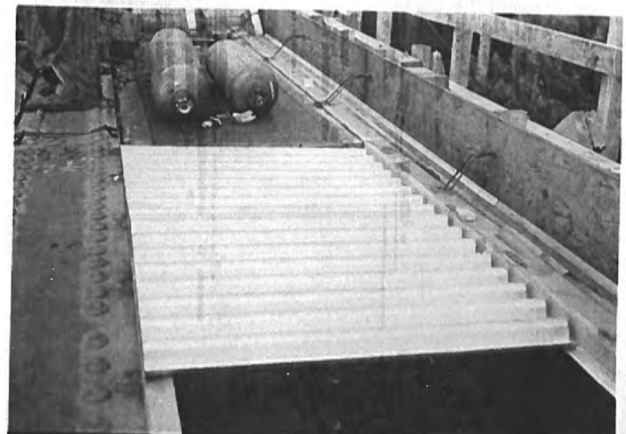
Support to forms from below was by two I-Beams which ran parallel with the pier, one on each side, and supported on blocking. It was difficult to align these forms for pier 9 as superstructure steel was already erected and the highway deck placed. Forming and casting of concrete was done after railroad traffic was transferred to its new location.

Piers 1 and 10 are located adjacent to railroad tracks and the Contractor had to adequately sheet the excavation for footings so there would be no delay to train operations. Abutment A.R.W. of the railroad, was located next to the U.P. Power Co. screen house, and had to be protected at all times to prevent damage while excavating.

b. Superstructure

Forms for the concrete deck of the approach spans were of the galvanized, stay-in-place type. as manufactured by Granco Steel Products Co. of St.Louis, Mo. Special permission to use these forms was granted on recommendation #31-F. Conditions of approval were: forms were to be mortar tight and shop plans were to be approved by the Department.

CONCRETE (continued)



1. UB1 of 31-10-1 C5U, SIP-Forms.
7-16-59 LHG.

b. Superstructure

Span #11 required special forming, due to the widening of the deck in order to match approach plans.

7. UB1 of 31-10-1 C5-U, Forming deck, Span 11, looking toward Abut. "B".
6-30-59 LHG.

CONCRETE (continued)

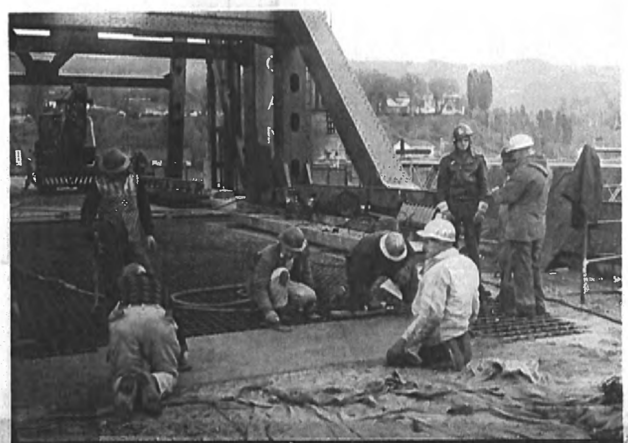
b. Superstructure

The slab in this section was not only curved and superelevated but also raised as much as a foot over I - Beam stringers. This change was as a result of Revision E. The Contractor had planned to ask for an increase in unit price for this section of slab due to the extra work involved in forming but later changed his mind and did not submit a request.

The Contractor experienced considerable labor union trouble in placing stay in place deck forms. The carpenters union started placing the forms and completed about two-thirds of the deck, when the steel union decided they should be doing the work. After a couple days of strike the steel union took over.

Special care was needed to paint the welds of the metal forms to prevent future corrosion of the steel. On the whole the feeling was that Stay-In-Place forms do not supply the answers to deck forming.

The 4 1/4 inch concrete filled grid floor and 2" Tee-Grid Sidewalk of the lift spans upper level, required no forming.



1. UB1 of 31-10-1 C4, Pouring concrete, upper deck of lift span. 10-29-59 LHG

CONCRETE (continued)

2. Ready-Mix Plant

a. All concrete was obtained from a Ready-Mix Plant located at Ripley, Michigan, which is approximately ½ mile from the bridge. Both contractors, Johnson and American Bridge, obtained concrete from this plant. This was a new plant at the start of construction of the bridge along with four new mixer trucks. Aggregate piles at the plant were heated on concrete slabs which had steam coils inserted. This insured proper heat with moisture during winter pours.

The Ready-Mix trucks were Blaw-Knox manufactured, with a capacity of 6 cyds. However, considerable trouble was encountered with variances in the wetness of the mix within the drum when mixers were loaded to capacity.

No. 1 U B1 of 31-10-1, C5U
Dumping transit mix concrete, Pier 6 caisson, using two 2 cyd. buckets
2/28/58 LHG

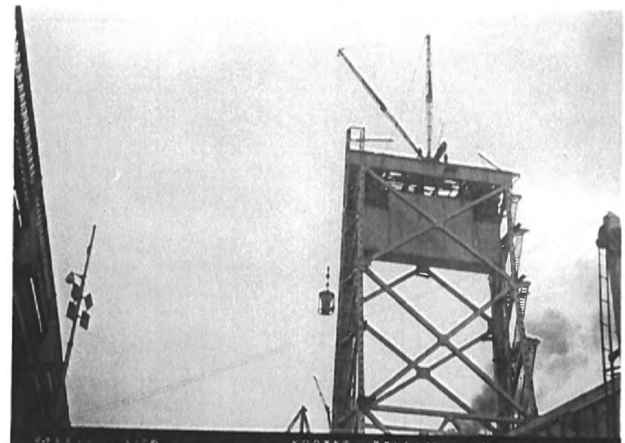
b. Aggregates & Cement

Coarse and fine aggregates were obtained from the Superior Sand and Gravel Co. of Hancock, Michigan. Testing was done at the source by our Testing & Research Division. The 6B material was made of mine waste rock. First trials of a blend of mine rock and pit run gravel were rejected because the gravel contained too much soft, non-durable and absorbent material. The 6A stone and 2NS sand was obtained from the Superior Sand & Gravel Company pit #31-20. The 6B stone came from a mine rock pile in West Hancock, Michigan. Coarse aggregate used for the 4 1/4" concrete filled grid floor of the lift span was 17A and came from Superior Sand & Gravel Company pit #31-45 at Hancock, Michigan.

CONCRETE (continued)

Cement, as used for the entire project, was from the Penn-Dixie Co. of Petoskey, Michigan and was transported to the site by railroad bulk car. Curing of concrete was primarily accomplished by the wetted burlap method. The Contractor purchased soaker hoses to place on the deck pours which insured continual and uniform wetting. Concrete pours for piers under water was done by flooding of the cofferdams. The Contractor asked for and received permission to use membrane curing compound on the sides of the caissons. This also aided in sinking the caissons by reducing skin friction. Curing compound was also used on the approach slabs sdjacent to each abutment.

c. Counterweight Concrete



1. UB1 of 31-10-1 C4-U, Pouring N. counterweight concrete. 6-25-59 LHG.

In order to establish an average unit weight of concrete to be used in counterweight calculations, it was necessary to make ten concrete test blocks using 6A aggregate and ten using 17A aggregate. Aggregates and cement were from the same sources as used in making the actual pours. The blocks for Grade A (6A) were weighed two days after pouring. During this time they were stored under shelter in the open air and no water sprinkled on them for purposes of curing. The remaining test blocks were cured for a week and then weighed when surface dry. The unit weights then obtained were used in determining the final volumes of mass concrete which was placed in the counterweight boxes. A careful check was kept during pouring of the counterweight to insure obtaining an average unit weight equal to that obtained from the test blocks.

CONCRETE (continued)

Counterweight adjustment blocks 10 x 10 x 11" were cast of the same class of concrete used in constructing the counterweight. These blocks were placed in the pockets provided in the counterweight to the extent required to balance the lift span. Extra blocks were made at this time to balance the lift span and were later purchased by the Department.

d. Grid-Floor-Lift Span

Concrete placed in the 4 1/4" floor of the lift span's upper deck presented problems in placing and finishing. Filling of this grid floor was done while the lift span was in the open position or 100' above the water. Pouring was done during the months of October and November. Specifications called for grids to be struck off flush with the top of the grid units. However, due to high winds, very cool weather and the additional calcium chloride to the mix, the concrete did shrink and grids had to be refilled and refinished. To counteract this the grids were slightly overfilled so that the final result was flush. The use of calcium chloride was requested by the contractor and was approved by the Lansing Office.

1. UB1 of 31-10-1 C4U, Pouring upper deck, Lift Span. 10-15-59 LHG.

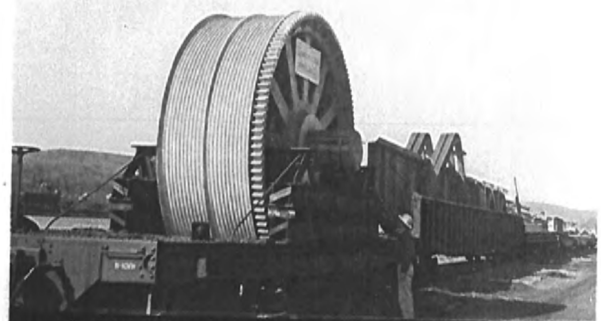
STRUCTURAL STEEL

a. Shipment

Fabrication and erection of structural steel was performed by the American Bridge Company under contract 4. All fabrication was done at

STRUCTURAL STEEL (continued)

their plant in Gary, Indiana. Steel was shipped by railroad to a site one fourth mile west of the bridge on the lake front. Special railroad transformer cars were needed to ship the four 15' diameter rope sheaves of the bridge machinery because of the limited vertical clearance under the old bridge.



No. 5 UB1 df 31-10-1, C4U
Counterweight Sheave - North tower.
4-20-59
LHG

This 16' -9" clearance also made it necessary to remove parts of the counterweight boxes in Houghton before moving to the site in Hancock. The steel girder frame for pier #9 also failed to clear the bridge and had to be loaded on two dolly cars and pushed across with a switch engine. Unloading was done with a stationery, stiff-leg derrick erected at the yard and by a Manitowac 3500 crawler crane. Material for spans on the north side was unloaded from a railroad spur which ran up to and under span #7.

STRUCTURAL STEEL (continued)

. UB1 of 31-10-1 C4, Looking W. at temporary RR spur laid by American Bridge, for moving struc.steel. Spu lies between piers 7 & 8.
3-9-59 LHG

Other steel shapes were shipped on regular railroad cars and required no special handling. Delivery of steel was well planned with required shapes shipped as needed in time for erection. A limited anount of small steel shapes were shipped by Clairmont Truck Transfer.

All machinery parts, when unloaded at the bridge site, were stored so as to be protected from dampness of ground and weather. This was accomplished only after some argument with the erection superintendent, G. W. Twing.

b. Equipment

Heavy equipment used for erection of the structural steel was as follows:

2 - Manitowac crawler cranes (3500)
1 - D-7 Caterpillar crawler tractor
2 - Caterpillar compressors (900 cft. capacity)
2 - Derrick hoisting engines and drums
2 - Sectional barges (4 sections)
2 - Scows (50' x 128')
1 - Hoist (portable)
1 - Tug, Diesel (30' long)
1 - Motor crane (1 cyd. capacity)
4 - Electric welding machines
2 - Stiff-leg derricks

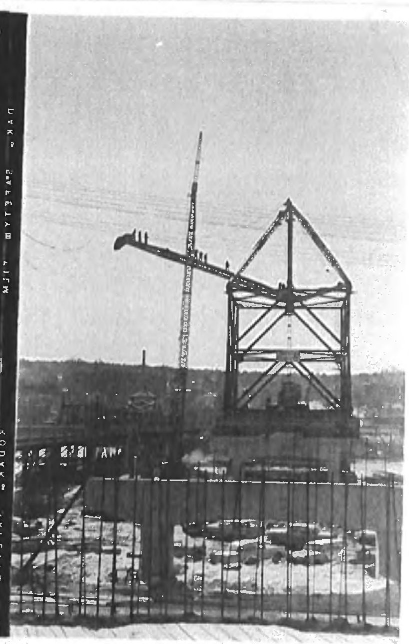
STRUCTURAL STEEL (continued)

c. Derricks

The contractor used two stiff-leg derricks on the project for erection of steel. Both derricks were shipped by railroad to be assembled at the bridge. The smaller of the two derricks was located at the yard. This derrick was mounted on H-piles near Portage Lake so it could be used in the erection of the lift span which was done on two scows.

8. UB1 of 31-10-1 C4U, Assembling tower truss span for Span 5 (on barges). 6-1-59 LHG.

The other derrick was erected on top span #8 of the new bridge for erection of the north tower and then dismantled and erected on span 4 for construction of the south tower. It was mounted on railroad rails and ties for easy movement on spans 7 and 5.



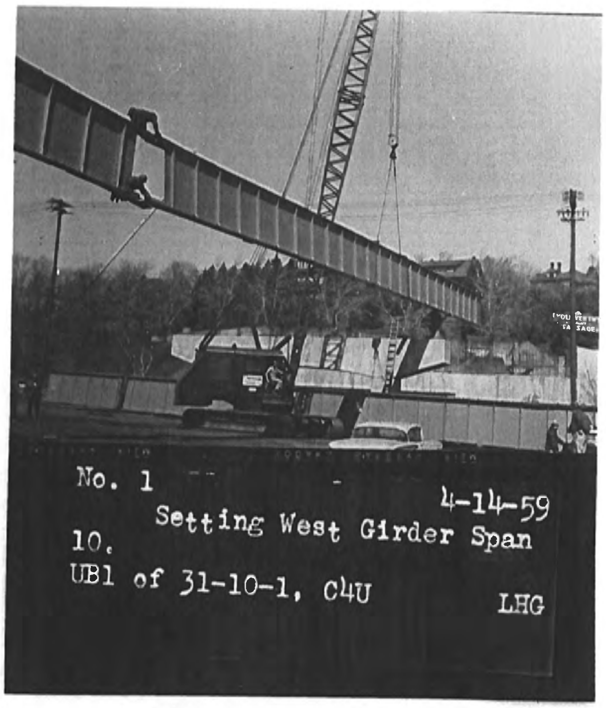
3. UB1 of 31-10-1 C4U, Stringing derrick tower cables, looking S. 3-25-59 LHG

STRUCTURAL STEEL (continued)

Both derricks were of similar construction with identical hoisting units. The large derrick was composed of a 60' erecting tower and a 130' boom which could rotate approximately 270 degrees.

e. Erection Procedure

The approach span, from abutment A to pier #1 was erected with crawler cranes. Spans 2 to 4 were placed with floating equipment. Spans 8 to abutment B were also erected with crawler cranes from the ground.



Span 8 was the first erected to allow placing of the derrick for erection of span 7. This was a plate girder span with I-Beam floor beams and stringers. The end section of this span over pier 7 was composed of the end vertical truss members of the span 7 truss. In order to secure span 8 to erect the derrick, the two knuckle joints over pier 7 were stiffened by the temporary connection of a knee brace. At pier 8, rockers under the girders were secured horizontally by rods and a 50 ton jack, all bolted to the anchor bolts of span 9. This prevented horizontal movement of span 8 which is mounted on rockers at each end. Span #8 was set back 1½" to permit closeure of span #7, over pier #6, and this movement was accomplished by using the jacks. To prevent rolling of the rocker over pier #7, blocking was placed under the lower floor beam and later removed by jacking.

STRUCTURAL STEEL (continued)

Side trusses for span 7 were assembled while the derrick was being erected on top of span #8. Each truss was assembled adjacent to pier 7, on the ground, and in an upright position on camber blocking with the hitch point about 40' north of pier #7.

1. UB1 of 31-10-1 C4-U, Setting E. girder, Span 7.
4-2-59 LHG.

Tension splices, bottom chord, were riveted before lifting of each truss. Compression splices were riveted after trusses were placed. At the time, the side trusses were being assembled, truss shoes or tower bases were placed on pier 6. Measurements to position these bases were made by State and American

STRUCTURAL STEEL (continued)

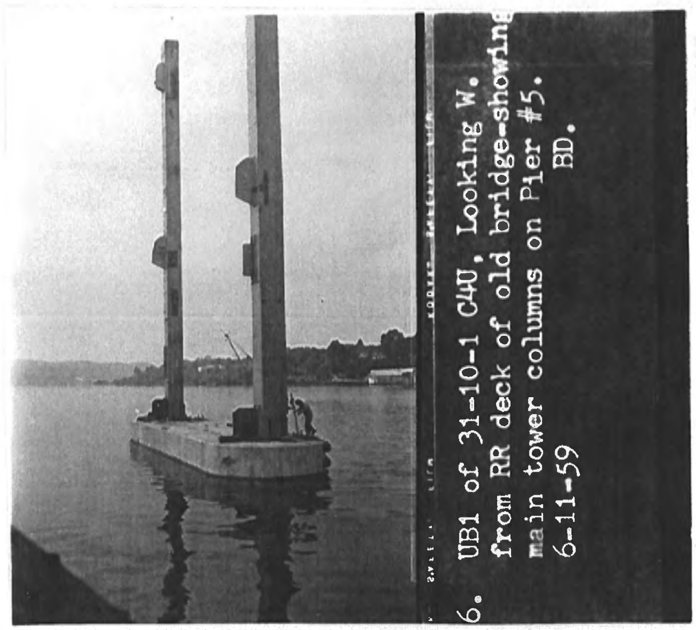
Bridge personnel. Hydraulic jacks were used to correctly position these heavy steel bases.

The light truss on the east side was erected first. This truss was lighter due to the railroad being off center to the west side, Thus requiring heavier design of the west truss. Erection was done with the derrick mounted on top of span 8. The remaining truss was placed in a similar manner and secured by assembling upper and lower floor beams. At the completion of span #7, temporary wire rope cross-bracing was placed at panel points 3 and 6 to secure the span, temporarily, to support the derrick on top.

During the erecting of the truss span 7, a crawler crane was erecting spans 9,10 & 11 from the ground. This assembly followed the usual procedure for girder spans.

The derrick, on top of span 8, was moved from its position to span 7 by sliding on the railway previously placed. The derrick was pulled with its own hoist.

Erection of the north tower was started next, using the derrick. Structural members were brought to the bridge and close to the derrick by using the railroad spur which ran under span 8. The derrick was able to pick pieces directly off of railroad cars. The two lower tower column sections were placed first on pier 6 and securely bolted in place.

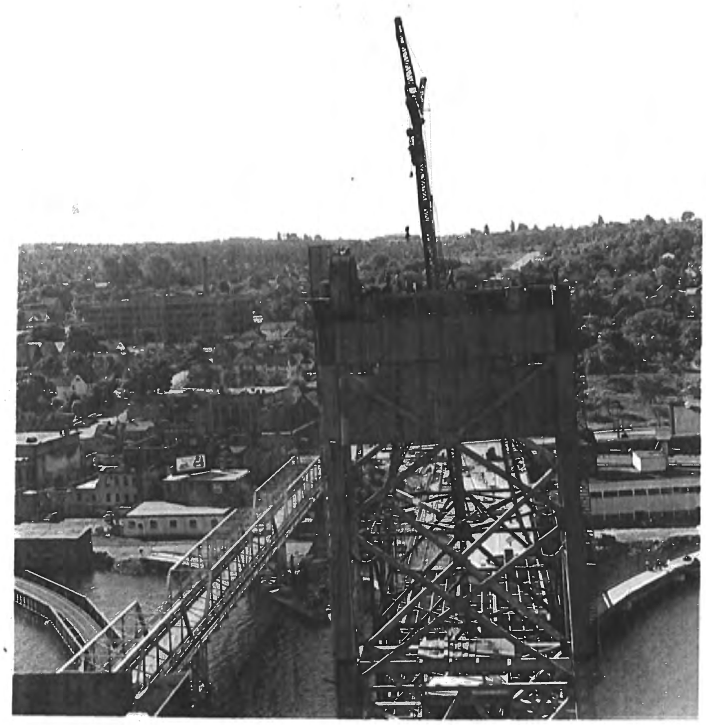


These huge sections were approximately 100' long and weighed 60 tons each. Next, the rear tower legs and tower members were erected, in order, to the tops of the lower tower columns. At this point, the upper half of the front columns were placed on top of the lower sections and the splice bolted with high strength bolts. Again, the rear tower legs and members were erected to the top of the tower.

STRUCTURAL STEEL (continued)

8. UB1 of 31-10-1 C4U, Looking E. from top of west tower column, Pier 6. 4-29-59 LHG.

Erection of the huge front transverse girder between the tops of the two columns was accomplished next. This girder is of double girder construction with tie walls between them. This section was transported to the bridge on the railroad flat-car and lifted in place by the derrick. The smaller rear transverse girder was erected in the same manner. These girders formed the flooring system for the machinery room along with floorbeams and a plate floor.



STRUCTURAL STEEL (continued)

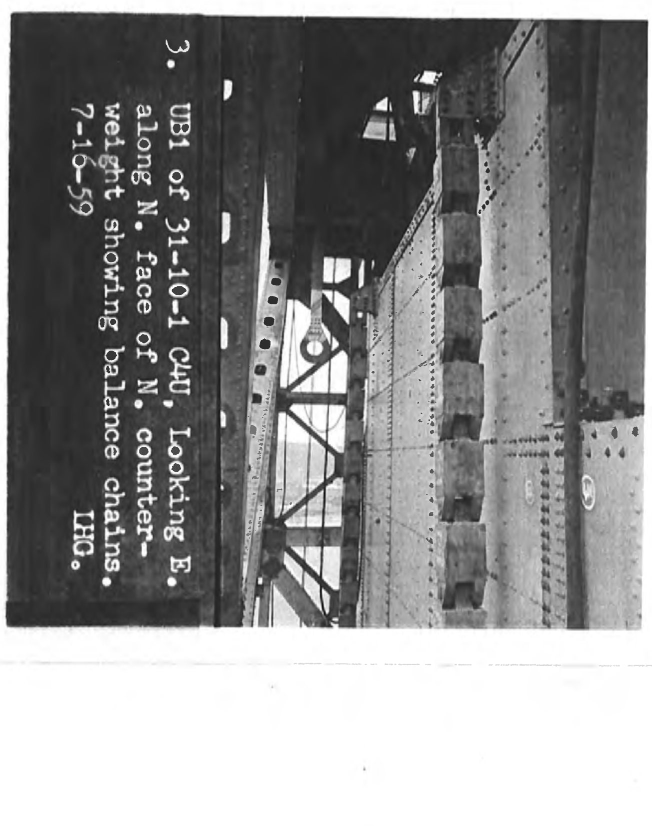
Counterweight

At this point the two 15' diameter rope sheaves were hoisted into position on top of the tower and placed into temporary mountings. Temporary supports were used because of a months delay in delivery of sheave bearings from the Messinger Bearing Co. of Philadelphia, Pa. Hoisting of the 65 ton sheave was delayed a day because of high winds. Hoisting was done slowly and required approximately two hours for each sheave. Drilling of anchor bolt holes for these sheaves will be covered under machinery.

A 30' stiff-leg derrick was now placed on the machinery room floor of the north tower to place machinery and the house walls, and allow dismantling of the large derrick for movement to the south tower.

Counterweight box sections were assembled next by first erecting two temporary I-Beam sections 65' long on the north tower and under the hangers on which were placed each box section for riveting together. After all sections were placed and riveted the two I-Beams were removed and the counterweight was then supported by the counterweight hangers. Counterweight billet steel was placed in the heavy end of the counterweight next, and welded in position according to computations previously computed. These billets were required because of the off-center construction of the Railroad on the left span. Each piece of billet steel was previously weighed and cut to a specified length so as to obtain the required weight according to the counterweight computations.

The balancing chains were erected next. These chains were composed of cast iron blocks 11" X 14" X 11-13/16" in size, all connected together with bearings and pins.



STRUCTURAL STEEL (continued)

During the erection of the northeast chain one of the castings broke at the pin, with the result that eleven blocks fell into the lake. Only slight damage to deck steel was done and no one was injured. New blocks were ordered and erected without incident. Cause for the failure of this chain was probably due to handling of the chain in its assembled condition. Evidently, the castings were overstressed causing a partial cracking while lifting them to the tower. One other possibility is the driving of pins in a tight joint may have cracked the supporting joint.

Design of the towers called for a deflection of $\frac{1}{2}$" between the joint F-5 at the top of the tower and joint U_0 at the bottom of the tower. This deflection was calculated and to be set when the towers were erected to the machinery floor, the stairs and walkways were in place, the counterweight boxes and temporary supports were in place and before the sheaves, bearings, operating machinery, machinery floor and enclosure, were erected. When the erection reached this point a field check was made with a transit on a cloudy day to determine this deflection. For the north tower, it was observed to be 7/8" for the east column and 1" for the west column. This deflection was adjusted to $\frac{1}{2}$", with a design tolerance of $\frac{1}{4}$", by jacking at anchor span joint U_2 and reaming holes to align and then riveting up.

Span #5, the south anchor span, was being erected on two barges at the yard while the north tower was going up. This span was 120' long and similar in design to span #7. It was not erected as span #7, from land, because it lies entirely over deep water. On June 13, 1959 this span was floated from the yard to its position between piers 4 & 5. Weather conditions at the start of the operation were favorable with slight winds, but by the time the span neared the bridge site, winds from the west increased and made it necessary to change the hook-up from towing to pulling so as to stop the floating span. Positioning of the span went without incident and the barges were flooded allowing seating of the span on the piers. Pin connections were made and anchor bolts secured.

Approach spans 4,3 & 2 were erected in that order, using floating equipment. Structural steel shapes were loaded on barges at the yard and towed to the floating crane at the bridge where they were erected. These spans were similar to the north approach spans and were erected in the same manner. Span #1 was over land and was erected with a 3500 Manitowac crawler crane.

While the south approach spans were being placed, erection of the derrick was taking place on top of the truss span #4. This derrick was the one dismantled from the north side and used to erect the north tower.

Erection of the south tower was started after the derrick was complete. The tower design was the same as the north tower and its assembly done in the same manner as described previously for the north tower. One change in steel erection was required at the south tower when the stairs from the operators house up to the tower fell in line with an I-Beam diagonal brace of the tower. Stairs had to be moved to the north approximately 4' to provide headroom. This was paid for by authorization.

STRUCTURAL STEEL (continued)

The railroad approach spans to the tower truss span #5 on the south side were erected at the completion of the highway spans 1,2,3 & 4. These spans formed a Y, one from the east and the other from the west. These spans consisted of 6 I-Beam sections, 36" WF #280, spaced 2'-3½" with diaphram between, for span one and built up plate girders for spans 2,3, & 4, east and west wyes. Decks for all spans were steel plate sections, riveted to the stringers.

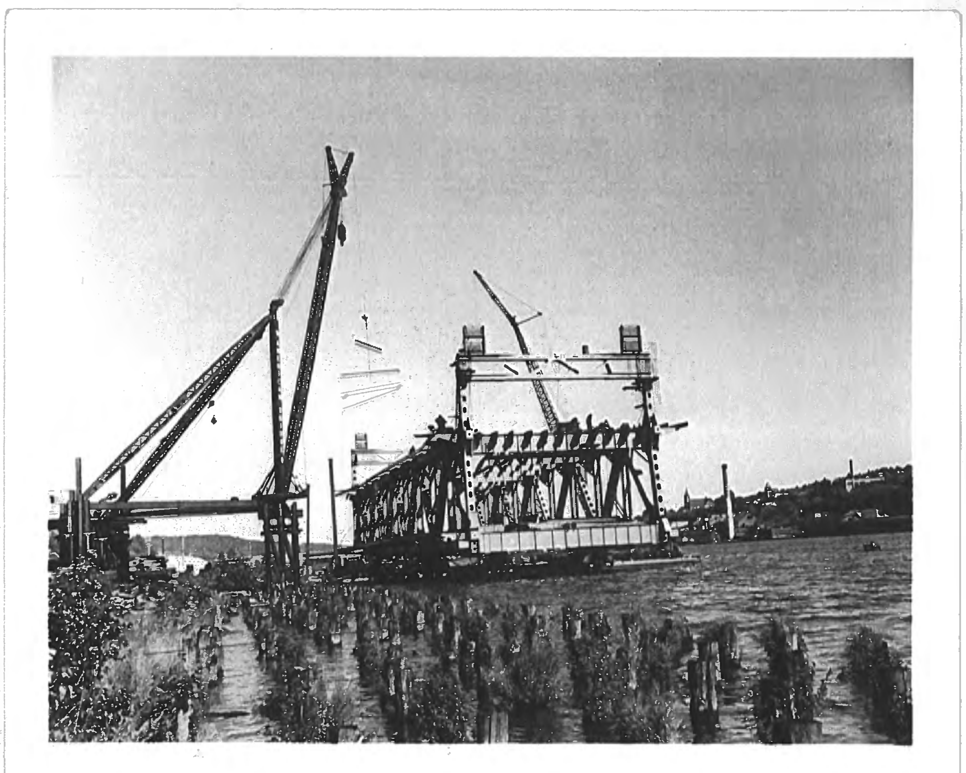
8. UB1 of 31-10-1 C4U, Structural Steel, Span IRE.
7-16-59 LHG.

Erection of all spans, except 2RE was done with floating equipment. Span 2 RE was not erected until the following January because a pier of the old bridge was at this location. Structural steel for this span was moved near this location, on shore for quick erection after the dismantling of the old bridge.

Anchor bolts for the piers at the railroad approaches were placed after the piers were cast. Holes were drilled in the concrete and bolts embedded with "Embreco" mortar.

i. Riveting

Riveting of all joints and connections for the entire bridge was specified, except the splice at the mid-section of each tower columns, where high strength bolts were used. The rivets were placed by six man crews of which there were ten crews at the height of construction. All rivets were checked by State inspectors as the work progressed and loose or poor rivets replaced. Riveting crews moved in right after the erection of each span. A total of approximately 240,000 field rivets were driven.

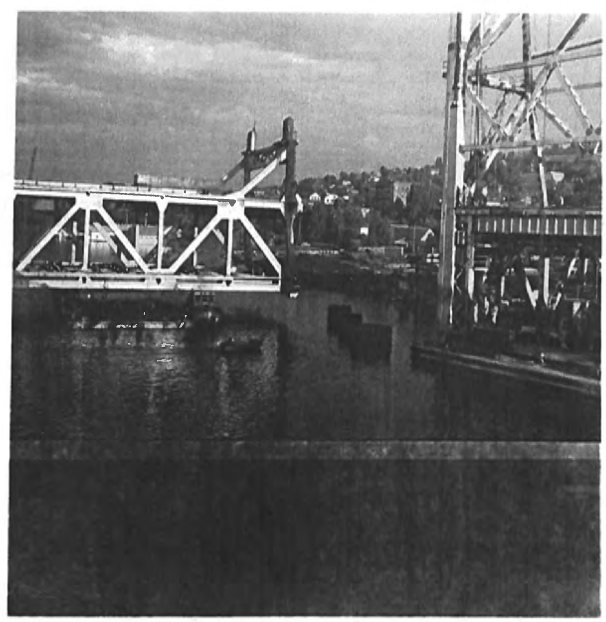


STRUCTURAL STEEL (continued)

j. Lift Span

The lift span was assembled on two barges at the yard, in three stages. The first stage was with barges located at joints L - 4 and L'- 4. This allowed erection of the center two panel sections. After the placing of temporary wire rope cross-bracing at panel points L'- 4, sections between L_3 and L_2 were assembled. At this time the weight of the span was transferred from the center barges at L - 4 and L'-4 to barges at points L - 2 and L'-2 to allow erection of the remainder of the span. Truss supports on barges consisted of shoes and plates similar to pier supports. Riveting of the tension splices (bottom chord) was done as assembly progressed through stage 2 and 3. Compression splices were riveted after the lift span was hanging from the counterweight ropes. Erection stresses did not require more than the minimum amount of bolting and pinning which was 30% bolts plus 30% traffic pins. Permanent placing of the grid decks was not done until the span was in position. However, all grid units were loaded on the span to provide dead weight. Two barge sections were on the upper deck to provide additional deadload weight when filled with water so as to counter balance the tower counter-weight. Railroad rails and accessories were not assembled until span was placed.

On Sept. 9, 1959 the lift span was floated from the yard, ¼ mile west of the bridge to its position between Pier 5 & 6.



Moving was done by four tugs and started at 6 A.M. The span was first moved out from the dock to the center of the lake channel. Then tugs were repositioned and it was towed at a very slow pace to the bridge. By 9 AM the span was at the bridge and positioning between the piers began. Due to the span being approximately 3" lower in the water than planned, it was impossible to clear the tops of the I-Beam railroad ties of span 5 & 7.

STRUCTURAL STEEL (continued)

It was necessary to cut a foot section off of the span 5 I-Beams to allow clearance. These I-Beam ends were later welded in their original position. The lift span was now in position on centerline but a foot above the pier seats. Next, the wire rope cables previously placed on the tower sheaves, were connected to the lifting truss on each end of the lift span. As this was being done, water was pumped into the barges to settle the span weight onto the counterweight ropes. By afternoon, the span was free of the barges which were pulled from beneath and returned to the yard.

Since the lift spans dead-weight, at this point, was less than its completed weight, additional dead load was added by pumping water into the two barges placed on the upper deck as mentioned before. This was done after the lifting cables were connected and caused the span to seat on the pier. It also released the counterweight from the hangers which held it in place during construction of the towers.

The lift span was now ready to be hoisted to its fully open position, 100' above the water, where it remained till the end of construction. This allowed navigation of ships in the channel during completion of the spans roadways. Because installation of the bridges hoisting machinery was not complete, auxillary hoists were used to lift the span. Wire rope and pulley combinations were connected to the lifting truss of the span and hoisting done by the stiff-leg derrick on the south side and a portable hoist mounted on the railroad deck of span 7 on the north side. Hoisting was done very slowly and when the fully open position was reached, navigation in the channel was again opened. The first official ship to pass under the lift span was the Ranger III of the National Park service at Houghton. This passage was approximately one hour after the span was up. An interesting side-light to the raising of the lift span was the equipment operator who went to work on the lift when it was down and during the process of lifting, did not realize the height of the span at fully open. He then became freightened and had to be carried down by fellow work men.

While the span was in the open position, finishing operations were carried on. Rivets were driven and floor grid sections were welded down, and filled with concrete. The continuous railroad rails were welded and placed in position.

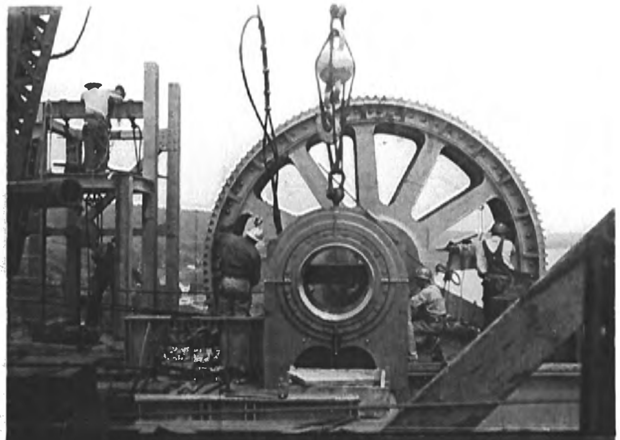
k. Machinery

The item of machinery consisted of assembling and erecting parts of the operating machinery sheave trunnions, air buffers, certain parts of the traffic barriers, bridge locks and the movable bridge seats operating mechanism.

Special machinery consisted of the installation of the following items: speed reducers, flexible couplings, roller bearings for rope sheaves, hydraulic power units, double acting hydraulic cylinders and control valves.

The operating machinery of each tower was erected by the American Bridge company.

STRUCTURAL STEEL (continued)



6. UB1 of 31-10-1 C4U, Setting sheave bearing at Pier 6 tower. 7-16-59 LHG.

Sheave trunnion bearings were placed first and required the drilling of holes for anchor bolts by using a special template made of a one inch, hardened steel plate. This template was clamped into position after the layout was completed for each bearing. Holes were drilled through the top plates of the front tower column which supported the two outside bearings and the top of the counterweight hanging girder which carried the inside bearings. After drilling the holes, the template was shipped to the Messinger Bearing Company of Philadelphia, Pennsylvania, manufacturer of the bearing. so that corresponding holes could be drilled in each bearing at the shop. As the bearings arrived at the project they were placed on the trunnion shaft of the sheaves which were previously mounted on temporary supports. The sheaves were then jacked from below to lower them into position for bolting.

Next, the various bearing supports of the gear train were placed on the machinery room floor and bolted in place to I-Beam floor stringers and bearing supports. Drilling of field holes to anchor motors, reducers and brakes was done after alignment of all machinery. Shims were placed under bearings to give support for proper alignment. Considerable difficulty was encountered in aligning the machinery of each tower because of the movement that each tower has as the lift span is being operated. This condition still exists to some extent, although machinery is holding its position. Also, difficulty in alignment was caused when the inside bearing of the northeast sheave did not deflect the 3/16" as planned.

After the shafts and gears were properly aligned the gear train was hooked up to the electric motors. By omitting the hook-up to the sheave gear, the gear chain could be run and tested. This was done and adjustments between gear teeth made.

STRUCTURAL STEEL (continued)

After considerable testing and adjustment, the gears were connected to the sheaves and the lift span raised and lowered by the motors. It was observed, during the working of the lift, that the support for bearings of the main pinnion, immediately adjacent to each of the four sheaves, showed heavy evidence of design failure. Bolts in the supports were loosened and were replaced, temporarily, with 1-1/16" manganese fitting up bolts, till corrections in design could be made. After consulting the design engineers, a revision in plans was made to provide reinforcing material in the form of gusset plates welded to the bearing support. Also, 1-1/8" high strength bolts were used to anchor the bearing, along with tack welding of the bearing to the support. Total cost of this extra work was $3,750.00.

Along with this difficulty in bearing "b" support, trouble was experienced in keeping the shear bolts tight in bearing "e" of the north tower. This was due to the excessive anount of shims between the bearing and the machinery support. The need for this large amount of shims was probably caused by the deflection of the transverse beams carrying the machinery The edges of the shims were welded along each side with two welds 1-1/2" long to make them act as a unit in shear. This seemed to take care of the movement and the bearing has held its position.

During operation of the tower machinery it was also noticed that the low speed reducer shafts were floating endwise while running, due to internal play in the flexible couplings. Set collars were placed on the end of these shafts at bearing "f". Total cost of supplying and installing these collars was $443.00.

On Dec. 11th, 1959, a sharp cracking sound was observed in the southwest sheave. Operation of the bridge was immediately halted until an inspection of all sheaves could be made. This was done on Dec. 2, 1959 by representatives of the Highway Dept., American Bridge Co. and the Messenger Bearing Co., manufacturers of the bearings. Inspection covers were removed from the bearings and observation made while the lift was moved. No damage to the bearings could be found so it was decided that the noise was caused by movement of the ropes in the sheave grooves. This noise seemed to vibrate through the sheave shaft and into the roller bearings. It has been observed since that time and it is still felt that the above reason is the answer. It was recommended to the maintenance division that the ropes be again lubricated.

While adjusting the electrical limit switch for the lift span on Nov. 29, 1959, a section of the upper deck sidewalk at the southwest corner, hooked on to the end of the tower guide and damaged the sidewalk channels and concrete filled grid. This was caused when high west winds pushed the lift span to the limit of its clearance in the guides. Damage was corrected by providing more clearance at the sidewalk level at this location and beveling the four lift span guides at the top. Cost of this extra was $871.00 for the sidewalk and $109.00 to bevel the guides.

chain polls

STRUCTURAL STEEL (continued)

Air buffers, as included in the item of machinery, were assembled at the fabricators shop. These large, cushioning devices were erected at the following locations: one on each of the tower legs, at the fully open position and one at each corner and under the lift span. Operation of the buffers is still not desireable because of failure of the piston rods to return to the buffer position. This movement of the piston out of the cylinder is produced by its own weight. However, friction due to the piston rings and shaft packing, sometimes prevents the piston from moving down. It is recommended that on future jobs where buffers are required, some method of returning the piston be provided. Also, no means of lubricating the pistons of the upper buffers from the tower was provided. A piping system from the top of the cylinder to a place near the tower stairway on the elevator to the east would have corrected this problem. It is now necessary to use the lift span in the fully open position to perform this lubrication. Each cylinder requires approximately 20 minutes to lubricate, while holding up highway and rail traffic below.

On April 7, 1960, it was observed that bearing "g", west side of the north tower machinery, was damaged from overheating. This required replacement of the bearing insert and the 8' long shaft. Temporary repairs were made by American Bridge Personnel. On June 16, 1960 the insert and shaft were replaced. Damage was either caused by incorrect clearance between bearing and shaft, which produced heating and resulted in melting of the bronze bushing and plugging of the oil grooves or possibly, the presence of foreign particles, which plugged the grease fitting and grooves, caused heating and deformation of the bronze bushing. This work was paid for by American Bridge Company.

Machinery trolley hoists, for each machinery room, were not provided for by the plans or specifications. Therefore, the American Bridge Co. was asked to furnish two Yale and Towne chain hoists of three ton capacity. Cost of these hoists was $1,870.00.

Special machinery for this project, as listed previously, was composed of manufactured items and were subject to the specified requirements under "Machinery of the Specifications and, in addition, had to meet the respective manufacturers specifications for the highest type of equipment handled by them.

The hydraulic systems required some adjustment, after they were installed and in operation. The two systems are identical and operate the traffic barriers, bridge locks and the intermediate bridge seats on each tower span. Numerous fluid leaks occurred in the piping and cylinders of each system after operation of the bridge was started. These leaks caused air to enter the system, making it necessary to bleed cylinders and lines at the highest pinnacle or point of the traffic barriers to prevent spongy operation of the cylinders. American Bridge personnel corrected the leaks and made adjustments to cylinders for normal operation of the system.

In July of 1960, the intermediate bridge seats failed to operate when the operator intended to place the lift span in this position. A check at the north hydraulic system showed that the solinoid valve for the seats was not

STRUCTURAL STEEL (continued)

operating. It was taken apart and found to be full of water. This water caused the valve to rust and stick. This prevented flow of fluid to the moveable seats. Upon investigation, it was determined that water was entering the valve through the electric conduit. Water had entered the conduit at the highway deck level and eventually found its way through a terminal cabinet and into the hydraulic valve. This leak was corrected and no trouble was experienced after that time.

1. Counterweights

Each counterweight was constructed of the following: a structural steel box, steel billets to compensate for unequal transverse weight of the lift span, concrete and concrete adjustment blocks.

The total weight of each counterweight was based on actual weights of parts of the structure as calculated from shop plans and on the unit weight of the concrete placed in the box and the concrete filled deck of the lift span. The weight of concrete was determined from sample blocks for each class of concrete. These weights were determined to be 152 #1 ft. 3 for the counterweight and 148 #1 ft. 3 for sidewalk and roadway. This is described under counterweight concrete. Counterweight computations were as computed on American Bridge Plan Sheet CW 1 AC, 1BC & 1C.

Each box contained one pocket, 8'-6"x 6'-8"x 6'-11" deep, in each of the three center sections. Pockets were provided with drain pipes at the bottom and a steel hatch cover bolted to the top. Adjustment blocks, of the same concrete as the counterweight, were placed in the pockets to the extent required to balance the span. In balancing the lift span a positive reaction of this span upon its supports, when seated, was required. To obtain this reaction, a temporary weight of four thousand pounds was placed on each counterweight during the period the span was being tested. The Contractor chose to make additional adjustment blocks to provide the extra temporary weight. The Department later purchased these blocks for future use. In testing the final balance of the bridge, ammeter readings were equalized for both raising and lowering while operating between the nearly seated and fully seated range. Final record of adjustment blocks is as follows: In the south box, 886 blocks; in the north box, 754; storage, temporary weights, 372 blocks.

Pouring of concrete in each box was done in 6' layers. This depth was increased from 4' to 6' upon request of the American Bridge Co. to speed operations and approval was given by the designers. The delay in pouring was required to provide for shrinkage of concrete.

The concrete surface of each counterweight was coated with two applications of AE-3. Approximately 25 gallons was required for both counterweights.

ELECTRICAL

A. General

It was required that the Contractor sublet all electrical work to a licensed contractor. Lake Shore, Inc. of Iron Mountain, Michigan, was awarded this contract by the Al. Johnson Construction Company.

ELECTRICAL (continued)

This work consisted of furnishing and installing the following items: limit switches, selsyn transmitters, switch boards, control desks, traffic gates, traffic lights, navigation lights, lift span lower deck lights and upper flood lights, together with all material required for their interconnection. Provide and install power cables, control cables and terminal cabinets. Furnish and install the 150 H.P. drive motors and 55 H.P. selsyn motors.

B. Operation of the Lift

Operation of the lift span is by power selsyn or synchrotie system. The power drives for the span in each tower consists of one 150 H.P. electric motor and one 55 H.P. selsyn motor directly coupled and geared to the hoisting machinery. Operation sequence was as described in the proposal for contract #5.

Interlocking System:

The controls for traffic lights, traffic gates, traffic barriers, locks and the bridge, are interlocked so they can be operated only in the following sequence in opening.

1. Withdraw railroad system locks
2. Change traffic light to amber and to red
3. Lower gates
4. Raise barriers
5. Withdraw bridge locks
6. Open bridge

In closing, the sequence is reversed. Step number one, above, insures interlocking of the railway signal system so the bridge cannot be operated unless trains are cleared from the bridge and the required signals set in the stop aspect. By-pass switches are located at the operators desk to allow by-passing of steps 3 and 4.

The above sequence is mentioned here to explain the bridge operation.

C. Changes in Operation

Several changes in electrical wiring and conduit diagrams were necessary to provide better operation of the lift span. During the first several weeks of operating the lift, it was observed that considerable shock was produced by setting of the brakes. A check by the designers, Hozelet and Erdal, indicated that the designation of the brakes was interchanged and, as a result, the large brakes were stopping the span when the smaller service brakes should have been energized. Brakes were reconnected to operate in the following manner: both small brakes are applied when the master controller is at the B-3 position, one large brake at the B-2 position and one large brake at the B-1 position. This is the most desireable sequence when operating in an extreme, unbalanced condition which might occur with a heavy snow load. This also prevents excessive wear on one small brake if they had been applied at separate positions of the master controller.

ELECTRICAL (continued)

The operation of brakes, by the governor at the alignment guides of the intermediate position, was changed to provide a more desireable operation by applying the brakes when speed is over 600 R.P.M. and then releasing them after the span has slowed. The original operation completely stopped the span when over speeded. This change resulted in a very desireable operation of the lift.

The existence of a sneak circuit, when one end of the span reached the fully open position before the other reaches its fully open position, was found and control circuits were revised by the designers to allow both ends to reach fully open, independently.

The specifications for selsyn motors required that each motor have a capacity of at least 50 H.P. at 400 R.P.M. The motors actually used were furnished by the Louis Allis Co. and their secondary current characteristics were such that it was necessary to increase the electrical conductors, conduits and some of the contactors. In discussions with Hozelet and Erdal and their electrical consultants it was indicated that some changes would be required, regardless of the type of motor to be furnished. In as much as adjustments would have to be made for the current capacity of the most favorable motors, it was agreed that the Highway Department would accept the responsibility for the increase in cost. This cost amounted to $2,548.16.

D. Traffic Gates, Navigation Lights, Air Horn

Traffic gates as approved by the Department were manufactured by B & B Engineering Co. Four gates with 34' single arms were required. Gate stands were furnished with a 12" bell mounted on the cover of the machinery housing. These gates seemed to be light in construction for pins sheared on the shafts of two of the gates after installation. These failures accurred under normal operation. Also the gate arms have a tendancy to drift considerably in a high wind. This is due to the brakes not holding tight when properly adjusted.

The air whistle to signal navigation was a self contained unit with two horns. This whistle gives an audible sound, approximately one mile in each direction, on a calm day. In connection with the whistle, the Federal river and harbor act of Aug. 18, 1894, for this waterway and the old bridge, stated the following: the bridge shall be provided with an electric light signal on top of the bridge near the center, thereof, which will give flashes of the same duration and at the same time as the audible signal. As a result of this act, two directional range lights were mounted, one on each side of the lift span and at the center. The lights were mounted on pipe posts and at the upper sidewalk level. This work was an extra item which amounted to $1,046.50 in cost. This electrical change was accomplished by placing all the lower lift span bridge lights on one circuit, thereby making one wire in the existing cable on the reel available for the range light circuits. A common return wire was used for both circuits. Additional conduit was needed from a pull box inserted in the lighting conduit near the center of the lift span to each of the range lights.

Telephone

Provisions for a telephone at the operators house was omitted from the plans and had to be done at extra cost. Work involved placing an additional fiber conduit in the southwest sidewalk to carry telephone wires. Total cost was $1,235.80.

E. Overhead Aerial Cables

The seven aerial cables were suspended between the two towers. Cables, as approved by the department, were manufactured by the Simplex Wire Co. Suspension of the power conductor cable from the messenger cable was by a spiral wrapped copper tape. This differed from the plans, which called for individual wire suspenders uniformly spaced. It is felt that the plan type is the better arrangement, as considerable trouble was encountered in erecting the other type, when cables twisted, causing them to spiral around the messenger cable during erection. Cables were placed while the lift span was in its fully open position. Cables were pulled from reels on the roadway deck, 100' below, up the south tower, across to the north tower and secured. Hoisting was done with a small hoist. In hoisting the cable, the copper spiral wrap was damaged on several cables when they became hooked on structural steel. These brakes were repaired with stainless steel clamps. Messenger cables were secured to structural angles at each tower. The plans called for ½" eye bolts, bolted to the angle, but during the first wind storm several of the eye bolts snapped and it was necessary to place larger and better connections. A universal joint was designed, using two cleaves and a larger 1" diameter eye bolt with spherical washers placed under the securing nut. This system allowed movement and has worked satisfactorily. Along with this new anchoring device, wooden spreaders were clamped at one third points between the cables, to prevent side sway and entangling during periods of high winds. Predetermined cable sags were set by use of an engineers level working on top of the lift span. Elevations of the end anchors were known and from this elevation was subtracted the design sag. Cables were then pulled up until the correct elevation was reached and then secured.

F. Bridge Auxillary Power Unit

Auxillary power equipment consisted of one gasoline driven generator unit, including storage battery, charger, muffler, fuel oil storage tank, fan and radiator. The gasoline engine has a capacity of 180 H.P. at 1200 R.P.M. and is manufactured by the Waukesha Motor Co. The connecting generator is rated at 100 K.W., 125 K.V.A., at 80% power factor, 480 volts, 3-phase, 60 cycle continuous output.This unit was manufactured by the Kato Company of Minnesota. The combined unit was mounted inside of the generator house on span five, lower deck. This house was the subject of safety studies by the department and the Michigan Department of Health. It is much too small, in floor area for the equipment placed inside. This 14'x 20' house contains the generator unit, a furnace, a hydraulic pump and reservoir, two wet cell battery banks for railway signal system, along with a terminal board, a tool crib and work bench. This building could have been made bigger and it is recommended that on future jobs this be considered. Several alterations were made to this house and paid for at additional cost. It was necessary to provide ventilation of the house to prevent overheating of the gasoline driven generator unit and to expel hydrogen gas fumes as produced by the wet cell batteries. This later item was as recommended by the Michigan Department of Health. Work included installation of a 12" explosion proof fan with automatic shutter in the west wall of the house and directly over the batteries. To cool the house, Bridge Auxillary Power Unit (continued)

during operation of the generator, a motorized shutter 36" x 42" was installed in place of the window in the south wall and one gravity shutter 18" x 32", placed in each of the two doors in the north wall, by removing windows. The motorized shutter was controlled by a thermostat, while the 12" fan was connected to a time clock which allowed operation for 10 minutes of every hour. It was also necessary to install a 12 volt relay on the ignition system of the auxillary generator to operate when the generator starts and, in turn, open the circuit to the house furnace. This was to prevent flameout of the furnace, caused by insufficient combustion air when the generator is running. However, this did not completely solve the problem as the fan of the generator still robs air from the furnace when a fire is burning in the pot and causes excess smoking. Maintenance was to supply an outside vent to the furnace at a later date.

RAILWAY SIGNAL SYSTEM

The railway signal and interlock system consisted of furnishing and installing all appliances, such as, a desk type switch board in the operators house, dwarf signals at designated locations on the railway, electric switch machine and lift span rail locks, together with all material required for their interconnection, operation and control in accordance with specifications and drawings. This system is interlocked with the operation of the lift span in such a way that the lift cannot be operated unless trains are cleared and the rail locks are withdrawn.

Work was done by the General Railway Signal Company of Buffalo, New York, under a subcontract to the Johnson Construction Co. Performance of all work was without incident except for installation of the rails on the lift span. These rails were insulated from the structural steel by fabreeka pads, sleeves and washers. This is provided so that a signal current can be conducted through each rail. At the completion of placement of insulation and rails, resistance to current leakage was checked by the railroads and found to be 300 ohms. This was not satisfactory to the railroad people, even though the signal system operated satisfactorily. The American Bridge Co. again removed the rails, cleaned contact surfaces and painted bolts with an insulating paint to provide more resistance. Again, the railroads were not satisfied. They insisted that the fiber sleeves and washers were not of the required thickness and should be of fabreeka material. Because the fiber material had been approved by the Department, the cost of this change was borne by the Department. New materials were ordered and placed in accordance with the railroads request. However, difficulty was encountered in removing the old fiber sleeves without lifting the rail and the railroad people approved leaving the old sleeves and replacing the 1/8" fiber washers with $\frac{1}{4}$" fabreeka washers. Extreme care was taken during the installing to obtain the best possible insulating properties. The railroad people were now satisfied although written approval would not be given.

Referring to the insulation of rails, it is felt that the railroads were a little unreasonable in their demands for complete resistance. Checks with an ohm meter showed that they themselves had only a high of 900 ohms resistance on their own rail systems off the bridge. Yet they were asking for infinity on our system. Then, it was proven, by tests, that moisture on damp days effected the

RAILWAY SIGNAL SYSTEM (continued)

resistance. Snow and rain had a great effect on insulating qualities. The signal system never failed to operate and installation was satisfactory. Additional cost to place the fabreeka washers was $3,600.00.

At the completion of installation of the removable track plates adjacent to each railroad rail of the lift span, two undesirable conditions developed. First, the tops of plates were above the rail in numerous places and, as a result, the train wheels would ride on the plates instead of the rails. This was corrected by removing the plates and bending down the edge approximately ¼" so the plate would be below the top of the rail. The cost of this extra was borne by the Department because no plate adjustment was provided for on the plans. Total cost amounted to $937.75.

Second, the hexagon heads of the bolts which held down the track plates protruded approximately 3/4" above the plates which produced an undesireable surface for car traffic. To remedy this, stainless steel countersunk bolts were installed.

EXTRA PARTS

At a meeting held on May 4, 1960 at the C.R.R. office in Houghton, the Railroads requested the Department to furnish spare parts for the signal and switching systems. Estimated cost for these spare parts amounted to $5,000.00. This request was referred to the Bureau of Public Roads for participation, by the Department and they ruled that these parts were maintenance items and therefore not eligible for aid. The Department thus informed the railroads that they would not honor their request.

PLUMBING

The highway deck of the bridge required an extensive drainage system, consisting of 6" diameter wrought iron pipe and collector boxes. Installation was according to plan but it is felt that the collector box design should be changed to provide better cleaning of the system. These boxes are difficult to get at and clean out. Heavy sand and debris collect here and eventually filled the boxes causing water to flow over and onto the structural steel.

The sewer system from the Operators House to pier #5 consisted of a 4" wrought iron pipe line, insulated with a 3" thick Glass-Fabric, jacketed foamglass, and protected with #10 gage galvanized sheet metal. This line was protected from freezing by a heating cable placed along the pipe. In March of 1960 this line froze at pier #5 and upon investigation it was learned that the heating cable did not extend into the well provided in the top of the pier. The Contractor was notified and the cable was extended at additional cost to the Contractor.

The operators house was provided with a water system connected with the village of Houghton water main, at abutment A. This line was a 1" diameter, wrought iron pipe, insulated with 4" thick glass-fabric, jacketed Foamglass and provided with a heating cable controlled by air thermostats. Two changes in the system would be desirable. One, the thermostats should be controlled

PLUMBING (continued)

by water temperature, as at times, the air could be warm at the thermostats yet the water near the freezing point under the bridge. The other change would be to install drainage valves to drain the system at various locations. Along with this, there should be inspection plates in the pipe insulation. Also, it would be convenient if valves for hose connections were installed in the operators house and at other locations on the bridge, to provide water for cleansing purposes.

TOWER MANLIFTS

Each of the two bridge towers were provided with a manlift to enable personnel to reach the machinery rooms without walking the stairways. Work of installing these elevators was accomplished by the Gust Lagerquist Company of Minneapolis, Minnesota, under subcontract to Al. Johnson Construction Company. Alterations to the power cables of each cab was necessary to prevent sway of the looped ends of the cable during periods of high winds, which caused these cables to hook on the structural steel of the open hoistway. This was corrected by installing spring operated cable reels in the machinery room of each tower, near the elevator shaft, to reel out cable under tension, as the elevator moves. This system required purchase and installation of two reels, new power cables to the elevators, minor changes to the wiring and conduit, and placing of two sheaves to direct the cables from the reels to the elevator shaft. This change corrected the cable sway and has worked very well since its installation. Total cost was $9,589.00 and was paid on an extra authorization.

Other alterations were recommended by the Department of Labor under whose jurisdiction this manlift came. They are as follows:

1. Enclose elevator shafts at the Highway Level.
2. Install pipe railing around elevator machinery platform.
3. Limit use of the manlifts to working personnel.

Concerning item #1, American Bridge Division was asked to perform this extra work. Total cost was $2,345.00 and was allowed by an extra authorization. This work consisted of removing the existing chain link fence and replacing it with 1/8" steel plate. This included the doors at each landing. This work was done in January of 1961.

5. B1 of 31-10-1, Elevator shaft enclosure at sidewalk level. 3-7-61 L.H.G.

TOWER MANLIFTS (continued)

The pipe railing around the machinery platform in each tower was recommended to prevent personnel from falling 12 feet to the floor when performing inspection or maintenance. American Bridge also did this extra work. The railing consisted of approximately 12 lineal feet of $1\frac{1}{2}$" pipe around two sides of the platform with a steel toe plate at the floor level.

It was recommended by the Department of Labor to limit the use of the manlifts to bridge personnel and with this intension, they issued a permit to operate the elevator. Metal plates with the inscription are installed on each elevator wall.

Various difficulties in the operation of the manlifts were encountered after installation. However, most of this trouble was in the operation of door limit switches. We feel that these switches probably should have been of heavier construction, due to the large steel doors, which jar them out of adjustment. The rail guides mounted on the car also give some trouble during cold weather, when the set clearance diminished. so that the cab would stick at times. A greater opening was provided and cars then functioned properly.

On future manlift installations it would be well to consider complete enclosure of the shaft to protect the cabs and guides from the weather.

As a point of interest, it should be mentioned that the lift span itself is classed as an elevator by the Department of Labor. Their personnel conducted an inspection of its operation and issued a serial number and a plate, stating its load capacity. This plate is fastened to the operating desk of the operators house.

FIELD PAINTING

Field painting was as specified by the proposal. The undercoat was brown with the final coat aluminum. The final color was a topic for discussion among the local people who expressed desires for other colors, namely, copper, green and white. However, this should have been decided at the time of the city approval of plans.

Considerable difficulty was encountered with the painting sub-contractor and relations were strained at various times. This, we feel, was due to the subcontractor trying to get by as cheap as possible and thus not doing a good job. The greatest difficulty was in trying to get the steel cleaned properly before applying the paint. Because of this, it was necessary for our inspectors to take samples of the paint and test them by weight to prevent the contractor from thinning paint. Several tests proved that paint was thinned with the result that the paint was destroyed and the area repainted. Painting proceeded into October of 1960 and, with cold weather, painting was difficult. The sub-contractor completed the project on October 23, 1960.

Several extra items of painting was necessary as the project progressed. They were the painting of the oil lines green and the gasoline lines red, for safety identification purposes. Also, requiring extra money to paint, was the exposed under surface of stay-in-place forms of the lift spans, upper roadway deck.

FIELD PAINTING (continued)

These pans formed the bottom of the $4\frac{1}{4}$" concrete filled units of the roadway. Contract #4 did signify "no shop paint" and contract #5 omitted including an extra cost of paint. Pans had a heavy coat of rust and required more cleaning than normal. For this reason additional work was approved, by authorization, to clean the pans. Total extra cost was $900.00

On large structures of this type it would be well to include painting for safety purposes, such as oil and gasoline lines, tanks etc. and also signs for high voltage fire extinguishers and etc.

END

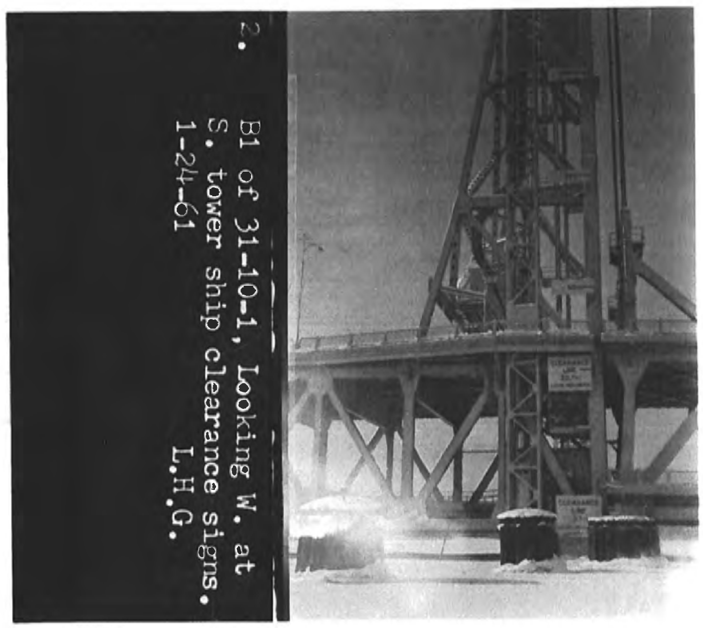
CLEARANCE SIGNS

In November of 1960, The American Bridge Company was asked to perform the extra work of furnishing supports and installing clearance signs, for navigation, on each of the towers. These signs were requested by the U.S. Corps of Engineers and were not included in the original contract. The sign panels were fabricated by the Dept. sign shop in Lansing and transported by truck to the bridge. Each sign was constructed of aluminum panels with plexiglass numbers. This design was proposed to limit maintenance. Signs were 7' x 9' and 3' x 4' and placed at the following elevations: 32' closed, 32.7' intermediate, 50' 75', and 100'. Four pointer signs were erected at each lower corner of the lift span. All signs were erected on structural steel supports, on each of the four tower columns, during December and January of 1960 and 1961. Painting of the supports was difficult in freezing weather and for this reason some spot painting may be necessary at a later date. See Page 48-A for picture.

APPROACHES

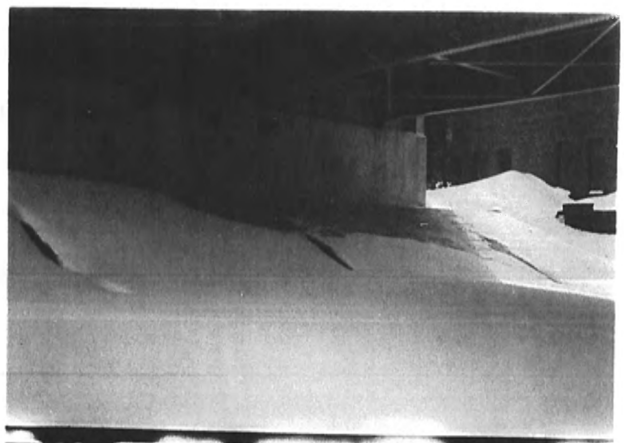
Approaches to the bridge were changed by numerous revisions. The original plans called for connection with the streets of Houghton and Hancock in much the same manner as the old structure. However, after construction was started, it was decided by the Department, to change the approach system in each city. In connection with this, Revision E lengthened abutment B and abutment B wingwalls and widened span 11 to provide for a longer radii on approach lines of the Hancock approach. This revision also deleted numerous approach items and revised the quantities of others. This revision and Revision L, deleted the majority of the approach items and set up temporary approaches so the new permanent approaches could more adequately tie in with proposed changes in the street systems of both cities. As a result of deleting items completely and again adding them by revisions M & S, to make the proposed change from temporary to permanent approaches, the Johnson Construction Company requested new, and in most cases, higher unit prices. This was primarily due to work being done later in the construction season, requiring faster work and weather protection. Agreement was finally reached on unit prices and the necessary authorizations approved.

The new approaches were laid out and constructed, from preliminary plans, in the fall of 1959. Work on concrete items proceeded without incident.


2. B1 of 31-10-1, Looking W. at
S. tower ship clearance signs.
1-24-61
L.H.G.

APPROACHES (continued)

The approach drainage system at abutment A developed into a problem when ground seepage from behind the abutment did not stop, after drain tile and the storm sewer system was installed. At the time of placing the slope paving, in front of abutment B, there was a considerable amount of water flowing through each of the 3 weep holes of the front wall. In order to carry off this water and prevent a fluid head behind the wall, 3" diameter pipes were placed from the weep holes through the berm section, to spill on the slope paving. It was felt at the time that when the street drainage system above was completed that the seepage would stop or at least slow to a trickle. This assumption did not hold true. The water itself is not objectionable during the summer months but during freezing weather it builds up and covers the C.R.R. tracks which cross approximately 20' in front of the slope paving. The Railroad people have since insisted that the Department



7. B1 of 31-10-1, Ground water seepage from behind Abut. "A". 3-7-61 L.H.G.

correct this drainage. A system was proposed in the summer of 1960 whereby an intercepting pipe would be placed under the slope paving and connected to each weep hole pipe and then run underground to the lake water. The cost of approximately $3,000 made the Department postpone work to further observe the drainage.

During the excavation for the head wall in connection with the slope paving of abutment A, a 12,000 volt power line of the U.P. Power Company was damaged with the result that cable had to be replaced. This cable was in the vicinity of the N.E. corner of our slope paving. The Contractor

APPROACHES (continued)

raised the question of liability as this cable was moved to its present location in August, 1957. However, their labor foreman was aware of it's new location, therefore, should have been watching for the cable during excavation. The Departments decision of this matter was covered in the Bidding Proposal under the section which requires the contractor to carry insurance to cover property damage such as this.

REMOVAL - OLD BRIDGE

Removal of the old bridge was accomplished by the Al. Johnson Company under contract #5. The superstructure was dismantled during the winter of 1960. Truss spans on the south end were toppled to the ground and cut up. North end I-Beam spans were stripped and also cut up. The swing span was removed last, by dismembering in place.

2. B1 of 31-10-1, Looking N. at N. half of old span #2 on barge. 1-12-60 L.H.G.

3. B1 of 31-10-1, Removing N. approach of old bridge. 1-12-60 L.H.G.

The sub-structure units required considerable work to remove. Railroad piers on the south side were composed of timber cribs and concrete piers. Cribs were removed with clam bucket on a floating crane and concrete piers by drilling and blasting.

The pivot pier was very difficult to remove and required considerable time. It was constructed of 74 piles, driven in a rectangular pattern and spaced approximately 3' apart, with mine rock fill placed in and around

REMOVAL - OLD BRIDGE (continued)

the piles. The rock made the extraction of the piling practically impossible. The Contractor was only able to pull one pile about 6' in an 8 hour shift. After extracting 6 piles in this manner, the Contractor requested permission from the Dept. of the U.S. Corps of Engineers, to break off piling at elevation 571.0 or river bottom, which ever was lower. Permission was granted and the removal proceeded with out incident.

In order to remove the old timber and piling of the old protector pier, which fell under the new lift span, the Contractor worked a night shift, from 10 PM to 6 AM, for 3 consecutive nights. During this shift all highway and rail traffic was stopped while the lift was up. After a two hour period, the span was lowered and traffic allowed to flow for a 10 minute period. This operation went smoothly after announcements were made to the people, by radio and newspaper. Emergency calls were handled without delay.

During removal of old substructure units on the south side, cribs and piling of an old bridge, built previous to the existing structure, were encountered and had to be removed at extra cost. These cribs and piles were located between railroad piers 1 & 2, 3 & 4, 5 & 6 and an old pivot pier, just south of the existing pivot pier. This work was done by Force Account at a cost of $1,280.00 for an 8 hour shift. Total cost was $20,000.00. After spending this amount it was felt that we had fulfilled our removal agreement with the U.S. Army Corps of Engineers and any additional obstructions in the channel bottom that were there before our construction, should be removed by the Corps.

DELAY - COSTS (Contract 5)

The Al. Johnson Construction Company filed a claim for time delays in performance of their contract. This amounted to approximately $83,000.00. This claim was based on delays due to the following: structural steel not being completely riveted on spans 4 & 5, causing delays in placing deck concrete; riveting of the railway deck spans was needed sooner, to facilitate deck waterproofing; the electrical Sub-Contractor was held up because of structural steel erection at both the north and south towers and also delay in making the lift span movable. As a result of the above delays, the bridge was not opened to traffic on either of the tentative dates of October 15, 1960 and November 2, 1960. Actual opening to Highway traffic was on December 20, 1960 and rail traffic on February 16, 1961. Rail traffic delay was due, primarily, to the railroads refusal to accept rail insulation methods for the lift span.

The Contractor was allowed settlement in the amount of $17,341.76, based on costs of delays from the tentative opening date to the actual opening date. These costs were in the form of equipment stand-by and labor expenses. Also included was additional cost of a railroad pilot, while the Copper Range Railroad used the D.S.S.& A. railroad tracks.

INCIDENTS & STUDIES - June 24, 1960

On june 24, 1960, at 2:30 A.M., the new bridge structure narrowly missed being damaged from a collision with a large ore boat. The steamer J. F. Schoellkopf, Jr., of the American Steamship Company, Buffalo, New York, signaled the bridge to open for passage. The ship was proceeding in a westerly direction and, as far as could be determined, had given two separate signals for the bridge to open. Upon receiving no answer from the bridge, the vessel then blew a repeated distress signal, dropped anchor and reversed engines to stop. The ship came to rest approximately 1,250 ft. from the bridge, but the anchors had hooked two of six Michigan Bell Telephone Company submarine cables laying on the river bottom.

The Officials of the Copper Range Railroad, operators of the bridge, were consulted about the delay in raising the lift and they stated that the operator did not hear the boat signals. However, it was felt that the operator could possibly have been asleep. As a result of this incident, the operators house was the object of an intensive study to determine whether any conditions may be present to reduce alertness and hearing.

Tests were made for carbon monoxide and air samples taken for analysis. Results were as follows:

Carbon Monoxide

Test #1, at operators chair, no indication.
Test #2, cumulative test at five locations, no indication.

Air Samples	Carbon Dioxide	Oxygen
Test #1, at operators seat	Trace	19.5%
Test #2, cumulative at five locations	Trace	19.5%

The above quantities of carbon dioxide and oxygen are normal. However, it was observed that the house is very tightly constructed and no allowance was made for furnace conbustion air. Depletion of oxygen was possible, when windows and doors are closed. To correct this problem, a 4" x 8" metal duct was run from the south, outside wall to a point close to the furnace air intake. Other changes, as observed, were as follows: The weather cap on top of the furnace stack was changed to a free revolving type, to facilitate venting of exhaust fumes from the furnace and prevent back pressure. As the result of sound tests performed, by listening for boat signals, it was proved that very little sound could be heard by the operator. In connection with this, a two-way radio was installed to allow ships to call the bridge when approaching.

It was observed, during this study, that the view of the channel from the operators house is not as good as it should be, particularly, to the east. For this reason, the solid panel of the east door was replaced with plate glass. It would do well, on future projects, to give considerable time and study to the operators view and provide the greatest possible sight distance.

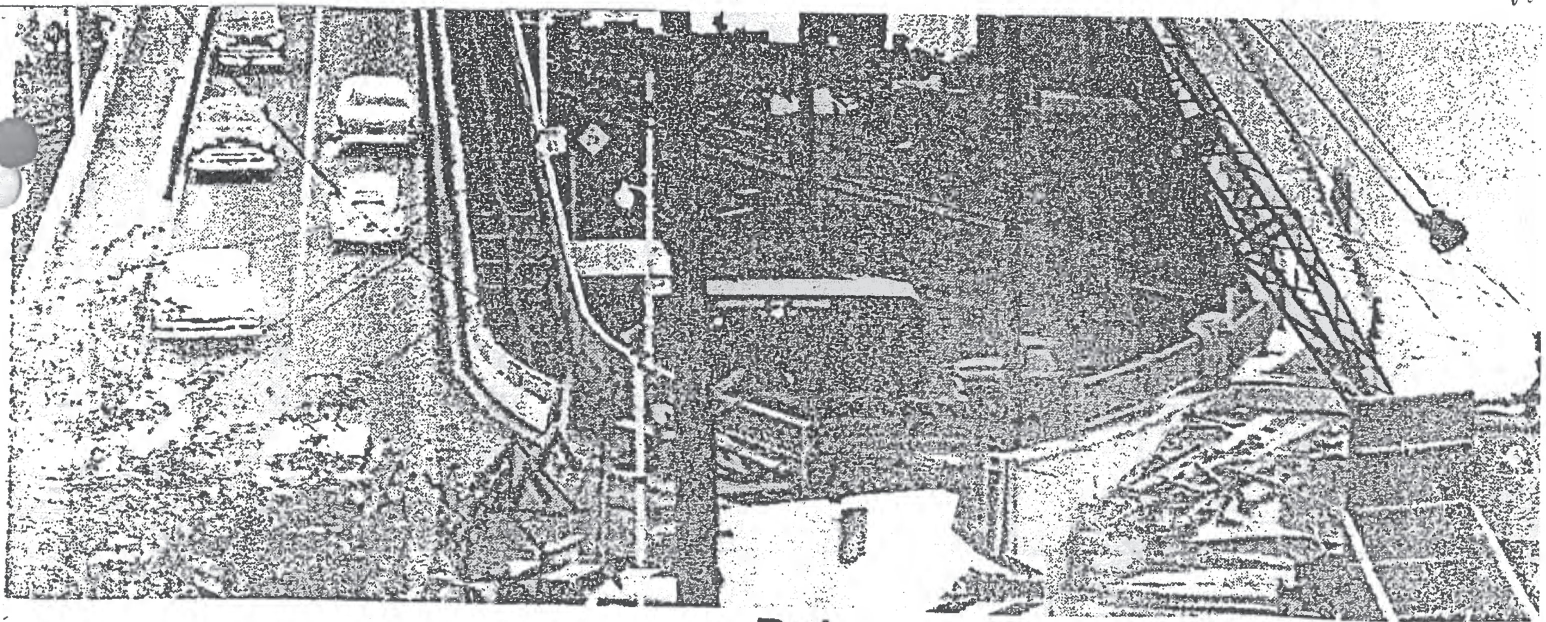
INCIDENTS & STUDIES (continued)

It may also be noted, while on the subject of the operators house, that it would be well to include the installation of combination screen and storm doors on the entrance doors. This would stop cold drafts etc., which are objectionable during the winter months.

End

Accepted by Corps of Engineers (5-12-61)
Accepted by Copper Range & D.S.S.&A Railroads (6-15-61)
Accepted by Bureau of Public Roads (9-19-61)
Accepted by Michigan State Highway Department (9-19-61)

16



Detour

While workers riveted away on the new Portage Lake Lift Bridge in the late 1950s, people traveling between Houghton and Hancock used the old swing bridge. Carrying an $11 million price tag, the Lift Bridge would probably cost more than $50 million to construct today. In its day, the Lift Bridge per foot to construct than the Mackinac Bridge. (Gazette file phot

Bridges – Portage Lake

Bridge has only one official name

HOUGHTON, Dec. 4, 1968 — Copper Country people frequently tend to give the main artery between Houghton and Hancock a variety of names. Some call it the Portage Lake Lift Bridge, the Portage Canal Bridge, the Portage River Bridge, etc. According to the Houghton Canal's Charles McManiman, however, its official name is the Portage Lake Bridge. This, due to a resolution he put through the senate back in 1960, the year the bridge was officially dedicated in June.

Former State Senator McManiman well realized at the time that there were many persons for whom the artery could be title and that these had done notable work in achieving the ultimate construction of the bridge.

It also is widely known that L'Anse's Captain George Skuggen played a big part in promoting the building of the bridge in that it was he, who, at the time, brought the attention of the Lake Carriers to it through Admiral Spencer who pushed the issue to Washington.

In the 1950s it was Captain Skuggen who, with other lake skippers, declared the bridge a navigational "hazard" and it was due to this pronouncement that, in those days, the opinion concerning the structure that was in existence at the time, the drawbridge, was declared a menace to navigation and should be replaced.

The many plans made to name the bridge for an individual having failed at the time when McManiman was in the Senate, he put forth the resolution that it should merely be called Portage Lake Bridge. It has officially retained this title up to this time.

Steamer heads toward wrong passage

of OLD BRIDGE

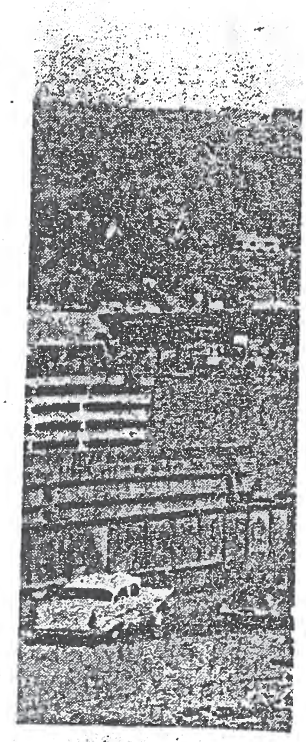
NOV. 28, 1958 — The Portage bridge engineer and two gatemen spent a few breathless minutes Wednesday midnight when they had to blow down the McCarthy Steamer J.F. Durston which was attempting to go through the southern draw opening against regulations in effect while the new bridge is being built.

The three men saw the boat coming and immediately sounded the proper warning toots for a vessel to stop but by the time the Durston was able to halt, its bow was almost opposite the bridge's pilot house. By this time the ship had dropped anchor and it was possible for the skipper to get instructions from the bridge personnel. The captain said he had been unaware that the southern opening should not be used. He then rang two bells in the ship's engine room and the 420 foot steamer reversed engines to a point from which it was possible to clear the north channel without difficulty.

Early in the navigation season all fleet members of the Lake Carriers Association had been informed of the bridge construction and that the southern passage could not be used because of the smaller draft in the area and the fact that movement of the propeller might cause instability of Cassion No. 5.

Skippers seem to be suspicious of the opening on the Hancock side because of its closeness to the shore. This is their reason for preferring the southern passage. The bridge opening on the north is narrower by more than 10 feet.

On Tuesday, one of the ships which anchored in Big Portage to wait out the early week's storm also came close to damaging piers at the bridge site. It touched one of the projections, as did the Durston. Neither did extensive damage, however.



A look at the Portage Lak tion from the Houghton side the double deck lift span in

Section 2 Attached Documents:

[2-1] Robinson, Major General B. L.. Letter to Secretary of the Army Re: Public Hearing Under Bridge Alteration Act, Houghton-Hancock Bridge over Portage Lake, Mich. March 7, 1955. Houghton County Road Commission Bridges, Portage Lake, 1954-1955, RG77-104. Box 2, Folder 5. MTA & CCHC.

[2-2] "Carl Winkler Saw New Bridge Need" (June 24, 1960). Daily Mining Gazette. Page 3. Microfilm Collection, MTA & CCHC. See attached document [1-5].

[2-3] "History & Culture- Winkler, Carl F." *Michigan Department of Transportation,* (viewed Feb 25, 2019). <www.michigan.gov/mdot/0,4616,7-151-9623_11154-126463--,00.html>.

[2-4] Winkler, Carl. Letter to George Foster Re: B1 of 31-10-1 Bridge Crossing Portage Ship Canal Between Houghton and Hancock. May 22, 1952. Houghton County Road Commission Bridges, Portage Lake, 1949-52, RG77-104. Box 2, Folder 3. Michigan Tech Archives & Copper Country Historical Collections.

[2-5] "History & Culture- Ziegler, Charles M." *Michigan Department of Transportation,* (viewed Feb 25, 2019). <www.michigan.gov/mdot/0,4616,7-151-9623_11154-126453--,00.html>.

[2-6] Winkler, C. F.. Letter to Charles Ziegler Re: Near Collision. May 9, 1952. Houghton County Road Commission Bridges, Portage Lake, 1949-52, RG77-104. Box 2, Folder 3. Michigan Tech Archives & Copper Country Historical Collections.

[2-7] "Bennett, John Bonifas." *History, art & Archives, U.S. House of Representatives,* (viewed Feb 25, 2019). <history.house.gov/People/Detail/9266>.

[2-8] "History & Culture- Mackie, John C." *Michigan Department of Transportation,* (viewed Feb 25, 2019). <www.michigan.gov/mdot/0,4616,7-151-9623_11154-126428--,00.html>.

[2-9] "Data on New Portage Lake Bridge." Date unknown. Houghton County Road Commission Bridges, Portage Lake, 1953, RG77-104. Box 2, Folder 4. Michigan Tech Archives & Copper Country Historical Collections.

[2-10] Foster, George M.. Letter to Carl Winkler Re: People who Worked on Negotiations for Houghton-Hancock Bridge. September 17, 1959. Houghton County Road Commission

Bridges, Portage Lake, 1958-1961, RG77-104. Box 2, Folder 7. Michigan Tech Archives & Copper Country Historical Collections.

[2-11] D'Arcy, Tom (Feb 8, 2019). "Houghton Hancock Bridge." Written supplement to personal call on Feb 11, 2019.

[2-12] "Portage Lake Lift Bridge." Unknown date and author. General facts about Lift Bridge provided by Al Anderson (Feb, 2019).

[2-13] Various hand written and typed documents from John Michels on the history and construction of the bridge (Feb, 2019).

[2-14] "Houghton-Hancock Lift Bridge Newspaper Articles- History," (Various dates). Compiled and provided by John Michels (Feb, 2019).

[2-16] Weingarten, Dan (June 16, 2016). "Portage Lake Lift Bridge History Preserved in Documentary Film." *Michigan.gov,* (viewed Feb 25, 2019). <www.michigan.gov/som/0,4669,7-192--386908--rss,00.html>.

COPY

Subject: Pu lc Hearing Under Bridge Alteration Act, Houghton-Hancock Bridge over Portage Lake, Mich. (Ltr Rep. Bennett to OCE 23 Mar 53)

Office of the Chief of Engineers, Washington 25, D. C; 7 March 1955

THRU: The Judge Advocate General, SSUSA
Washington 25, D. C.

TO: THE SECRETARY OF THE ARMY

5th Ind

1. Acting on complaints from navigation interests a public hearing was held at Houghton, Michigan, on 15 October 1953 under Section 3 of the Act of 21 June 1940 to afford all interested parties an opportunity to be heard as to whether the combined highway and railroad bridge over Portage Lake (Keweenaw Waterway) between Houghton and Hancock, Michigan, should be altered as an unreasonable obstruction to navigation.

2. The bridge is a double deck bridge carrying railroad traffic on the lower deck and highway traffic on the upper deck, built in 1895, with a swing span providing navigation openings of 118 feet and 107 feet. It provides a vertical clearance of 5.4 feet above low water in the closed position. Commerce on the water way averages about 600,000 tons annually and vessel trips average about 400 of the large lake carrier type and 500 smaller craft of 30 tons or less. An important purpose of the waterway is to offer a sheltered route in times of stormy weather on Lake Superior off Keweenaw Peninsula, in addition to a saving in distance and sailing time.

3. Navigation interests stressed at the hearing the difficulties and hazards of navigating the narrow drawspan. They pointed out further that the present lake carriers of 500-foot length and 60-foot beam are being replaced with vessels up to 714 feet long and beam of 75 feet. Present difficulties are greatly increased by prevalent cross winds, particularly with a light ship, producing a tendency to "crab" or drift. Vessel masters testified it is necessary to go full speed in strong winds to avoid drifting in to the bridge piers. Delays to navigation are occasioned by anchoring to await favorable conditions before attempting passage, and there was testimony that passage through the waterway was avoided because of the bridge.

4. The narrow drawspan opening, the size of the lake carriers, and the severe cross winds, are undoubtedly factors making navigation difficult and hazardous. The drawspan was hit and demolished in 1905, and, while there is no

Subject: Public Hearing under Bridge Alteration Act, Houghton-Hancock Bridge over Portage Lake, Mich. (Ltr Rep. Bennett to OCE 23 Mar 53)

COPY

5th Ind (Cont'd)

ENGWO

record of recent serious damage this is due not only to skillful navigation, but also to the fact that most of the larger vessels, particularly loaded downbound, avoid the waterway even during stormy weather on Lake Superior when passage through the waterway could be advantageous. These storm hazards are not susceptible of evaluation, but about 100 large vessels pass Keweenaw Peninsula each day and in an average year they are exposed to 23 days of severe storm conditions. Therefore, about 2,300 vessels would have good reason to use the waterway, or about 1,900 more than at present. The Lake Carrier's Association presented data estimating one hour gain in sailing time and earning capacity of a large vessel at about $200 per hour, thus, the 1,900 vessels would represent a saving of $380,000 per year. In addition, estimates of the cost of delays to the vessels now using the waterway amount to $10,000 annually in added cost of operation. Division and District Engineers find the bridge unreasonably obstructive and recommend issuance of an order to alter.

5. A bridge with horizontal clearance of 250 feet and a vertical clearance of 100 feet in the open position, which is the minimum necessary to provide reasonably unobstructed navigation, designed for the heavier highway loading and wider highway deck desired by the owner is estimated to cost $5,100,000. The share of the United States under the provisions of Section 6 of the Act of 21 June 1940 would be somewhat over 50 percent.

6. The existing highway deck provides two narrow lanes for vehicles, and bridge openings create serious congestion and delays to highway traffic. Since this bridge is the only connection between the mainland and the Keweenaw Peninsula any delay affects the entire area. The bridge owner, if ordered to alter the bridge, will construct a lift bridge with a 4-lane highway deck of increased loading and will also install a highway surfacing on the lower deck of the lift span. The span will then be kept in an intermediate raised position, except for the passage of trains, and a vertical clearance of 32 feet will be available which will allow most small boat navigation to pass under the closed bridge without causing any delay to vehicular traffic. Section 6 of the Act of 21 June 1940 provides that the Secretary may require equitable contribution when alteration is desirable to remove an unreasonable obstruction, but also for some other reason. It is considered equitable that the State of Michigan, in addition to the apportionment provided for in Section 6, should contribute an amount measured by

COPY

ENGWO

SUBJECT: Public Hearing under Bridge Alteration Act, Houghton-Hancock Bridge over Portage Lake, Mich. (Ltr Rep Bennett to OCE 23 Mar 53)

5th Ind (Cont'd)

the cost of the right-of-way for highway approaches, estimated at $166,500, the right-of-way for railroad approaches and moving railroad buildings, estimated at $20,500, and a portion of the construction of approaches estimated at $350,000. With this contribution by the State of Michigan the share of cost to be borne by the United States would be about 33 percent. Informal discussions with representatives of the State Highway Department indicate agreement to such an apportionment would be forthcoming. The service of the order will be contingent upon formal agreement by the State.

7. After full consideration of all the facts and circumstances presented at the public hearing and subsequent discussions with the Michigan State Highway Department it is my opinion that the existing railroad and highway bridge is an unreasonable obstruction to navigation and its alteration is necessary to render navigation reasonably free, easy, and unobstructed. Subject to the contribution from the State as described above, I recommend that the Secretary of the Army give notice under the provisions of Section 3 of the Act of Congress of 21 June, 1940, as amended, to the Michigan State Highway Department, to alter its bridge by:

> Providing a vertical lift span with an horizontal clearance of 250 feet between fenders and a least vertical clearance above mean high water of 100 feet in the raised position, the center of the said lift span to be in approximately the center of the existing channel.

8. A draft of order embodying the above recommendations has been prepared by this office and is herewith. If approved, it is requested that two copies be signed, one to be served on the owner of the bridge, the other for the records of this office.

B. L. ROBINSON
Major General, USA
Acting Chief of Engineers

1 Incl (added)
17 Order to alter bridge
(in dup)

(Incls 2-16 w/d

Winkler, Carl F. (1883-1968)

One of Michigan's outstanding highway engineers, Winkler devoted more than 50 years to the development of county roads in the Upper Peninsula. He was a pioneer in developing effective highway snow removal and worked unstintingly for passage of good-roads legislation and for roadside beautification. He was a key figure in bringing about construction of the vertical lift bridge linking Houghton and Hancock. Winkler was county engineer of Gogebic County (1917-1930) and engineer-manager of the Houghton County Road Commission (1930-1964). He headed the Michigan Good Roads Federation in 1941 and the County Road Association of Michigan in 1950.

Michigan Transportation Hall of Honor, 1971

May
Twenty-second
Nineteen
Fifty-two

Mr. G. M. Foster
Chief Deputy Commissioner
Michigan State Highway Department
Lansing, Michigan

Dear George:

Re: Bl of 31-10-1
Bridge crossing Portage Ship
Canal between Houghton and Hancock.

It has always been my opinion that either your Department or your consultants should make a complete study of this bridge location with the view of covering all possible types of construction, railroad combinations and semi-high level and high level for vehicles only.

Until you do get a definite plan and a reasonably accurate estimate of the cost, I fail to see how I can go to the local people and get them to subscribe wholeheartedly to any type or location of bridge.
It is also a lead pipe cinch that unless and until something concrete is proppsed, it will be impossible to interest the Railroads or the Federal Government or the United States Engineers or the War Department.

Also, in spite of all the statements of my friend, the Commissioner to the contrary (see his letters May 13 and 14 to me) all planning attempt at co-ordination of separate interest must stem from him, at his initiative and at his call. When he does call the five or six agencies that might be interested in this bridge, together, it would certainly be unthinkable to do so without having in more or less detail a comprehensive plan and estimate of costs.

5/22/52

Mr. G. M. Foster

At a meeting of the Commission, held May 20, the matter of a bridge was discussed and it was the opinion of this Board that the primary interest was to get a safe highway bridge built before this one fell down.
If in designing such a structure and planning on its construction, the Railroads should become interested the next move would be up to them.

Yours very truly,

BOARD OF COUNTY ROAD COMMISSIONERS

C. F. Winkler
Engineer

CFW-ack

Ziegler, Charles M. (1888-1959)

As a four-term state highway commissioner (1943-1957) and earlier as district engineer, deputy commissioner and chief engineer for the State highway Department (1919-1933), Ziegler was a key figure in the development of Michigan's outstanding highway system. He led in forming a close working relationship among the state, counties and municipalities, leading to passage of Michigan's basic highway law, Act 51 of 1951. He was at the forefront of efforts to keep the highway system, toll free rank of the states in construction of its Interstate freeway network. Ziegler was president of the American Association of State highway Officials in 1952-1953.

Michigan Transportation Hall of Honor, 1982

May
Ninth
Nineteen
Fifty-two

Mr. Charles M. Ziegler
State Highway Commissioner
Michigan State Highway Department
Lansing, Michigan

Dear Charley:

Just to keep you well informed and to further impress upon you the slight thread whereby hangs the fate of the Portage Lake Bridge - just the other day, within approximately one thousand feet the Texaco Tanker "Michigan" had to come to a full stop because the bridge had not opened on signal as usually given.

If you think that you did not miss a horrible headache by the slimmest possible margin you do not then have a very good conception of stopping distances for freighters.

Kindly pin this letter on the office wall so you can read the "I told you so" when luck is lacking.

Yours very truly,

BOARD OF COUNTY ROAD COMMISSIONERS

C. F. Winkler
Engineer

CFW-ack

cc: G.M.Foster
Chief Deputy Commissioner
Michigan State Highway Dept.
Lansing, Michigan

BENNETT, John Bonifas

1904–1964

OFFICE
Representative

STATE/TERRITORY
Michigan

PARTY
Republican

CONGRESS(ES)
78th (1943–1945), 80th (1947–1949), 81st (1949–1951), 82nd (1951–1953), 83rd (1953–1955), 84th (1955–1957), 85th (1957–1959), 86th (1959–1961), 87th (1961–1963), 88th (1963–1965)

Image, Pocket Congressional Directory, 83rd

Biography

BENNETT, John Bonifas, a Representative from Michigan; born in Garden, Delta County, Mich., January 10, 1904; attended the public schools; was graduated from Watersmeet (Mich.) High School, from Marquette University Law School, Milwaukee, Wis., in 1925; took a postgraduate course at Chicago (Ill.) University Law School in 1926; was admitted to the Wisconsin bar in 1925 and to the Michigan bar in 1926; practiced law in Ontonagon, Mich., 1926-1942; prosecuting attorney of Ontonagon County 1929-1934; deputy commissioner of the Michigan Department of Labor and Industry 1935-1937; elected as a Republican to the Seventy-eighth Congress (January 3, 1943-January 3, 1945); unsuccessful candidate for reelection in 1944 to the Seventy-ninth Congress; resumed the practice of law; elected in 1946 to the Eightieth and to the eight succeeding Congresses and served from January 3, 1947, until his death in Chevy Chase, Md., August 9, 1964; interment in Gate of Heaven Cemetery, Silver Spring, Md.

View Record in the Biographical Directory of the U.S. Congress (http://bioguide.congress.gov/scripts/biodisplay.pl?index=B000377)

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External Research Collections

University of Michigan
Michigan Historical Collections, Bentley Historical Library

Ann Arbor, MI
Papers: 1928-1964, 2 linear feet. The papers of John B. Bennett include correspondence, campaign materials, copies of bills introduced in Congress, and files concerning congressional reapportionment and the problems of the Upper Peninsula. A finding aid is available in the repository.

Sound Tape Reels: 1954, 2 sound tape reels. A radio program from May 1954, with John B. Bennett and Congressman Victor A. Knox on the subject of social security. Also included is a campaign message of John B. Bennett from 1954, discussing the issues of special relevance to the voters of the Upper Peninsula.

Papers: In the Bonifas Family Papers, ca. 1929-1944, 3 linear inches. Correspondents include John B. Bennett. A finding aid is available in the library.

Papers: In the Wilber M. Brucker Papers, 1877-1968, 52 linear feet and 2 oversized folders. Correspondents include John B. Bennett. A finding aid is available in the library and online.

Papers: In the Owen J. Cleary Papers, 1944-1959, 10 linear feet and 2 volumes. Correspondents include John B. Bennett. A finding aid is available in the library and online.

Photographs: In the Fred L. Crawford photograph series, ca. 1935-1952, approximately 0.6 linear foot. Persons represented include John B. Bennett.

Papers: In the Lawrence L. Farrell Papers, 1935-1971, 4 linear feet. Correspondents include John B. Bennett. A finding aid is available in the library.

Papers: In the Arthur Hendrick Vandenberg Papers, 1884-1974, 8 linear feet and 25 volumes. Persons represented include John B. Bennett. A finding aid is available in the library and online.

Microfilm: In the Arthur Hendrick Vandenberg Papers, 1891-1974, 11 microfilm reels. Persons represented include John B. Bennett. A finding aid is available in the library and online.

Papers: In the Stellanova Osborn Papers, 1916-1992, 40 linear feet. Persons represented include John B. Bennett. A finding aid is available in the library.

Papers: In the Charles M. Ziegler Papers, 1928-1959, 2 linear feet and 9 volumes. Correspondents include John B. Bennett. A finding aid is available in the library.

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Bibliography / Further Reading

United States. 88th Cong., 2d sess., 1964. *Memorial services held in the House of Representatives and Senate of the United States, together with remarks presented in eulogy of John Bonifas Bennett, late a Representative from Michigan*. Washington: Government Printing Office, 1964.

[Top]

Office of the Historian: history@mail.house.gov (mailto:history@mail.house.gov)
Office of Art & Archives, Office of the Clerk: art@mail.house.gov (mailto:art@mail.house.gov), archives@mail.house.gov (mailto:archives@mail.house.gov)

Mackie, John C. (1920-2008)

Under Mackie's aggressive leadership as state highway commissioner from 1957 to 1965, Michigan moved to the nation's front rank in highway construction. Throughout most of his administration, the state led the number one position in construction of its interstate freeway system and was the first to build a cross-state interstate freeway (I-94). Mackie was the first commissioner to propose and carry out a five-year construction program, all based on priorities determined solely from engineering criteria. His strong advocacy of bond financing helped Michigan improve a first-rate highway system while keeping it toll free. He was president of the American Association of State highway Officials in 1963.

Michigan Transportation Hall of Honor, 1973

DATA on NEW PORTAGE LAKE BRIDGE

Jan.23,1953 State Highway Commissioner Charles M. Ziegler - letter to Mr. Grover C. Dillman, copies to Hon. John B. Bennett and Hon. Homer Ferguson, stating that from the data given, he believes that a new Bridge should be built over the Ship Canal between Houghton and Hancock.

Feb. 6,1953 Letter to Hon. Homer Ferguson, U. S. Senate, from S. D. Sturgis, Jr. Major General, Acting Chief of Engineers, stating public Law 564 amended the Act of Congress of 21 June, 1940, (33USC 511) and provides for the alteration of certain bridges, including combined highway and railroad bridges, over navigable waters of the United States and the apportionment of cost of alteration between the U.S. and the owners of such Bridges. The Act can be applied, however, only when, in the opinion of the Secretary of the Army, the Bridge constitutes an unreasonable obstruction to navigation, etc.

Feb. 10,1953 C. F. Winkler's letters to Hon. Homer E. Ferguson, U.S.Senator, Hon. Victor A. Knox, House of Representatives and Hon. Chas.E. Potter, United States Senator, requestion congressional help to obtain new Bridge - reference to Daily Mining Gazette of Feb. 5 and Feb. 7, referring to need of replacing of the Bridge crossing Portage Lake between Houghton and Hancock.

Mar. 23,1953 Letter to Mr. Winkler from Hon. John B. Bennett, stating that he and Senator Ferguson have requested the Chief of Engineers to make and hold a public hearing in respect to condemning the Bridge under the provisions of Public Law 647-76th Congress, as amended by Public Law 564-82nd Congress. While our mutual interest in this Bridge primarily concerns its inadequacy so far as Highway traffic is concerned. The Army Engineers will not be interested in that aspect but will look at it solely from the standpoint of its detrimental effect to navigation, Thus, in presenting evidence under Public Law 647, it will be necessary to have the testimony of the Lake Carriers Association, as well as that of individual shippers and ship owners.

Mar. 24, 1953 Mr. C. F. Chopening, Brigadier General, U.S.A. Assistant Chief of Engineers for Civil Works answering Hon.John B. Bennett, Washington, D.C. requesting an investigation of the Bridge over Portage Lake in Houghton County, Michigan, in order to determine whether it unreasonably obstructs navigation.

Mr. O. A. Rockwell, Vice President and General Manager, C.& H. letters to Legislators and others in Washington in regard to getting a new Bridge between Houghton and Hancock.

Apr. 2,1953 Letter from C. H. Chopening, Brigadier General, U.S.A. Assistant Chief of Engineers for Civil Works to Hon. John B. Bennett.

The Bridge Alteration Act of 21 June 1940, Public Law 647, 76 Congress, as amended, provides that "No Bridge shall at any time unreasonably obstruct the free navigation of any navigable waters of the United States." Section 3 of the Act provides for a public hearing at which all parties in interest shall have full opportunity to be heard as to whether alteration of such Bridge is needed, and if so, what alterations are needed.

In 1941 the Lake Carriers Association objected to the location of a proposed bridge approximately 2,500 feet east of the existing bridge and stated the existing bridge should be modified within a reasonable time to provide a horizontal clearance of 200 feet.

In view of the stand taken by the Lake Carriers and the numerous complaints from your constituents that the Houghton-Hancock Bridge is a menace to navigation and does not provide free and unobstructed water navigation I am pleased to advise that a public hearing will be held to determine whehter alteration of the Bridge is needed and if so what alterations are needed.

April 1953 Colonel George Kumpe U.S. Engineers visited the District and conferred with Mr. Winkler, State Highway Officials and Railroad Officials.

Apr. 27,1953	Letter of Adm.Lundon Spencer of Lake Carriers Association to Hon.John B. Beneett, Washington D.C. stating that the Lake Carriers Association will be represented at the hearing. Replacement of the Bridge is a matter of great interest to them.
June 19,1953	Meeting in Chicago with Lake Carriers Association and Colonel George Kumpe of the U.S. Army Corps of Engineers, Michigan State Highway Department and the interested Railroads (Copper Range & D.S.S.& A.), Mr. Winkler, Houghton County Road Commissio
Aug. 25,1953	Letter to Mr. R. J. Barry, General Superintendent, D.S.S.& A. Railroad to Mr. H. I. Johnson, General Manager, Copper Range Railroad Co. from G. M. Foster, Deputy Highway Commissioner, Michigan State Highway Dept. explaining the possibilities of financial aid under the Truman-Hobbs Act.
Oct. 14,1953	Letter to Colonel George Kumpe. Corp of Engineers, U.S. Army from Board of County Road Commissioners submitting information it desires to present at the Public Hearing to be held October 15, 1953, in Houghton, Michigan, at the County Court House.
Oct. 15,1953	Colonel George Kumpe, District Engineer, U.S. Corp of Engineers, and Aides, heard Public Hearing in Houghton County Court House.
Jan. 18,1954	Letter from Colonel George Kumpe, Corp of Engineers, U.S. Army, to Hon. John B. Bennett, stating that it will take at least a month more to complete their studies on the matter of the Houghton Bridge. Following our report it is probable, due to various complications involved, that one to two months will be required to complete review of the case by higher authority. Final decision in the matter cannot be anticipated much before May 1, 1954.

May 11, 1954	Letters from C. F. Winkler to Hon. Homer E. Ferguson, Hon. John B. Bennett, Hon. Leo H. Roy, requesting information on status of Houghton-Hancock Bridge.
May 12, 1954	Letter from G. M. Foster, Deputy Highway Commissioner, to Colonel George Kumpe, Corps of Engineers, U.S. Army, requesting information relative to the status of the hearing on the Houghton-Hancpck Bridge.
May 13, 1954	Letter from Colonel George Kumpe, Corps of Engineers, U.S.Army, stating the report was submitted to the Division Engineer on May 1 and is being reviewed. The formal recommendation on the Bridge will be made by the Chief of Engineers to the Secretary of the Army.
June 7, 1954	Letters to Hon. Homer Ferguson, United States Senate and Hon.John B. Bennett, from E. C. Itschner, Brigadier General, Assistant Chief of Engineers for Civil Works, U. S. Army, stating that additional studies was found necessary and that the studies and consultation will require approximately a three month period. It is expected that the report will be submitted to his office about September 1954.
Aug. 18, 1954	Letter to Colonel George Kumpe. District Engineer, Corps of Engineers, U.S. Army, from G. M. Foster, Deputy Highway Commissioner, submitting estimates of cost for revision of the facilities of the Copper Range Railroad and the D.S.S.& A.Railroad, in connection with the proposed reconstruction of the existing bridge and the most of revising the railroad approaches at the proposed new location of the Bridge just west of the existing Bridge and also the cost of revising the Railroad approaches, if the present swing span was to be replaced by a 250 foot span.

Oct. 28, 1954 — Telegram from G. M. Foster, Chief Deputy Commissioner, to Mr. C. F. Winkler. Following message received from Major Glenn P. Ingwersen, U. S. Corps of Engineers: "Additional information concerning cost estimates and plans for the Proposed New Houghton-Hancock Bridge over the Keweenaw Waterway furnished with your letters of 1 October and 11 October 1954 have been received. Our report is being forwarded today for consideration by Higher Authorities. Your assistance in this matter is appreciated."

Dec. 2, 1954 — Letters from E. C. Itschner, Brigadier General, U.S.A. Assistant Chief of Engineers for Civil Works, to Hon. John B. Bennett, and Hon. Homer Ferguson, United States Senate, stating that conflicting requirements between navigation thru the Bridge, and train and vehicular traffic over the Bridge presents a complex problem which requires a detail study of all related facts pertaining to both water and land transport as well as the most economical means of alteration. You may be assured that the matter is now under consideration and a decision will be made as rapidly as practicable.

Feb. 3, 1955 — Letter from E. C. Itschner, Brigadier General, U.S.A. Assistant Chief of Engineers for Civil Works to Hon. John B. Bennett. After careful consideration of all facts and circumstances while the evidence demonstrates difficulties of navigation, there does not appear sufficient grounds to support a finding that the Bridge is unreasonably obstructuve to present navigation within the intent of Law. Considering prospective navigation, there is very little doubt that additional vessels would use the waterway to escape storm hazards if conditions at the Bridge were improved. Such additional use is reasonably prospective, but the degree of use if somewhat speculative, and, on the basis of all the evidence presently available does not appear to justify the expenditure of the amount of Federal Funds presently estimated to be the share of the United States under the Truman-Hobbs Act.

Feb. 3, 1955 (continued)	This letter is intended to be in the nature of a preliminary finding, and any further views or data the Bridge owner or other interests may wish to submit, will be considered before final action is taken in the matter.
Feb.16, 1955	Mr. C. F. Winkler, Engineer, Houghton County Road Commission, State Senator, Leo H. Roy, met with Congressman Bennett and Officials from the Corps of U.S. Army Engineers in Washington, D.C.
Mar.25, 1955	Part of order signed by Robert T. Stevens, Secretary of the Army: Whereas the following changes in said Bridge have been recommended by the Chief of Engineers as necessary to render navigation thru or under said Bridge reasonably free, easy, and unobstructed, to wit; provide a vertical lift span with a horizontal clearance of 250 feet between fenders and a least vertical clearance above mean high water of 100 feet in the raised position, the center of the said lift span to be in approximately the center of the existing channel. NOT THEREFORE, in obedience to and by virtue of the provisions of Section 3 of the Act of Congress of 21 June 1940, as amended, Supra, the Secretary of the Army, having first given the parties full opportunity to offer evidence and be heard as required by that Section does hereby order the Michigan State Highway Department to make alterations in said Bridge as described above.
Jan. 12, 1956	Letter from Hon. John B. Bennett to Mr. George M. Foster, Chief Deputy, Michigan State Highway Department: The budget of the Corps of Engineers to be released next week contains an item of $500,000. for the Portage Lake Bridge. The Federal money will be available for expenditure any time after July 1st and I feel sure there will be no difficulty in getting the balance of the Federal share in next Fall's budget.

May 1957	Bids were received by the Michigan State Highway Department on the New Lift Span Bridge between Houghton and Hancock but again there were delays due to bid price exceeding the Engineers Estimate
Sept.25,1957	Bids were again received and proved more favorable which lead to the awarding of the contract.

STATE HIGHWAY DEPARTMENT
OF INDIANA
STATE HOUSE ANNEX
INDIANAPOLIS 4, INDIANA

September 17, 1959

Mr. Carl Winkler, Engineer,
Houghton County Road Commission,
Hancock, Michigan.

Dear Mr. Winkler:

Mr. Foster asked me to send you the attached list of the people he could remember having been connected with the negotiations leading up to the ultimate construction of the Houghton-Hancock Bridge.

We do not have any records down here which would help to refresh our memory and you undoubtedly will think of others who had a part in this, as well as being able to supply the name of the Bridge Engineer for the Bureau of Public Roads in Lansing at that time and the representative of the Lake Carriers Association in Cleveland.

Very truly yours,

(Miss) Virginia Florian

Virginia M. Florian, Secretary to
George M. Foster, Executive Director

F

PEOPLE WHO WORKED ON NEGOTIATIONS
FOR HOUGHTON-HANCOCK BRIDGE

W. P. Nichols - Copper Range Railroad
Wilbur Brucker - Secretary of the Army, Washington
Col. Otto J. Rohde - Corps of Engineers, St. Paul, Minnesota
Col. Allen - Corps of Engineers, Washington
R. J. Kennedy - Corps of Engineers, Washington
C. P. Hazelet - Hazelet & Erdal, Louisville, Kentucky
A.L.R. Sanders, Hazelet & Erdal, Louisville, Kentucky
Spencer Weber - Hazelet & Erdal, Lansing, Mich.
Ed. Gleason - Michigan State Highway Dept., Lansing
Harold Puffer - Michigan State Highway Dept., Lansing
B. E. Pearson - D.S.S. & A. Railroad, Marquette, Mich.
H. A. Halvorson - D.S.S. & A. Railroad, Minneapolis, Minnesota
R. H. Harrison - Bureau of Public Roads, Chicago
Neal MacDougell - Bureau of Public Roads, Lansing
- Bridge Engineer, Bureau of Public Roads, Lansing
Fred Kellem - Bureau of Public Roads, Chicago
Lynden Spencer-President -- Lake Carriers Association, Cleveland, Ohio
13

Homer Johnson--former General Manager Copper Range Railroad
Mr Barry, General Mgr. DSSS&A Marquette (Title to be obtained)

HOUGHTON HANCOCK BRIDGE

Tom D'Arcy - Feb 9, 2019

Upon graduation from the University of Illinois, I took a position with the Chicago Engineering firm of Hazelet & Erdal. This firm was a bridge design firm that specialized in moveable bridges, particularly bascule bridges. After a few years, I was promoted to Squad Lead and was put in charge of several bridge projects.

When the Houghton Hancock Project came up I volunteered to join the team because the project was so unique and interesting. The project was broken down into several pieces. I was to design the railroad approach spans and the main truss span. Other teams designed the caisson foundations and the two towers.

One of the most interesting aspect of the bridge was the two traffic levels. The lower level was designed to carry locomotives and copper ore cars, while the upper level was designed to carry auto and truck traffic.

The water way carried substantial boat and ore barges. When lake boats approached the lift, the span was raised all the way up to allow the boats to travel through. When river barges approached, the bridge requiring less headroom, was raised until the lower railroad level was at the street level and the barge passed under and the street traffic continued on the railroad level.

This presented a problem of providing a road surface that would allow automobiles to travel easily filling in the space between the rails. This was more than 50 years ago when today's materials and composites were not available. So, we studied several materials before deciding on a hardened rubber product which worked satisfactorily.

Since then, the copper mines have been closed and train traffic has stopped. The lower train level is carpeted with grass and used by ski-doos in the winter.

Because of the two level aspect of the bridge, and locomotives being carried by the structure, the design loading was not an easy task. Particularly when one considers the design was done in the time when there were no computers, no bridge design software and no design aids. The design was accomplished by cranking the Monroe calculator day after day.

After determining the size of locomotives used in the area, we found the critical one, which had as many as 12 axles, each one supporting several wheels and a different amount of load on each axle. To design bridge members, you take the center of gravity for all axles and split the distance to the nearest wheel and locate at the truss member you are designing. In this bridge, you would also add the effect of auto and truck traffic plus snow and ice and wind creating a time consuming, hand design. The drafting of the bridge was done by hand, no auto cad available. All calculations were checked and if your design had too many red marks, you were sent back to designing pedestrian bridges. The railroad approaches were curved, so the plate girders I designed had to be designed with unusual loads and torsion.

Another unique aspect of the bridge is that three of the piers were located where the water was deep (75 feet) and the loads were heavy, so a caisson foundation was selected. To keep the excavations proceeding, compressed air was employed to keep the water out of the work area. The men working under a compressed air atmosphere had special procedures to follow to go to the working level and to re-enter the surface. They had to undergo a half hour of decompression to prevent the disease called the "bends" caused by nitrogen in their bodies.

Another unique aspect of the bridge is because of the extremely heavy load it carried accommodating four lanes of traffic, plus the railroad level, the lift span weighs over 4,400,000 lbs. making it the heaviest ever built.

The bridge has three levels of clearance, ranging from 7 feet to 100 feet above the water level. This allowed for both rail and ore boat passage. The intermediate level allowed highway traffic to travel on the railroad level, and barge traffic to flow. The highest level of 100 feet above water level allowed the passage of ore boats.

The bridge has several distinguishing features: The main span is the longest lift bridge span, the weight required by the heavy load makes it the heaviest lift bridge structure and the dual traffic use of rail and street traffic coupled with the multiuse levels, make a very special bridge perhaps to be the only one of its kind.

PORTAGE LAKE LIFT BRIDGE

LOCATION - Over Portage Canal between Houghton and ~~Hancock in Michigan's~~ Keweenaw Peninsula.

HIGHWAYS - US-41 and M-26

RAILROADS - Soo Line Railroad - no longer in service

BRIDGE TYPE - Double deck steel truss and girder with two level lift span

UPPER LEVEL - Approach Spans - Concrete deck on steel plate girders for highway traffic. Tower Spans & Lift Span - Concrete filled grid floor on steel deck truss for highway traffic.

LOWER LEVEL - Approach Spans - Open deck on steel beams and plate girders for train traffic. Tower Spans - Open thru steel truss for rain traffic. Lift Span - Open steel grid floor for highway traffic, and rails for train traffic in steel through truss

COST - $11,040,441.85 **CAPACITY** - 875 vehicles per hour; 2100 per day

OWNER - State of Michigan **CONSTRUCTION ENGINEER** -State of Michigan

DESIGNER - Hazelet & Erdal, Consulting Engineer, Chicago

CONTRACTORS - Approaches & General Structure - Al Johnson Construction Co., Minneapolis.
Structural Steel - American Bridge Division of U.S. Steel

CONTRACT LET - May 23, 1957 - (Str. Steel)

GEN'L CONTRACT - September 25, 1957

GROUND BROKEN - December 18, 1957

OPEN TO TRAFFIC - December 20, 1959

DEDICATED - June 24, 1960

WIDTH OF BRIDGE - 60' c-c/Truss -- 2 rdwys @ 26', 2'median, 2 @ 5' walks - clear channel width 250'.

LENGTH OF BRIDGE - Upper Level 1310'

LENGTH OF LIFT SPAN - 260'

LENGTH OF TOWER SPANS - 120' each
DEPTH OF TRUSS - 31' -3'+ (varies)

ROADWAY VERTICAL HEIGHT - 14' **TOWER HEIGHT** - 188' above Piers

ROADWAY WIDTH - 4 - 13' lanes

-over-

SHORT CHRONOLOGY OF THE BRIDGE SPANNING PORTAGE LAKE

1875 Howard & Fox Contractors sold $47,000 in stock to build a wooden bridge.

1876 The draw was 180'.
Wooden bridge in use.

1888 Bridge closed to teams and passengers due to severe weather conditions. Ice roads used to cross the lake.

1898 Application for permission to build a new steel swing span bridge.

1905 Steel swing bridge open.
April Fools Day center span toppled by ship, NORTHERN WAVE. Replaced a year later with wooden section.

1950 Bridge purchased by Houghton County for $35,000 under threat that the county would build a safer bridge.

1956 Construction began in the fall.

1959 Center span completed.
RANGER III, first commercial vessel to pass under new lift span in September.
Opens for traffic in mid December.
Old bridge span fell on December 30th.

1960 First four car accident, February.
Bridge dedication, June.

SUBSTRUCTURE -

Concrete caissons supporting forward tower legs
Concrete caisson supporting an end of one tower span
(sand island technique used for construction)
Concrete piers and abutments for remaining units
(on steel H piles on Hancock end/br)

DEPTH OF TOWER CAISSONS BELOW WATER SURFACE - 78" +

HEIGHT OF UPPER DECK ABOVE WATER SURFACE - 41' +

POSITIONS OF LIFT SPAN - 3

Lowest - 7' clearance above High Water - Highway traffic top, train bottom

Intermediate - 35' clearance above High Water - Highway traffic on bottom level of lift span, closed to train traffic (allows for small boat traffic)

Highest - 100' clearance above High Water - Closed to highway & train traffic (allows for large lake ships)

WEIGHT OF LIFT SPAN - 4,400,000 lbs.

COUNTER BALANCE - Concrete w/steel billets and adjust. blocks

BALANCING CHAINS - Cast steel - 83.7 tons (balance wt. of lifting cables)

HOISTING SHEAVES - 15' diameter (2 on each tower)

HEIGHT OF HOISTING SHEAVES - CL - 180.7' above high water

DIAMETER OF LIFTING CABLES - 2-3/8" (22 over each sheave)

WEIGHT OF SHEAVE - 4 @ 50.3 tons, each

In order to minimize time for canal closure, lift-span was constructed on 2 barges 1/2 mile away, and floated into place.

Bridge replaced an old narrow truss swing bridge erected about 1895. The old bridge continued to handle both Highway plus pedestrian as well as train traffic during construction of new bridge 135' to the west. It's capacity was 500 vehicles per hour.

Weight of lift span exceeds weight of counterweight, including billets and adjustment blocks, by 4,000 lbs.

Accommodates boat, auto, train & foot traffic.

HOUGHTON-HANCOCK VERTICAL LIFT BRIDGE
CONSTRUCTION, ITEMS OF INTEREST

By: JOHN J. MICHELS
PROJECT ENGINEER

ADMINISTRATIVE

Reason to Build The old bridge was an unreasonable obstruction to navigation because of inadequate horizontal clearance for Lake Shipping.

Cost

United States Government, U.S. Corps of Engineers 36.7%, U.S. Bureau of Public Roads & Michigan Department of Transportation, 63.7%. Railroads, Copper Range and South Shore furnished rail-track and operators.

CONSTRUCTION - SUBSTRUCTURE

Footings for the 2 towers were constructed working through sand islands, constructed of sheet piling & filled with sand. Concrete pier sections were sunk through the sand by excavating material through large precast holes ~~in the~~ in the concrete. As each section sank, new sections were added, till the piers reached bed rock or dense gravel.

A sunken Scow 100'x25' loaded with sandstone was located during dredging & removed.

CONSTRUCTION - SUPERSTRUCTURE

1. Tower Columns are hollow and have a ladder inside to climb to the tops.
2. The 4 Pulleys on top of ~~each~~ tower column, that carry the lifting cables, are 15' in diameter & weigh 65 Tons each.
3. The large Counterweights, on each tower balance the lift span. The West side of each weight is heavier than the East side, because the railroad is offset to the West. The Counterweights can be hung from the towers with steel hangers, for Cable repair.

CONSTRUCTION - SUPERSTRUCTURE - Continued

4. Balancing chains, composed of steel blocks, offset the weight of the lifting cables, as weight of cables shifts from the lift span to the tower, as it opens.

5. The lift span provides 100' vertical clearance for boat traffic.

6. The lift span is classified as an elevator by the Michigan Dept of Labor, and requires a permit.

7. As the lift span is lowered, it stops automatically, 5 feet above pier seats, as a safety precaution. The Operator then powers the span down to seat.

8. The lift span was the heaviest in the world, at that time.

9. Two 150 Horsepower electric motors, one in each tower, raise & lower the span.

10. The cables that you can see that run from top of one tower to the other, do not lift the span, but are electrical cables for powering motors & controls.

11. Christmas of 1959 saw a lighted Christmas tree on top of North, Hancock Side, Tower. The tree was purchased, placed, and lighted by Mich. Dept. Transp. employees. However, Houghton people felt slighted and wanted a tree on their tower. Mr. Charles Sinicoh, Operations chief of the Copper Range Railroad provided a tree from their properties near Atlantic Mine. They also provided lights and State Employees erected the tree on the Houghton tower.

12. The Bridge is a Monument that brings Houghton & Hancock Together

INTERESTING FACTS

HOUGHTON*HANCOCK BRIDGE
CARRYING US-41 & M-26 OVER PORTAGE CANAL

ITEM	QUANTITY
Type of Bridge	Double Deck Vertical Lift
Total Length	1310 feet
Lift Span Length	260 feet
Clear Channel Width	250 feet
Lift Clearance-Lowered	7 feet
Intermediate	35 feet
Fully Raised	100 feet
Lift Span Weight	4,584,000 pounds
Structural Steel Weight	13,600,000 pounds
Roadway Width	4 - 13 foot lanes
Tower Height	188 feet above piers
Caisson Depths - Pier 4	67 feet
Pier 5	78 feet
Pier 6	74 feet
Cement, Total Used	134,212 sacks
Concrete, All Units	23,342 cubic yards
Total Number of Rivets	240,000 - Field Rivets
Total Cost	Approximately $ 11,000,000
Prime Contractors	Al Johnson Construction Company - Substructure American Bridge Division - Superstructure

The Houghton-Hancock Bridge is believed to have the heaviest lift span in the world.

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PORTAGE LAKE LIFT BRIDGE [redacted]

LOCATION - Over Portage Canal between Houghton and ~~Hancock in Michigan's~~ Keweenaw Peninsula.

HIGHWAYS - US-41 and M-26

RAILROADS - Soo Line Railroad - no longer in service

BRIDGE TYPE - Double deck steel truss and girder with two level lift span

UPPER LEVEL - Approach Spans - Concrete deck on steel plate girders for highway traffic. Tower Spans & Lift Span - Concrete filled grid floor on steel deck truss for highway traffic.

LOWER LEVEL - Approach Spans - Open deck on steel beams and plate girders for train traffic. Tower Spans - Open thru steel truss for rain traffic. Lift Span - Open steel grid floor for highway traffic, and rails for train traffic in steel through truss

COST - $11,040,441.85 **CAPACITY** - 875 vehicles per hour; 21000 per day

OWNER - State of Michigan **CONSTRUCTION ENGINEER** -State of Michigan

DESIGNER - Hazelet & Erdal, Consulting Engineer, Chicago

CONTRACTORS - Approaches & General Structure - Al Johnson Construction Co., Minneapolis.
Structural Steel - American Bridge Division of U.S. Steel

CONTRACT LET - May 23, 1957 - (Str. Steel)

GEN'L CONTRACT - September 25, 1957

GROUND BROKEN - December 18, 1957

OPEN TO TRAFFIC - December 20, 1959

DEDICATED - June 24, 1960

WIDTH OF BRIDGE - 60' c-c/Truss -- 2 rdwys @ 26', 2'median, 2 @ 5' walks - clear channel width 250'.

LENGTH OF BRIDGE - Upper Level 1310'

LENGTH OF LIFT SPAN - 260'

LENGTH OF TOWER SPANS - 120' each
DEPTH OF TRUSS - 31' -3'+ (varies)

ROADWAY VERTICAL HEIGHT - 14' **TOWER HEIGHT** - 188' above Piers

ROADWAY WIDTH - 4 - 13' lanes

-over-

SUBSTRUCTURE -

Concrete caissons supporting forward tower legs
Concrete caisson supporting an end of one tower span
(sand island technique used for construction)
Concrete piers and abutments for remaining units
(on steel H piles on Hancock end/br)

DEPTH OF TOWER CAISSONS BELOW WATER SURFACE - 78' +

HEIGHT OF UPPER DECK ABOVE WATER SURFACE - 41' +

POSITIONS OF LIFT SPAN - 3

Lowest - 7' clearance above High Water - Highway traffic top, train bottom

Intermediate - 35' clearance above High Water - Highway traffic on bottom level of lift span, closed to train traffic (allows for small boat traffic)

Highest - 100' clearance above High Water - Closed to highway & train traffic (allows for large lake ships)

WEIGHT OF LIFT SPAN - 4,400,000 lbs.

COUNTER BALANCE - Concrete w/steel billets and adjust. blocks

BALANCING CHAINS - Cast steel - 83.7 tons (balance wt. of lifting cables)

HOISTING SHEAVES - 15' diameter (2 on each tower)

HEIGHT OF HOISTING SHEAVES - CL - 180.7' above high water

DIAMETER OF LIFTING CABLES - 2-3/8" (22 over each sheave)

WEIGHT OF SHEAVE - 4 @ 50.3 tons, each

In order to minimize time for canal closure, lift-span was constructed on 2 barges 1/2 mile away, and floated into place.

Bridge replaced an old narrow truss swing bridge erected about 1895. The old bridge continued to handle both Highway plus pedestrian as well as train traffic during construction of new bridge 135' to the west. It's capacity was 500 vehicles per hour.

Weight of lift span exceeds weight of counterweight, including billets and adjustment blocks, by 4,000 lbs.

Accommodates boat, auto, train & foot traffic.

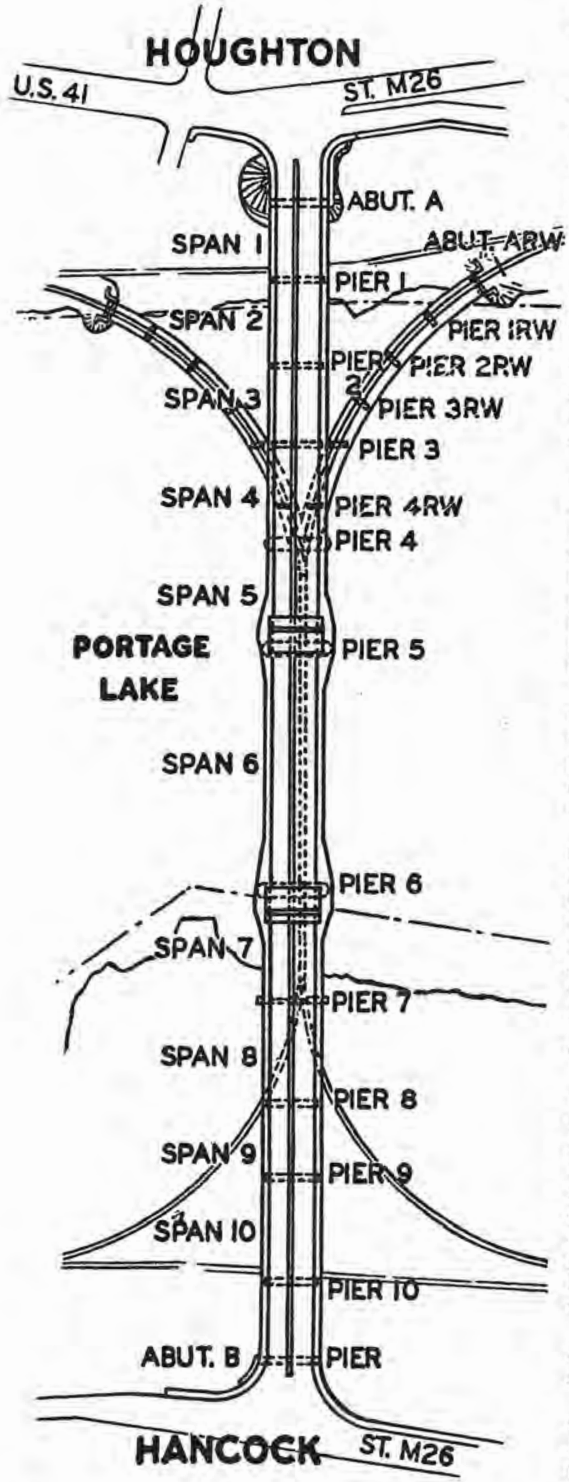


Figure 2. General foundation plan of new structure, showing supporting piers and caissons for combined, highway and railroad portions.

diesel pile hammer. As necessary, pile sections were spliced by welding inside the cofferdam.

In a separate operation which will be done next year, several hundred 80-foot treated timber piles will be driven in clusters to protect the piers from damage by floating vessels.

Construction of the abutments at each end of the structure will be carried out by conventional methods. Abutments are founded on spread footings.

Piers in Water

On the Houghton side of the structure, piers in the water were all constructed by the same basic method. For each, a cofferdam was formed of steel sheet piles driven to rock. Cinders were dumped on the outside of each cofferdam to somewhat restrain water from entering.

The lake bottom was cleaned out inside each cofferdam by chipping away loose rock by the use of an air lift. The air lift was made up of 10-inch pipe sections connected together; two 1¼-inch pipes ran down the outside of the larger pipe. An air manifold was provided at the bottom of the air lift assembly. On Pier 3, where this operation was in progress in September, the air lift was being handled by a Manitowoc 3900 crawler with 120-foot boom working from a Manitowoc 40 x 70-foot sectional barge.

After cleaning the bottom, tremie concrete was placed at the bottom of each cofferdam to form a seal. Water was then pumped out, steel put in, and the concrete poured. Ready-mix concrete was used throughout the job, and was supplied by Gundlach Concrete Co. of Hancock, with delivery to the site in Blaw-Knox transit mixers.

Once begun, construction of these piers was a fairly routine operation. An exception occurred in the construction of pier 3, the eastern end of which is extremely close to the existing railroad bridge. As sheet piles were driven for this structure, trouble was encountered when sheet piles hit a rock fill below the crib foundation of a pier on the old structure. After considerable effort, sheet piles were driven to a satisfactory depth and sealed sufficiently to permit construction to continue.

Caissons

The two piers of the left span and one other in deep water were constructed by the caisson method. These are large caissons. Piers 5 and 6 are essentially the same in plan, being approximately 30 feet wide and 94 feet long in over-all dimensions; ends of each caisson are semicircular in plan (15 ft radius). Caisson 6—first to be completed—has 81 feet of concrete, with top of the caisson being approximately 4 feet above normal water level; it contains some 3600 cubic yards of concrete. Caisson 5 will be about the same depth, planned bottom elevation being some 3 feet lower than that of Caisson 6.

Caisson 4 is somewhat smaller, being approximately 20 by 80 feet in plan, with a planned depth of concrete of some 70 feet.

Johnson's engineers and construction specialists conceived and designed the caissons, including air facilities. Although this was the first caisson work for the company, they had previously conducted compressed air work on tunnel shafts and other heavy construction projects. Air superintendent on the Houghton job was Charles Shorey, who has spent his entire working life in compressed air operations.

Initial step in construction of each caisson was installation of necessary steel sheet pile cofferdams and the creation of a sand island on which construction of the caisson could be carried out. Sand islands were connected to the shore to make possible the passage of construction equipment and materials.

As shown in Figure 3, each caisson was designed with five 9-foot circular shafts or "ports." In sequence, forming of the caissons was done in ten-foot lifts, working on the sand island. Reinforcing steel was placed and concrete poured to complete the lift. Working through the shafts, excavation was carried out by a crane equipped with a clamshell bucket. As material was removed, the caisson settled under its own weight. Removal of material was carefully controlled, so that the caisson settled without tipping. As soon as the caisson had settled ten feet, the process was repeated.

Excavation of the last few feet and preparation of the rock layer on which the caisson finally rested was done under compressed air.

Concreting of each lift of the caisson was done by the use of a Link-Belt Speeder 385 crane with 100-foot boom, handling ready-mixed concrete in a 2-yard Blaw-Knox bucket. 2-inch Vibro-Plus tube vibrators were used to consolidate the concrete.

A smooth working organization and carefully planned sequence of operations generally permitted the completion of one ten-foot lift per week. The sequence was—form Monday and Tuesday, pour Wednesday and Thursday, strip forms Friday, and sink the caisson over the weekend, in one continuous operation.

Compressed Air Work

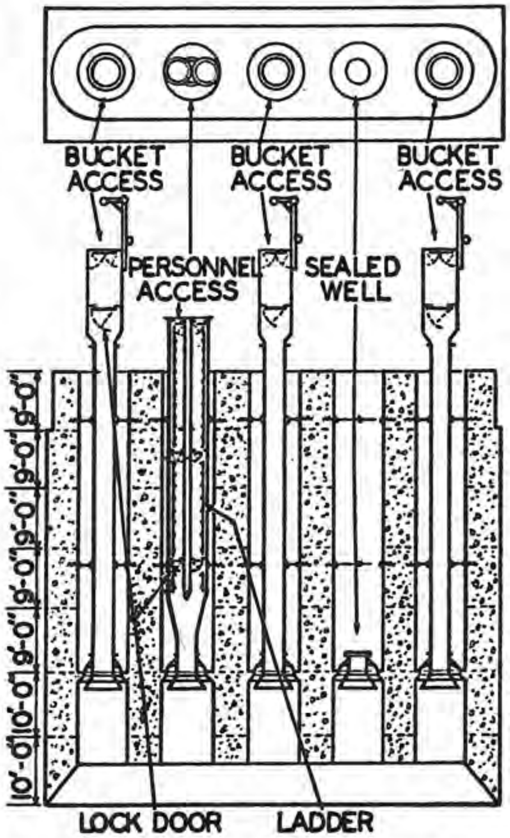
General scheme for conducting final seating operations under compressed air is shown in Figure 3. As shown, one shaft was used for personnel access, three for bucket access for removal of excavated material, and one was completely sealed off. Compressed air work was carried out in full accord with mandatory and established procedures. Compressed air workers spent 2 hours on and 4 off. As is usual, final seating of each caisson was a ticklish operation, but was carried forward successfully. Work on Caisson 4 was made more difficult by the fact that the underlying rock layer at that location slopes rather sharply; blasting was necessary to form a level shelf on which the caisson rested.

Heart of the compressed air work was an air barge on which were mounted two low and one high pressure air compressors. The barge also carried an air receiver, emergency medical compression chamber, and a coffee room, showers, and so on for use by air workers.

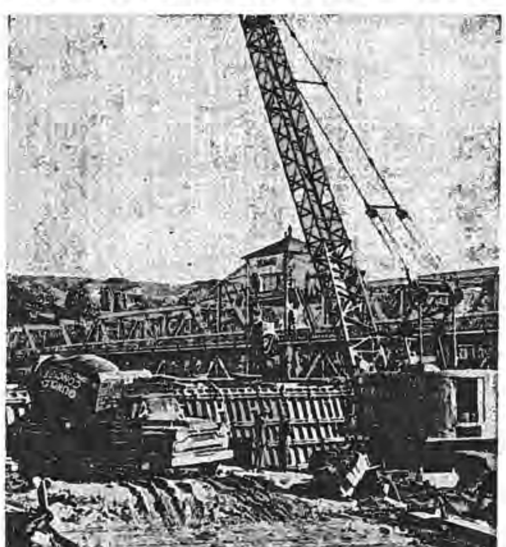
Personnel

C. F. (Chris) Woods is Project Manager for Johnson. For the Michigan State Highway Department, J. B. Oravec is district bridge engineer; L. H. (Tony) Gilroy, project engineer; and T. M. Wiseman is assistant project engineer.

For more pictures of the Houghton bridge, see page 10.



Above, Figure 3. Cross section, typical caisson. Below, general view of forming of one 10-foot lift on caisson. Each of the three caissons was sunk in 10-foot stages, until bottom was close to final elevation.



SHORT CHRONOLOGY OF THE BRIDGE SPANNING PORTAGE LAKE

1875 Howard & Fox Contractors sold $47,000 in stock to build a wooden bridge.

1876 The draw was 180'.
Wooden bridge in use.

1888 Bridge closed to teams and passengers due to severe weather conditions. Ice roads used to cross the lake.

1898 Application for permission to build a new steel swing span bridge.

1905 Steel swing bridge open.
April Fools Day center span toppled by ship, NORTHERN WAVE. Replaced a year later with wooden section.

1950 Bridge purchased by Houghton County for $35,000 under threat that the county would build a safer bridge.

1956 Construction began in the fall.

1959 Center span completed.
RANGER III, first commercial vessel to pass under new lift span in September.
Opens for traffic in mid December.
Old bridge span fell on December 30th.

1960 First four car accident, February.
Bridge dedication, June.

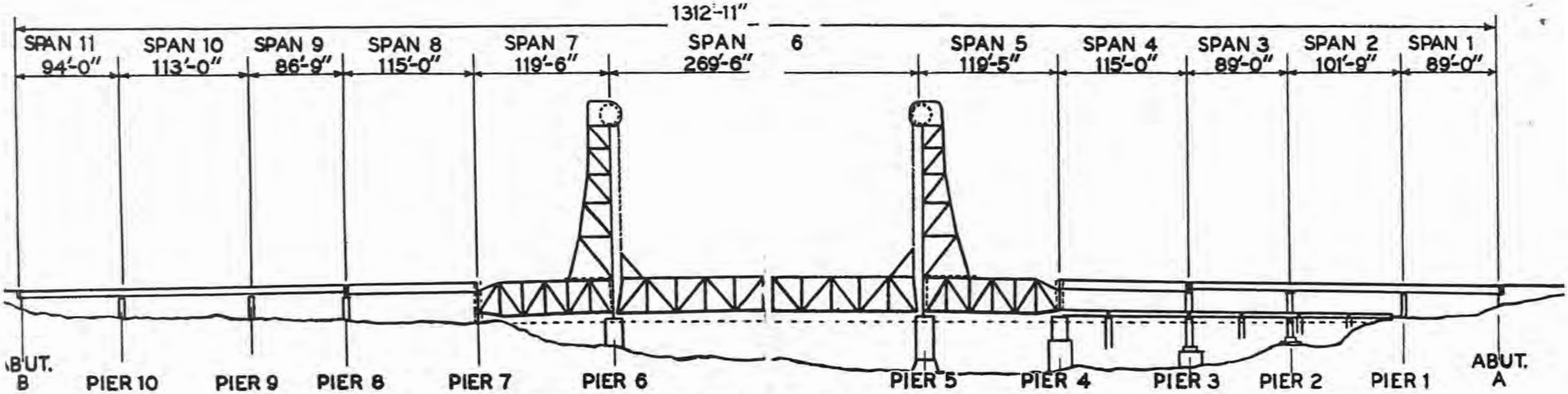


Figure 1. General elevation of double-deck lift bridge being built between Houghton and Hancock, Michigan.

ter piles for piers on Hancock side of the structure. to final bearing with McKiernan-Terry DE-30 diesel pile hammer.

from two railroad lines. However, the lower deck serves a dual function.

When the lift span is in the lowered position, a clearance of 4 to 7 feet is provided between the bottom of the span and the water surface. The upper deck will carry highway traffic and the lower deck rail traffic. Rail traffic is very intermittent in character, consisting of only a few trains per day. Thus, much of the time the bridge can function in an intermediate raised position, which provides an additional clearance of some 30 feet above the water. In the intermediate position, highway traffic will be carried on the railroad deck; rails will be carried on one lane of this deck only and will be buried beneath the level of the concrete deck. When necessary to accommodate large ships, the lift span can be raised to a still higher position, stopping all traffic over the bridge.

Foundation Plan

The complete foundation plan for the dual structure is shown in Figure 2. The highway portion of the structure rests on foundations in a straight line—abutments A and B, and Piers 1 through 10. The railroad tracks of the lower deck are supported on piers 3, 4, 5, 6, and 7 in the center portion of the structure. On the Hancock side, two railroad spurs are founded on existing ground, without separate foundation structures. However, on the Houghton side, each of the two railroad spurs is supported by four additional piers and one additional abutment; on one spur, the foundations involved are piers 4RW, 3RW, 2RW, and 1RW, and abutment ARW. Although they are not labeled on the drawing of Figure 2, similar foundations support the other (eastern) railroad spur.

A key operation during the 1958 construction season was the construction and sinking of caissons for major piers 4, 5, and 6; final stages of the construction of each of these required work under compressed air. At the end of the season, all foundations were essentially complete, except for three piers in locations where there is interference with the existing bridge. These are railroad piers 2RE and 3RE, and highway pier 2.

Johnson's construction operations are marked by careful planning and execution of every step in the process. During 1958, an average of 90 employees were on the job, working a normal 8-hour day, except as required during the actual sinking of each caisson lift; during the sinking operation, work was conducted on an around-the-clock basis. A dozen or so of Johnson's permanent employees made up a hard-core of seasoned and experienced management, with remaining personnel being hired from the local labor pool.

Major construction efforts during the 1958 construction season can be divided into three principal groups—piers on land, including pile driving; piers in water, including placing of tremie concrete; and the construction of caissons for Piers 4, 5, and 6.

Piers on Land

On the north end of the job, piers 7, 8, 9, and 10 were built on land. Each of these piers is supported by steel H-piles and a concrete pile cap. Both vertical and batter piles are incorporated in each foundation, which are of varying design. Piles were of varying length. For example, pier 7 is supported by 66 14-in. BP 73 piles approximately 70 feet long driven to 70-ton bearing capacity. Because of the high water table, construction of each pier foundation was aided by installation of a steel sheet pile cofferdam.

Pile driving was handled by a Lorain Moto-Crane with a 90-foot boom and 80-foot pile leads. After starting each pile with a single-acting hammer, the pile was driven into final position by use of a McKiernan-Terry DE-30

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Cofferdam for one of the railroad structure piers on the Houg of Portage Lake. Tremie concrete seal was placed prior to cor concreting operation.

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HOUGHTON - HANCOCK LIFT BRIDGE

NEWSPAPER ARTICLES - HISTORY

STATE HWY. PROJECT NO. UB1 of 31-10-1

1960

Composed By John Michiels

Cons't Project Engineer

HOUGHTON-HANCOCK LIFT BRIDGE

NEWSPAPER ARTICLES

STATE PROJECT No. UBI of 31-10-1

1960

Compared By: John Michels
Cons't Project Engineer

orIginal Bridge 1800's

...y Mining Gazette

...E NEWSPAPER FOR MORE THAN 95 YEARS
... Trading Area Circulation, Daily or Weekly, in the Copper Country

...ON, MICHIGAN, TUESDAY, MARCH 29, 1955 A. P. Wirephotos SIX CENTS

Goodness does not consist in greatness, but greatness in goodness.
—Athenaeus

Order Is Issued to Build a New Portage Lake Bridge

Malenkov, Ex-Premier Is Missing

Deposed Leader Absent After a Soviet Ceremony

LONDON (AP)—Rising speculation about the whereabouts of deposed Soviet Premier Georgi Malenkov was heightened today by his absence from a farewell ceremony for a visiting Swedish power delegation.

...wedes Monday night ended ... tour of Soviet power stations, made at the invitation of the Soviet government. For unexplained reasons they did not see Malenkov, who was demoted seven weeks ago from the premiership to the post of minister of power stations.

A Moscow radio broadcast describing the departure of the Swedish delegation made no mention of Malenkov. Alexi Pavlenko, described as a deputy power stations minister, saw them off at Moscow Airport. Until Malenkov got the job last Feb. 9, Pavlenko had been the minister.

Malenkov also was missing from the government box at the final session Saturday of the Supreme Soviet of the Russian Soviet Federated Socialist Republic, the Parliament of the largest of the 16 Soviet republics. He had attended the previous sessions, which began Wednesday.

LIQUIDATION SUGGESTED

Some Western officials have speculated that Malenkov, who stepped down as premier Feb. 8 with a confession of failure to do his job, was doomed to eventual liquidation. These officials, seeing him as a loser in the Kremlin struggle for power, believed it only a question of time.

Moscow radio Monday night reported what could be construed as a...ck on the ex-Premier by ... social science teachers. ...ng under the auspices of the Moscow Town Committee of the Communist party, the broadcast said, the teachers "sharply condemned the anti-Marxist reasoning of certain economists who rejected the law of the primary development of heavy industry under socialism."

As premier, Malenkov undertook...

TRUCK WRECKS SMALL TOWN—This was the scene of destruction Monday shortly after a heavy semi-trailer truck, top left, hit three automobiles and smashed the Charlottesville, Ind., post office and three other business establishments. The truck driver, R. E. Scranton of Media, Ohio, was killed. One motorist was injured critically. (AP Wirephoto)

Army Secretary Gives Go-Sign for $5,100,000 Span

Good news arrived in the Keweenaw Peninsula this morning with the receipt of the following telegram to the MINING GAZETTE from John B. Bennett, 12th District Congressman:

"Secretary of the Army Stevens has issued an order providing for the construction of a new highway bridge across the Keweenaw waterway between Houghton and Hancock on the basis that the present bridge is an unreasonable obstruction to navigation.

"The new bridge will remove the present hazard to navigation by providing greater clearance both vertical and horizontal. In addition it will provide four lanes for highway traffic and reduce highway congestion by reducing the need for as many draw span openings.

"The cost of the new bridge, which will be built immediately adjacent to the present structure, is estimated to be $5,100,000. About two-thirds of this estimated cost will be derived from federal and state highway monies and the remaining one-third from federal rivers and harbors funds. Bennett said construction would be under the supervision of the State Highway Department and that the new project would get underway as soon as plans and specifications are completed which it is hoped can be accomplished at the earliest possible moment."

CONGRESSMAN JUBILANT

Congressman Bennett was jubilant at the decision and well realized that Copper Country people would share the same enthusiasm.

The present structure over Portage Lake is a double deck railroad and highway bridge which was constructed in 1895. The draw or swing span provides for two openings, one 118 feet and the other 107 feet. It is 54 feet above low water in a closed position.

Commerce on Portage Lake averages some 600,000 tons annually and the vessel trips average about 400 of the larger type ship. Some 500 smaller craft proceed through the open span each navigation sea...

Legislatures Faced With Proposals Embracing Odd Places and Things

CHICAGO (AP)—Every day someone somewhere vows "there oughta be a law" for or against something close to his heart.

As a result state legislatures are confronted with proposals embracing a strange assortment of persons, places and things. These range from beer cans, bear traps and seagulls to wild horses. For instance:

Nebraska has pending a bill providing a 1-cent bounty on empty beer cans returned to the county clerk. Its sponsors say it would help keep empty cans off the roads.

Residents of Maine planning to set out bear traps may have to surround them with two strands of barbed wire bearing signs...

Byrd Plans Fifth Antarctic Trek Late This Year

WASHINGTON (AP)—Rear Adm. Richard E. Byrd will make his fifth visit to the antarctic later this year as head of a U.S. scientific expedition.

The expedition, announced late Monday by the White House, will set out in November and continue...

Officers Given Gruesome Tale Of Four Murders

MCMINNVILLE, Tenn. (AP)—Billy Gibbs, 23-year-old father of newborn twins, gave officers gruesome details Monday of killing a farm family of four, hiding their bodies and selling their livestock.

Dist. Atty. Fred Gilliam said Gibbs signed a statement in the...

-PORTAGE LAKE LIFT BRIDGE (PRE-1959)

BRIDGES

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Obstacles seen for new bridge over Portage Lake

HANCOCK (Nov. 25, 1947) — Recently the Hancock city council, the Lions clubs of the district, including the South Range Lions club, and other municipal and civic groups, have passed resolutions regarding the construction of a new bridge between Hancock and Houghton, which have been referred to Charles M. Ziegler, state highway commissioner.

A copy of the highway commissioner's reply to the South Range Lions club has been forwarded to the Hancock city clerk and is given as follows:

Lansing, Mich.
November 20, 1947

J. H. Dunstan, President
G. Miller, Secretary
Range Lions Club
South Range, Michigan

Gentlemen:

This will acknowledge your signed copy of the resolution passed by your Club on September 18, 1947, calling attention to the importance of the construction of a new bridge between Houghton and Hancock.

This Department fully realizes the importance of a bridge at this loction, connecting the Keweenaw Peninsula, and between Houghton and Hancock. We also realize the age and condition of the present structure, and the necessity of giving serious consideration to the construction of a new bridge within the next few years.

This Department also realizes the importance of the completion of the gap in US-41, between L'Anse and Nestoria. I believe there was a consensus of opinion of those in the area who were consulted, that the construction in the gap in US-41 should proceed first, unless there were sufficient finances to carry the construction of this gap, as well as the bridge through at the same time. In other words, I believe for that reason, the construction of the bridge could wait better than the gap in US-41.

Due to the fact that our costs of highway work have doubled since just prior to the war, we do not have sufficient finances to carry both projects on at the same time. Due to present high costs, and just roughly estimating the cost of a new bridge witout having completed plans to take off accurate quantities, I would say that this structure would cost between a million and a half and two million dollars.

We also realize the importance to the peninsula of maintaining the present railroad connections. I also question the ability of these railroad is to finance their share of the structure, where the new bridge is to be a combined highway and railroad bridge, or to construct a new bridge for themselves, entirely with their own finances.

I believe that, were a new highway bridge only is to be constructed at a different location, the War Department would probably condemn the present structure and ask for its immediate removal. This department's finances are by law, allocated to highway construction and maintenance only. Whether we could construct a highway and railroad bridge without the railroads reimbursing us for their share of the cost, is a legal question that has not yet been answered. This raises a big question as to whether or not a major repair job should be done on the present structure to carry it along for several years, to see what would develop with regard to the railroads situation.

The above are some of the problems, which we are attempting to decide, and with regard to which the answers must be secured before I could say when a start could be made on the plans and specifications for this structure.

I appreciate very much the interest your Club is taking in this important area matter. I can also assure you that this department is very seriously interested in this problem, realizing the importance of a new bridge from all angles of the picture, and have it in mind for immediate action just as soon as finances will permit.

Very sincerely yours,
Charles M. Ziegler

DMG 11/30/89

THE WEEK THAT WAS
NOV. 24-29, 1947

A quest to span the Portage (

Bridges - Portage Lift

...J COTE
F... .e Editor

The Portage Lake Lift Bridge—it stands as a "monument" which signifies the surrounding Houghton/Hancock area. Most of you have used it at one time or another, but have you ever wondered about the basis of its existence? Actually, it has a very interesting and somewhat eventful past.

The need to span the Portage Canal began in the 1870s. At that time, the only means of reaching Hancock was by ferry which was quite slow and limited to small numbers in each trip. Eventually, the number of people requiring transportation across the canal was far beyond the capabilities of the ferry system. In answer to the needs of a readily expanding community, Howard and Fox Corporation began to sell stock in an effort to finance a wooden bridge. By 1875, $47,000 had been raised and construction of the bridge began. Within a year, the bridge, which had a draw of 180 feet and rotated manually to allow ships to pass, was completed and open for use. To regain the capital investment of building the bridge, a toll was levied for all crossings: five cents for each foot passenger, 20 c... for horses, and 30 cents for b... and carriages. In 1888 the we... conditions were so severe that the bridge was closed to all traffic and alternate "ice roads" were formed on the snow covered Portage Lake.

By 1898, the severe weather had begun to take its toll on the wooden bridge. Decaying timbers and fear of collapse led the Mineral Range Railroad Company to apply for permission to build a new steel swing span bridge.

Despite its rugged steel construction, the new bridge still had one problem—the weather. During summer days when the weather reached "scorching" extremes, the open swing span would expand and it was sometimes necessary for the fire department to come and hose it down so that it would shrink and could be returned to its normal position. During cold weather, there was always a problem with ice forming in the gears and turning mechanism of the span. Solving the problem required chipping away the ice until the gears were once again free.

The most notable event of the steel swing bridge occurred when the steamer "Northern Wave" slammed into its swing span on April 15, 1905. The collision toppled the mid-section of the bridge and once again left a vast gap between the cities of Houghton and Hancock. The bridge operator claimed that he heard 3 blasts of the ship's whistle, which meant it would dock, but the captain insisted he had signaled with four whistles. By the time both realized what was happening, it was too late and the bow of "Northern Wave" lay hopelessly twisted within the wreckage of the Portage Lake swing bridge. A wooden mid-section was constructed as a temporary solution to the problem.

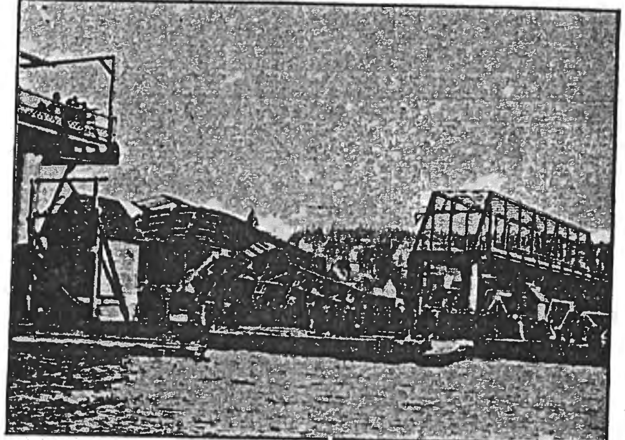


Photo courtesy of MTU Archives

In April of the following year, the span length was improved to 290 feet with the addition of a new steel swing span.

Several decades passed and once again the community needs began to expand beyond the capabilities of the current bridge. Because the center span rotated to allow ships to pass, local traffic was many times halted for up to 30 minutes. In 1950 the bridge was purchased by Houghton County for $35,000 and plans began for a more modern, and versatile bridge to replace the current outdated and inadequate one.

It was decided that a "lift bridge design" would best serve the needs of the people in the Houghton-Hancock area. Because the mid-section would have two levels, the only time traffic would be completely halted was when a very tall ship had to pass through. Otherwise, traffic could travel on the lower level and allow most ships to pass through without incidence. The plans became reality on December 18, 1957, when the official groundbreaking ceremony took place.

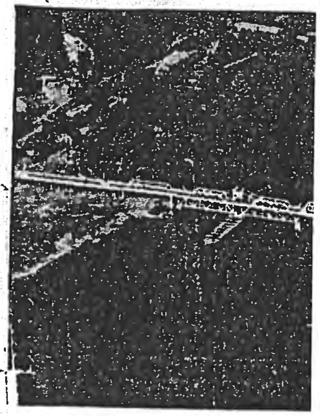
Construction of the new bridge generated a considerable amount of excitement in the Houghton-Hancock area, as it should have. Upon completion, the bridge would stand over 188 feet high, be 1,310 feet long, accomodate 4 13-foot driving lanes, and contain 7,000 tons of steel and 35,000 tons of concrete. At a whopping $11 million, it cost more per foot than the Mackinac Bridge.

They say that history tends to repeat itself and the new bridge almost had to close before it ever officially opened. At 2:30 a.m. on June 24, 1960, the freighter "J.F. Schoellkopf, Jr." was west-bound on the Portage Canal when captain Albert Wilhelmy sounded the typical whistle signal to have the bridge raised. To his surprise, there was no response as the bridge remained stationary. He sounded repeated blasts of the whistle with still no response. At the last moment, the captain gave the order to drop anchor and reverse the engines; that action alone kept the enormous 525 foot steel ship from colliding with the lift bridge. Responding to the ship's repeated signals, police rushed to the scene where bridge operator Eugene P. Sullivan said he didn't hear the ship's whistle.

Even though the ship had avoided a collision with the bridge, it was the cause of considerable damage. When the anchor was dropped, it caught two telephone cables, immediately cutting off service to over 1000 Keweenaw area customers.

The Portage Bay lift bridge opened for traffic in mid-December of 1959 and was officially dedicated in June of 1960. The completion of the new bridg... marked the end of over fiv... decades of service for the ol... swing bridge. Within a year, it wa... dismantled and hauled away.

Next time you happen to pa... by the lift bridge, take a little tin... and think of the long transacti... that took place in lieu of its e...istence. Its past was marked by... few interesting events and prevails as a proud reminder o... long standing determination ... improvement in the Hought... Hancock area.



(Above)—An aerial view of the ste... Houghton and Hancock for more t... wreckage lies strewn about after ... slammed into the bridge's swin...

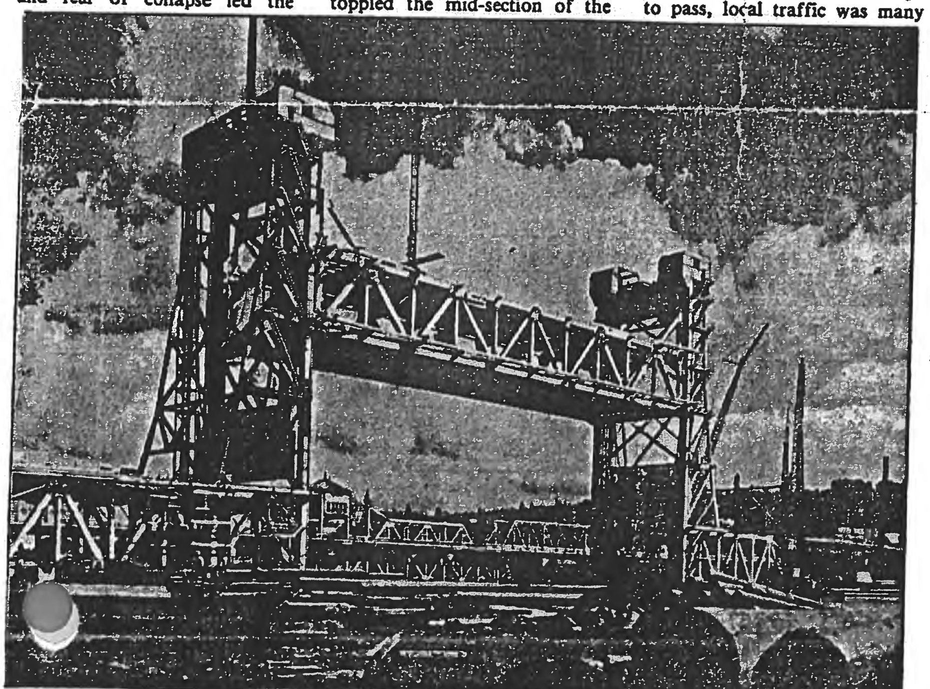


Photo courtesy of MTU Archives

An interesting view of the new versus the old. In the background rests the old swing bridge which was used until the opening of the new lift bridge in 1959. The swing bridge was later dismantled and sold as scrap.

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Yesteryears - Silver editi

April 7, 1905 Bridges - Portage Lake

DRAWBRIDGE GOES DOWN TO PORTAGE WATERS

DMG

The big draw span of the county bridge, connecting Houghton and Hancock, lies on Portage lake a shapeless mass of twisted steel and broken timber as the result of a collision yesterday afternoon with the huge steel steamer "Northern Wave" of the Mutual Transit company.

The collision occurred about 4:30 o'clock and was witnessed by scores of pedestrians on the bridge, who stood helpless and horror stricken at their inability to avert the accident.

Captain Carringway of the Northern Wave, attributes the blame for the accident to Daniel Hardiman, engineer of the bridge, who, he says, failed to heed his signal of four blasts for the draw. Mr. Hardiman, however, claims that the steamer only gave three blasts, the signal for the dock. This statement of the number of blasts from the steamer's whistle is corroborated by several witnesses.

Mr. Hardiman declares that when he saw the steamer approaching the bridge in spite of the signal for the dock he attempted to open the draw but the catches which hold the bridge in position refused to respond promptly to the wheel which operates them. Ralph De Mary, a representative of The Mining Gazette, was present at the time, and Mr. Hardiman called him in to help turn the wheel, but despite the combined efforts of the two the catches refused to yield.

A rigid investigation will be made by the authorities.

Miraculous Escapes.

It is miraculous that not more than two persons were injured. The bridge is usually crowded with pedestrians between the hours of 3 and 6 o'clock. There were several pedestrians on the bridge at the time but all saw the danger from the approaching steamer and hastily escaped to points of safety where they watched the destructive course of the boat with fascinated eyes.

Besides the engineer of the Bridge, Daniel Hardiman, there were only two pedestrains, Robert Shields and Ralph DeMary, on the draw at the time of the accident. Mr. Hardiman and Mr. DeMary received several bodily injuries by being thrown against the steel frame of the bridge by the force of the collision.

Mr. Hardiman received the greater injuries though his physicians state that no permanent ill effects will result. Mr. Shields miraculously escaped uninjured.

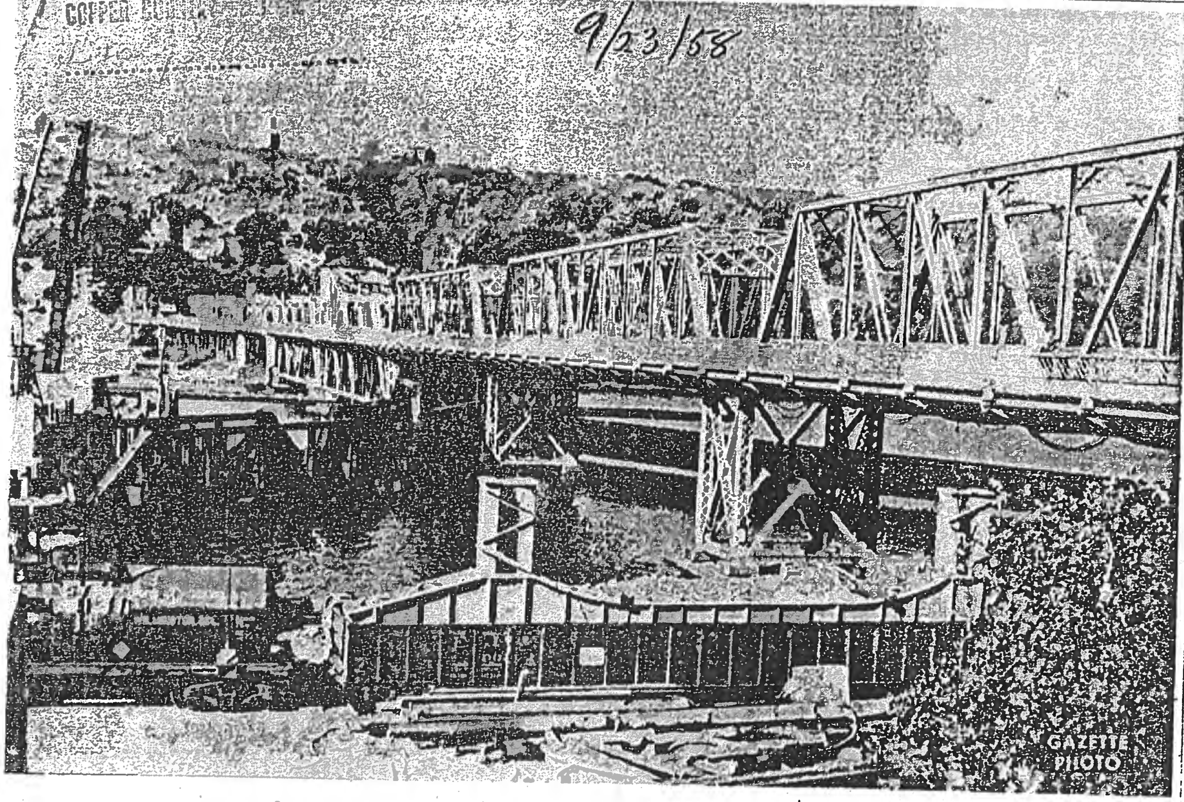
Repairs To Start At Once.

As a result of the accident the bridge will be out of commission for some time. Repairs, however, will be started at once and it is intended to rush the work as rapidly as possible.

Probably the greatest sufferers as the result of the collision will be the Mineral Range and Copper Range railroads and the Houghton County Street Railway company. Traffic over the bridge must necessarily be suspended until the repairs are completed.

4

9/23/58



THIS LONG GIRDER is the first to arrive for the superstructure of the new Portage Lake bridge. It will be placed on one of the piers on Hancock side. Because of its heighth above the car it could not be transported across to Hancock so will be unloaded in Houghton It will be placed on the pier heads by American Bridge Co. workmen expected in the Portage Lake district in February.

Construction of new Portage Lake bridge will start in fall

The State Highway Department expects to start the construction of a new U.S. Highway 41 bridge crossing the Portage ship canal between Houghton and Hancock in Houghton County by fall of this year, Highway Commissioner Charles M. Ziegler announced.

Detailed plans for the new bridge, which will have a vertical lift for the center span, are well advanced. The first construction work to be let will be the substructure. Bids for this work probably will be taken by Oct. 1. Bids for the superstructure steel probably will be let in advance of this date, while those for the superstructure and electrical equipment to operate the span will follow the substructure bids.

Commissioner Ziegler said he expects the structure will be completed in 1958. The new bridge will be built adjacent to and on the west side of the present bridge, which will continue to carry traffic until the new bridge is ready for service. The old bridge will then be dismantled.

The new span will be unusual in several respects. It will be the first vertical lift bridge on the state trunkline system and will carry railroad, highway and pedestrian traffic all at one time. It will have two levels, the lower for trains of the D.S.S. & A. (South Shore) and Copper Range railroads, and the upper for vehicular and pedestrian traffic.

The most unique feature of the new bridge will be the arrangement whereby small craft will be able to pass under the bridge without halting vehicular traffic. When trains are not using the lower railroad track level of the center span, it will be raised up to the level of vehicular traffic, which will then travel on the train deck. This will enable small boats to pass under the bridge without halting vehicle traffic.

When trains wish to cross the canal the center span will be lowered so that the train tracks will fall in line with the tracks on the other sections of the bridge. At the same time the upper level, built with roadways to carry cars and trucks, will come down to the vehicular traffic level of the other spans, and vehicular traffic may still flow with only a very slight interruption.

The only time vehicular and train traffic will be held up is when it is necessary to lift the center span up to its full limit to permit large lake freighters to pass through the bridge. At that point, the bottom of the center span will be approximately 100 feet above the water level, sufficient to clear spars of large Great Lakes vessels. When the train level is down to permit trains to cross the bridge there will be a clearance of six feet above the mean water elevation. When the bridge is at the intermediate position, with the train level carrying vehicles, there will be a clearance of 31.7 feet above mean water elevation in the center span. The center span opening for vessels will be 250 feet, compared to the two 100-foot openings provided by the present bridge. The center span can be raised or lowered in about 90 seconds.

The overall length of the new bridge will be 1,310 feet long, consisting of the 253½ foot center lift span, two lower spans each 120 feet long and flanking the center, lift span, and eight deck girder spans, totaling 800 feet in length, four of them on each end of the bridge. Also included will be short spans on the Houghton end of the bridge to carry the railroad tracks from the bridge to two connections with shore tracks.

The bridge will carry one set of railroad tracks on the bottom level and two 26-foot roadways on the upper level for vehicular traffic. The roadways will be separated by a median strip, with sidewalks ranging from six to nine feet in width on both sides of the bridge.

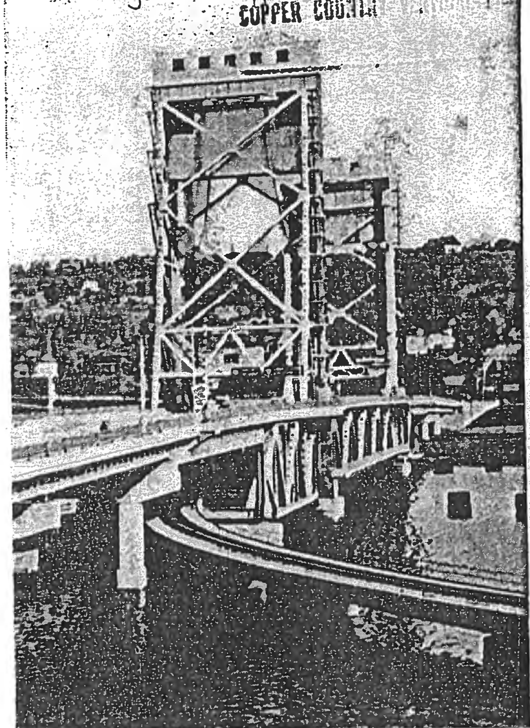
The present bridge between Houghton and Hancock is entirely inadequate for present traffic on U.S. Highway 41 across Portage Lake. The center span is a swing type which operates very slowly and has occasional mechanical difficulties, causing heavy traffic jams in both cities and long waits for cars and trucks waiting to cross the bridge. Maintenance of the bridge has been quite costly. Inadequacy of the present structure has resulted in the Corps of Engineers, U.S. War Department, ordering the Highway Department to replace the present span.

THE WEEK THAT WAS AUG 4/1986

DMG 8/7/86

Bridges - Portage Lake

COPPER COUNTRY



TOURISTS are fascinated by this two-level vertical lift bridge between Houghton and Hancock. The $12 million bridge ingeniously accommodates railroad and auto traffic on a single span across the ship canal.

Portage Bridge Included in New Public Works Bill

WASHINGTON (AP) — A House appropriations subcommittee Thursday approved a revised public works appropriation bill, eliminating from it projects to which President Eisenhower objected last week in vetoing the measure.

The House Wednesday failed by one vote to orverride the veto.

The bill now goes to the full committee and then to the House, either of which may alter the measure.

Michigan projects now in the revised bill, include:

Army Engineer projects: Construction—Battle Creek $1,548,000; Great Lakes connecting channels $27,000,000; Harrisville Harbor $532,000; Houghton - Hancock bridge $2,640,000; St. Mary's River, south channel $2,543,000. Planning — Hammond Bay harbor $20,000; Saginaw River $100,000; St. Mary's River, new Poe lock $367,000.

9/4/59

11/17/59

Bridge Freezes; Schools Close Due To Fall Blizzard

The fall's most severe snow storm in the Copper Country has resulted in conditions similar to those which strike the district in mid-January rather than mid-november.

The mercury sank to a low of three degrees during the night. The low temperature, coupled with Sunday's melting, froze the Portage Lake drawbridge so that it was unable to open. This condition persisted through the night and this morning. Thus, any steamer contemplating passing through the channel would have to harbor itself or turn about.

The Wayne Hancock, recently converted to a package freighter, was in security at Lily Pond awaiting fair sailing weather. Another unidentified craft, was anchored in the Entry channel but turned about when it either found bad weather abating or was informed of the bridge predicament.

All equipment of both the Keweenaw and Houghton road commissions was called out early this morning to combat the heavy snow which tallied out at 40 inches slightly before noon, according to personnel at Memorial Airport's FAA Station. This is, by far, the greatest amount of snow to fall in the district so early in the year.

Almost all schools in the county were closed this morning as heavy snow, poor visibility and dropping temperatures combined to make traveling hazardous.

Baraga, Ontonagon, Keweenaw and Houghton County schools will probably remain closed Wednesday if the storm continues.

Most of the school officials suspended bus transit before their drivers had a chance to get the vehicles out on the roads.

It has been estimated that California's 1957 traffic accident bill amounted to $461,375,000.

First friction matches in America were made in Springfield, Mass., in 1834.

OLD BRIDGE

...turday, November 28, 1959

...idge Railing ...ight Standard ...r the State

...per Country people who sur- ...the new Portage bridge's ...g is too abbreviated in height ...be interested in knowing that ...standard for the state.

...inner railing is defined as a ...h guard or rail, designed to ...pedestrians from getting ...ted in wet weather from the ...ng automobiles.

...for the outside railing, it has ...indicated that its height is ...y protective and is of similar ...t used on all modern bridges

...two beacons on the top of ...tower are lighted. They were ...led last week and will be turn- ...during the night and during ...ay when visibility is reduced.

...snow on the center lift span ...removed Friday to permit a ...balancing of the big struc- ...Any additional weight inter- ...with the balancing of the lift ...against the counterweights.

...last slab of concrete on the ...ock side was poured Friday ...paving the way for the com- ...n of the north side roadway. ...only concrete work now re- ...ing to be completed is a side- ...stretch on the north side.

...notorized snow plow, the pro- ...of the Houghton County Road ...nission, will keep the walks ...during the winter. Where, only one walk was kept clear on the old bridge, this year both walks will be cleared.

The machine was purchased especially for the new bridge. The commission has the responsibility of keeping pedestrian areas clear of snow.

Officials break ground for bridge construction

HOUGHTON (Thursday, Dec. 19, 1957) — With all the solemnity due an event that occurs once in a lifetime, the mayor of Hancock, Leonard Lahti, and the president of Houghton, Carlos Wenberg, shook hands as John C. Mackie, state highway commissioner, turned the first shovel of earth for the construction of the new $10 million Houghton County Bridge.

"This is a historical occasion," said Lahti.

"The new bridge will be a living monument to the efforts of all of us to bring our highway system not only up to date but fully capable of handling traffic for years to come," said Wenberg.

"I break this ground, ladies and gentlemen," began Commissioner Mackie, "to start work on our new bridge project which will benefit us all. It is an occasion long overdue, and when the structure is completed, the scenic wonders of the Copper Country will stand out with still greater relief against a backdrop of skyblue waters and azure skies."

The Al Johnson Construction Co. will build the foundations of the structure, and its approaches, and will paint the steel after it is completed. The steel work will be done by the American Bridge Co. Construction and is scheduled to be completed in three years.

About $1 million worth of equipment has been brought in by the Johnson company. There is a 30-ton motor crane, a 2½-yard Manitowac, a 2-yard link belt and a 1½-yard Koehring. The company also has brought in two big barges, a 50-ton lo-boy, two 2-ton semi-trailers, and six large compressors of capacities ranging from 315 to 1,100 cu. ft.

The company has eight large projects in operation throughout the United States. This is only one of them.

Company supervisory personnel are O.A. Johnson, vice president and general superintendent; C.F. Woods, chief project engineer; Mo Dumas, office engineer; Grant Fallon, office manager; H.W. Wenum, carpenter superintendent; Harry Erickson, carpenter shop foreman; Andrew Anderson, carpenter and pile foreman; Ronald Arbogast, Mechanical Superintendent; Don Bremberg, steel superintendent.

Besides the supervisory personnel, there are about 25 workmen now employed, and when it is operating at full capacity, the firm will have 125 men, most of whom will be hired from the local labor force.

It is pointed out however, that during the winter the company will operate with only a skeleton crew and there will be a minimum of work performed.

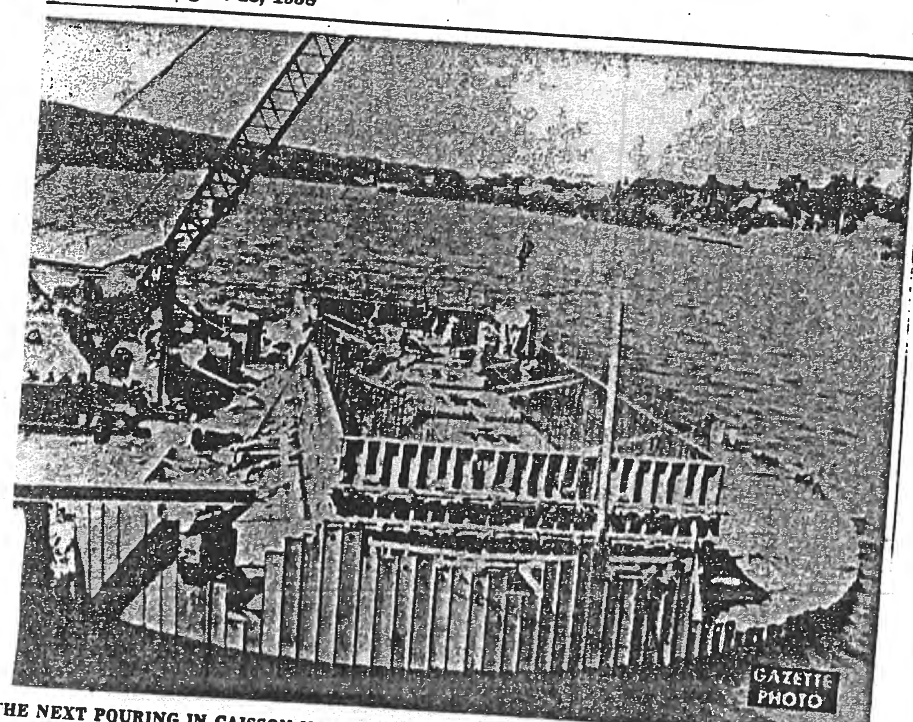
Herman Gundlach Inc. will furnish all the ready-made concrete for the foundation and approaches. Gundlach is building a large plant in Ripley that will employ more than 25 men and will continue to operate after the bridge has been completed.

The Al Johnson Construction Co. is one of national repute. It has projects going on the St. Lawrence Seaway in the building of the Iroquois dam and locks, the dredging of the Detroit harbor to Canada and five other immense projects throughout the nation.

At the conclusion of the ground breaking ceremony, Houghton President Carlos Wenberg sighed, "At last we are on our way."

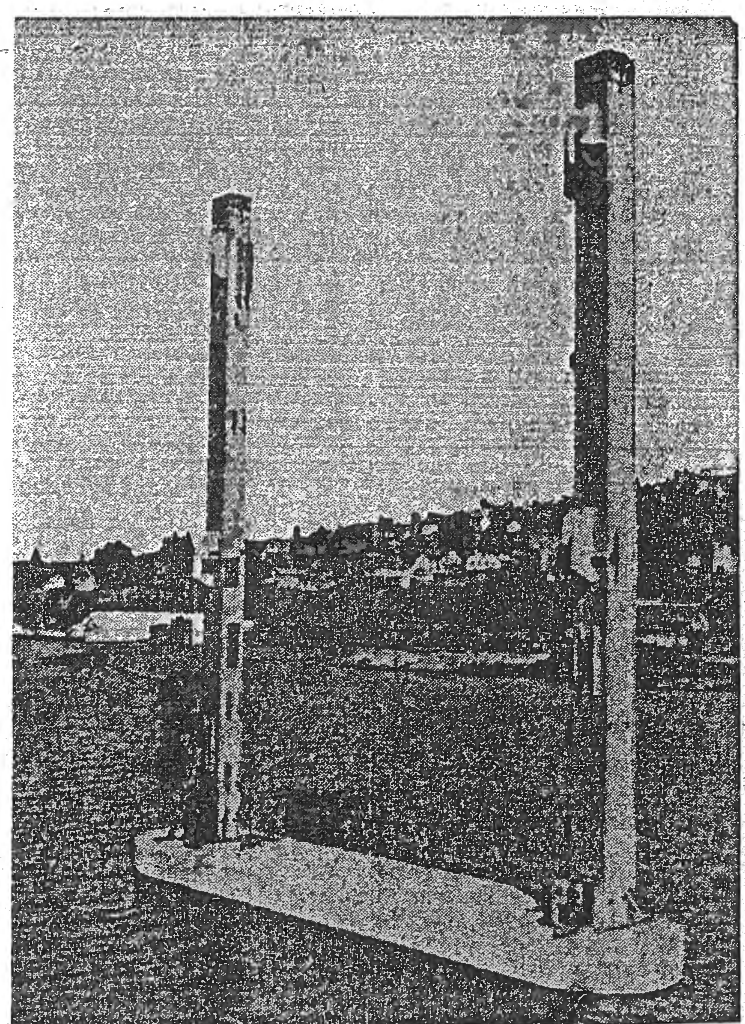
DMG 12/17/92
THE WEEK THAT WAS

Monday, August 18, 1958



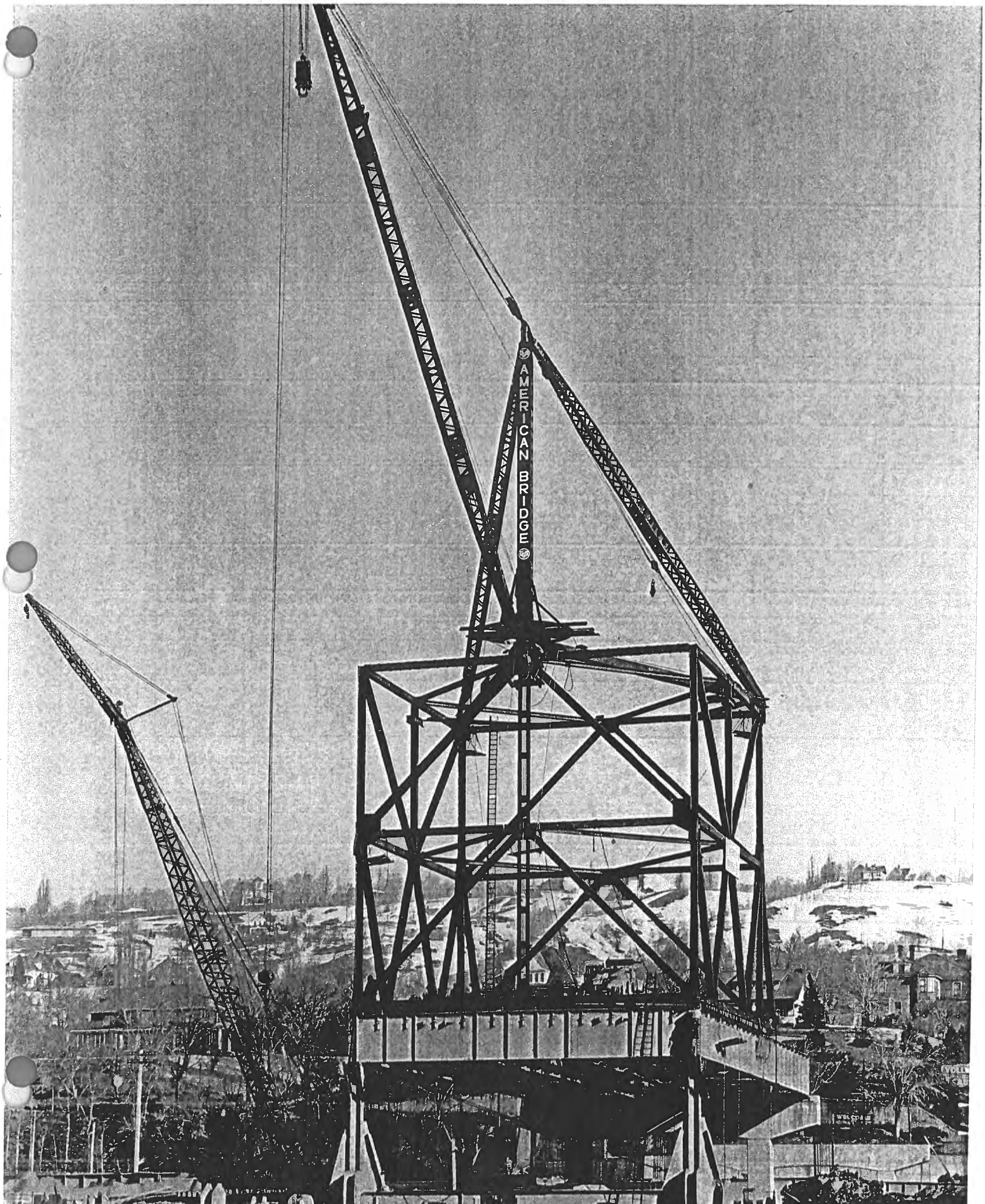
THE NEXT POURING IN CAISSON No. 6 will take place Wednesday. The weekend has seen extensive pouring of cement. After the Wednesday pouring the caisson will be sunk... 75 feet before being in a position to permit of the compressed air workers or sand hogs to complete the bottom work...

MDOT Crew ↑John Michels



(Mining Gazette Photo)

TWO BASIC COLUMNS of the south bridge tower. When all the structural steel is attached these two will resemble the network of the north side arrangement already in place. The horizontal bridge span which was floated in Saturday will be attached to these. The lift bridge assembly will rest between these and the two similar columns on Hancock side.


AMERICAN BRIDGE

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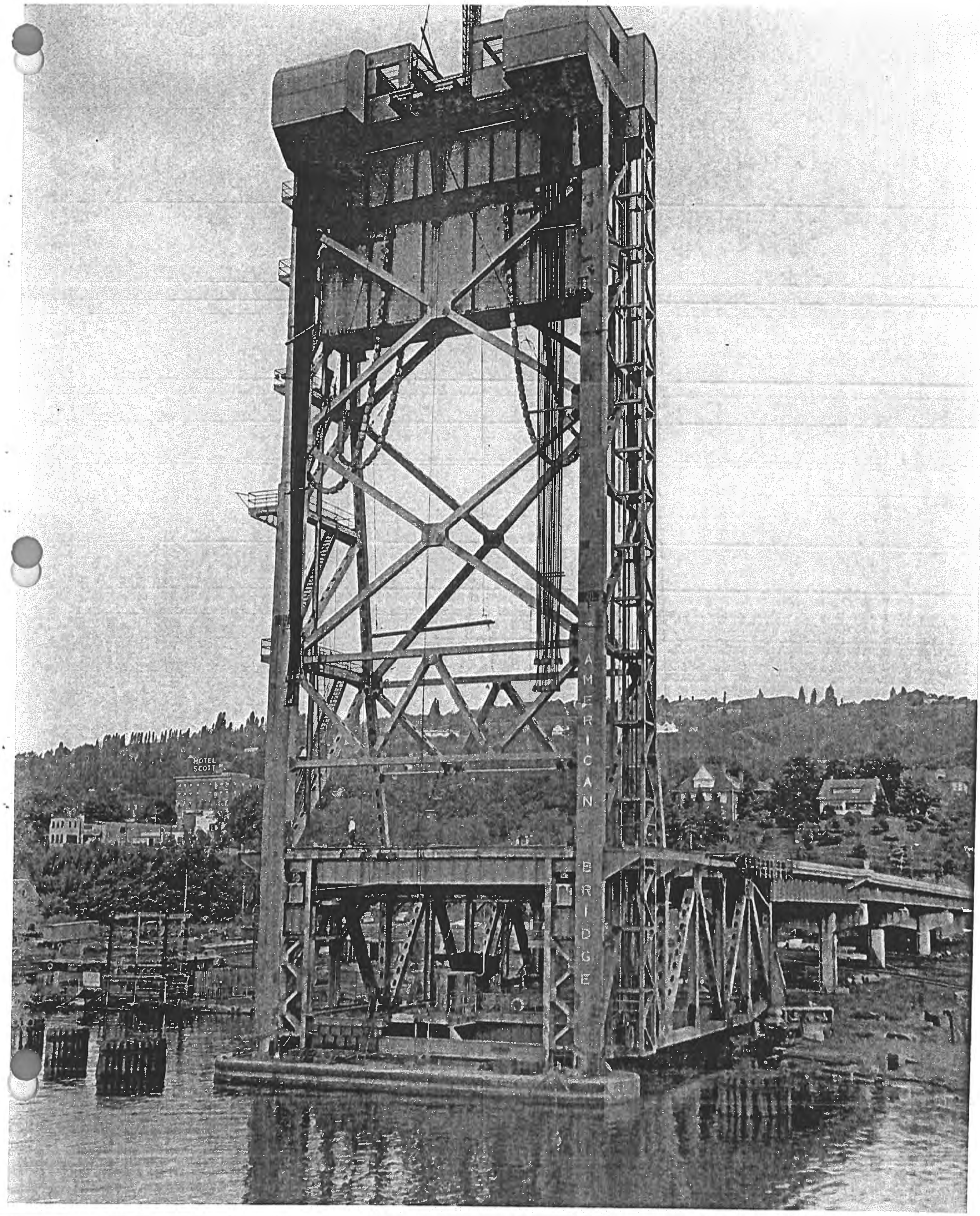
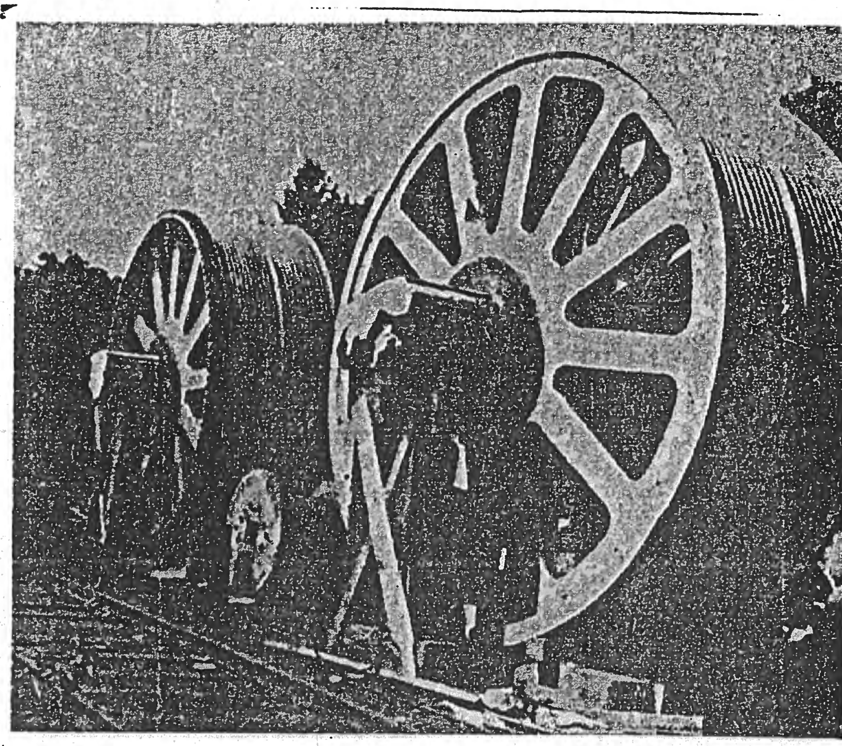




THESE TWO SHEAVES will be mounted atop the south tower of the new Portage lift bridge. Each is 15 feet high and will carry portions of the lift cable. The other ends will be attached to the counterweights. These will be the wheels which raise and lower the rail and vehicular decks of the center bridge span. (Mining Gazette Photo)

Big 'Wheels' Will Lift, Lower Center Bridge Span

The Daily Mining Gazette
Green Sheet
Houghton, Michigan, Saturday, August 22, 1959

Two sheaves (large wheels) were on the old Mineral Range plot west of the Hancock Naval Reserve Armory during the week. They are intended for the south tower of the bridge and will match the two now in place on the north tower. When in position the lifting cables will be attached to them at one end and to the counterweights on the other end.

The span to be moved by the cables or ropes will weigh 2,200 tons. Counterweights on each side of the structure will equally balance, since these weights will be 1,100 tons each.

The sheaves are 15 feet in diameter and weigh 65 tons apiece.

Eighty-four cables will lift the span. Because the west side will be the heavier portion of the 260-foot lift, 22 cables will be attached to each end of it and only 20 to each end of the center span's east side.

All this is due to the fact that the rails of the under deck will be off center to the west.

No specific time has been set for the movement of the span. It is virtually complete and is expected to be swung into position before Sept. 1.

Pavement work on the north side of the structure was almost complete when this story was written. Only a portion of the sidewalks, one on each side, and a middle lane are yet to be paved.

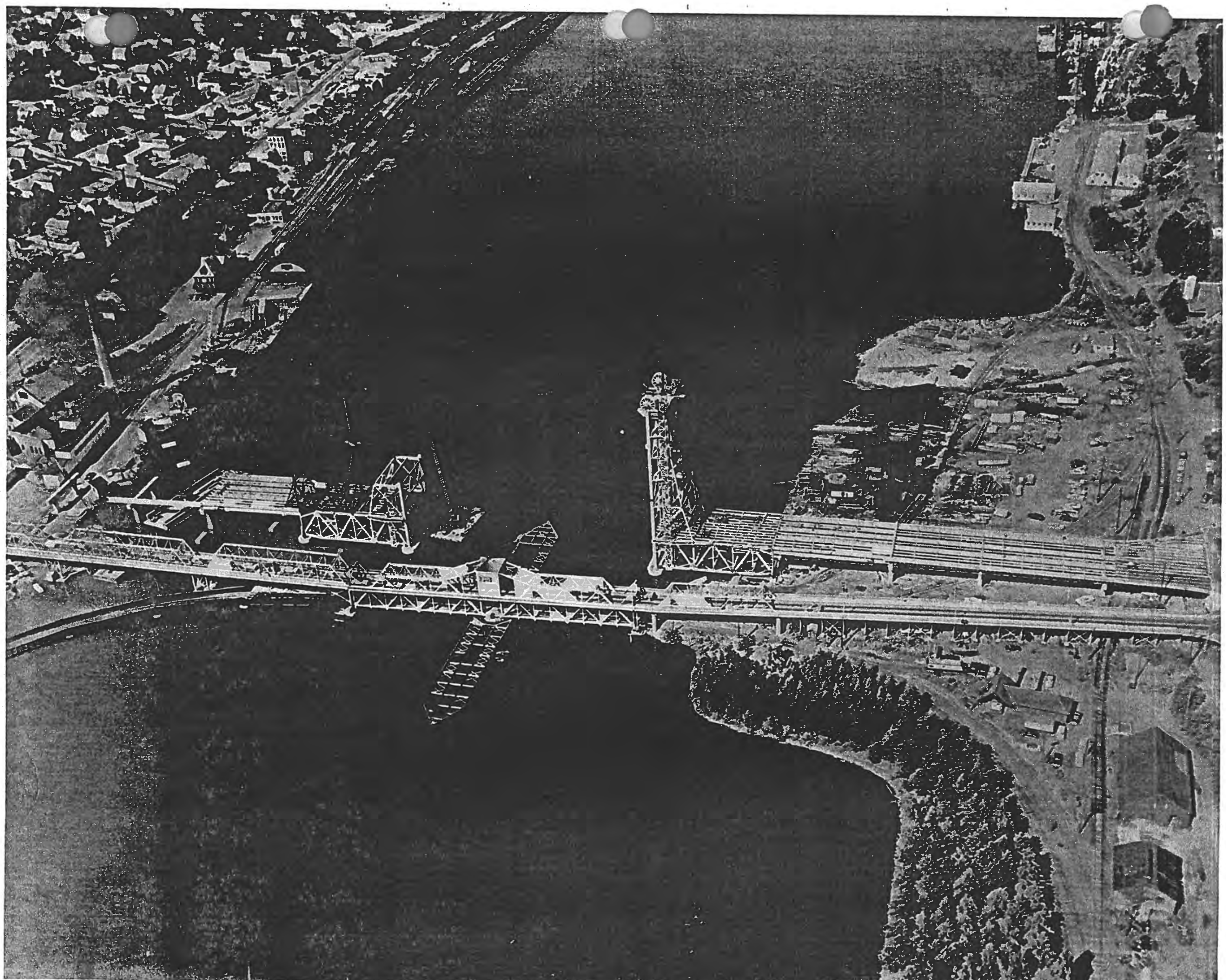
Placing of pavement on the south side was to begin immediately after the major portion of the north side was complete.

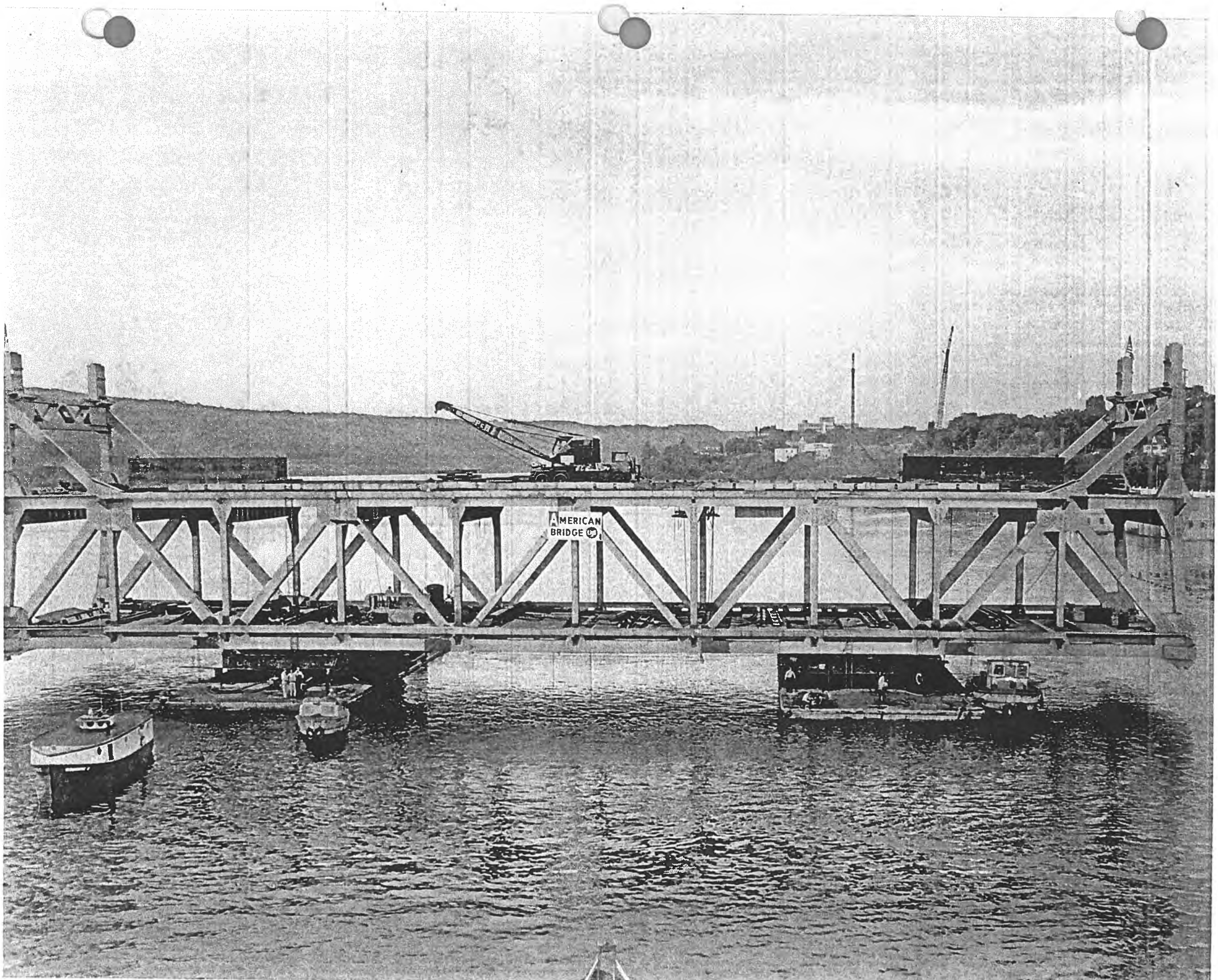
The American Bridge Co. is in charge of surfacing all lift span work while the Al Johnson Construction Co. is responsible for the north and south side surfacing.

Both companies are still working toward use of the structure before the end of October. The Johnson officials believe the old bridge will be removed from its location before Jan. 1. That company will salvage the steel.

BIG CHECK

A United States government check for $7.5 billion issued in 1948 to balance the books of the treasury is believed to have been the largest single check ever issued in this country.




AMERICAN
BRIDGE

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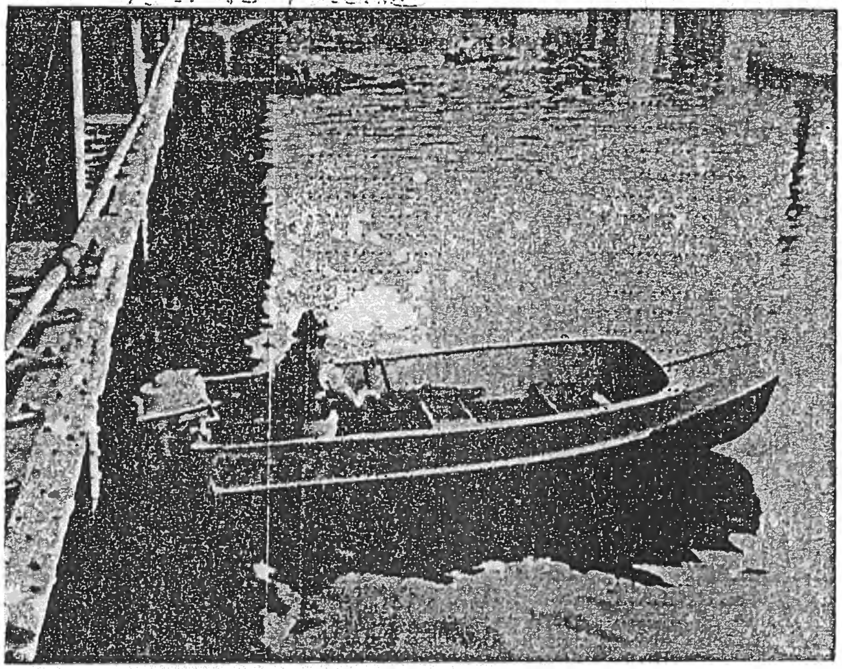
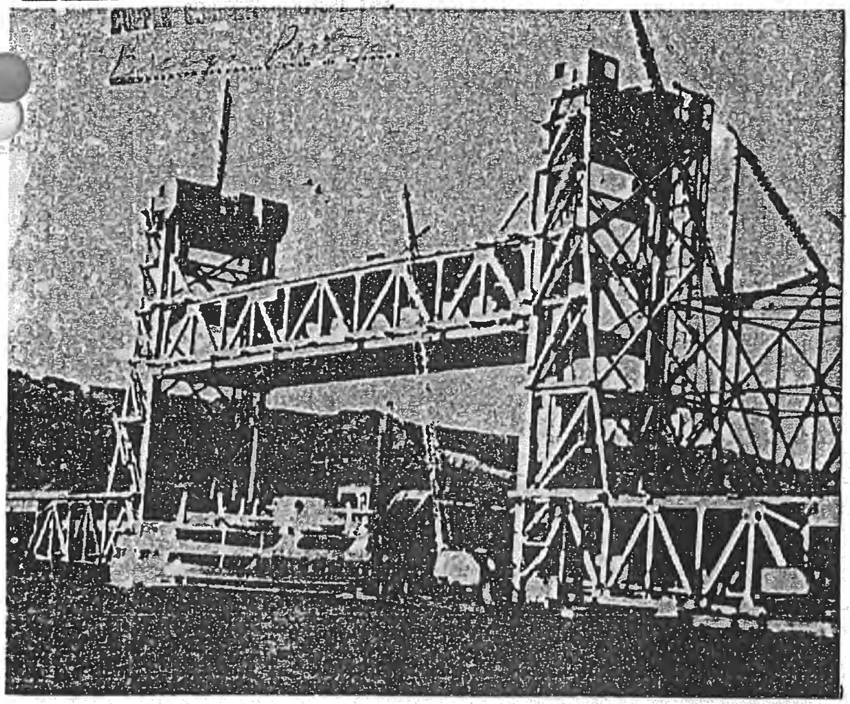


BERNARD GESTEL of Dollar Bay has one of the rare tasks incidental to the building of the Portage Lake lift bridge. His is the duty of rescuing any workmen who may topple in the water. Here he emerges from under the current draw span, headed for one of the piers in the middle of the lake. From the pier he will take a worker to the north side lake shore. He wears a helmet at all times and is never without his life jacket.

14



THE NATIONAL PARK CRAFT, Ranger III, was the first commercial vessel to pass under the new lift span of the Portage Lake Bridge. Its passage was made at 5:38 p. m. Thursday. The lift is elevated 103 feet. No lifting motors were used. Elevation was made by motors used on the job by the American Bridge Co., builders of the entire steel structure.

9/11/59

Ranger III First Ship To Pass Under Span

Portage Lake's new lift bridge went into action at 5:38 Thursday afternoon when Ranger III passed under the elevated lift of the new bridge and through the open swing span of the old drawbridge.

Squeezing through the two openings slightly before the Ranger was able to negotiate the passage was the Dr. John Aldrich yacht, Jane A II.

Because of the installation of the lift Wednesday, the Ranger remained at the island for an extra day. When it arrived in the Portage channel, it was impossible to lift the heavy center span so the ship was forced to tie at the Van Orden dock cleats from 3:45 to almost the time of passage. The Ranger's backward journey was its last of the regular tourist season.

It took about an hour and a half to raise the middle span. The reason lay in the fact that the regular motors of the bridge were not brought into play for the purpose. Motors of the American Bridge Co. lifted the span very slowly so that it would be raised with equality on both sides.

Michigan Highway Department officials this morning praised the work involved. Things have gone on hurriedly since the span was floated in Wednesday.

It appeared likely that the first lake carrier to use the new bridge passage would be the Str. Henry Platt of the Gartland Steamship Co. which is unloading coal at the Portage wharf and was expected to clear for Duluth early this afternoon.

Back in 1906, when the old drawbridge was first opened for traffic, the initial large craft to use the swing span was the lumber hooker, Niko.

Yesterday's procedures were witnessed by several thousand spectators who lined the shores and at vantage points on the bridge. These people knew history was in the making and that the activity would not occur again dur- their lifetime.

...tes wer... given the new ...v ...the Ranger and even the old ...

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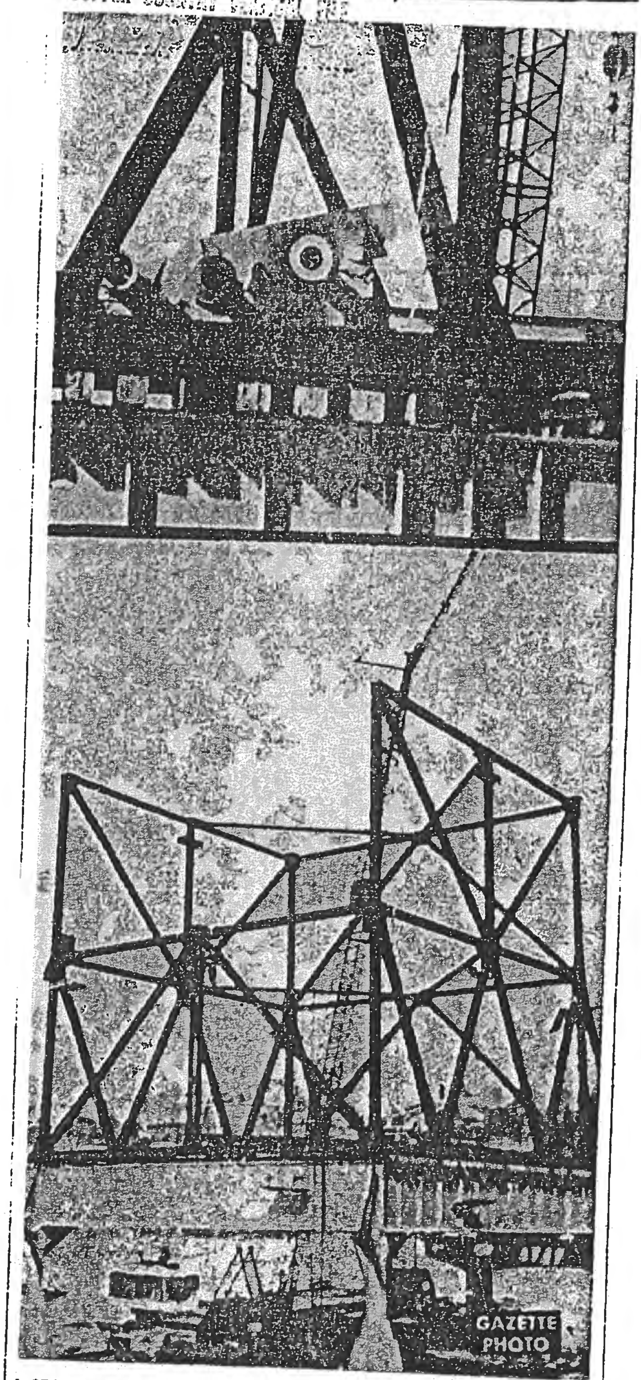
3/19/59



A 37-TON HOISTING ENGINE was raised atop steel beam resting on concrete piers of the Portage Lake bridge Wednesday by the American Bridge Co. The large photo shows the structural steel basework of the derrick which will be used to erect the support tower for the lift. When the north tower has been completed the equipment will be moved to the south side of the lake for the tower support there. The smaller photo shows the engine which cranes raised Wednesday morning.

15

New Portage Lake Lift Bridge opens to motorists

HOUGHTON (Dec. 21, 1959) — The new Portage Lake vertical lift bridge opened for public use at 8 a.m. on Sunday.

Hancock and Houghton police officers were on duty to regulate traffic over the four-lane roadway. Michigan Highway Department personnel moved the barricades from the new bridge to the entrance to the old structure.

The first recorded motorist to cross the structure was Hubert Peterson of Houghton Canal. He was traveling to Houghton from Hancock to meet the Greyhound bus. With him was Alvin Wakeham, of Stanton Township, who was returning to the Copper Country from Colorado.

He dined at Millies' in South Range for being the first serviceman to cross the bridge. The treat was on the house.

The second recorded car to cross the structure was that of Robert Jarvis of Mason.

The bridge is already becoming a speedway, according to Hancock Officer Matt Kobe, who found it necessary to check Hancock bound traffic. So fast was the traffic it was impossible to stop the first cars going north from Houghton.

Although the opening was historic, there was no official fan fare. The dedication ceremonies will be held in June when state dignitaries will visit the district.

Immediately after the barricades were removed, the old and new engine houses began a series of salutes. Auto drivers, also, saluted the bridge with their horns as they passed over the lift. Pioneer tower man and engineer, George Jacobson, tooted the three longs and two shorts from the old bridge tower and he was answered by a blast from the new bridge engine house.

Cloverland Contracting Co. had its supervisor, Lyol Huddleston, on the lift span to lower it prior to the opening. It had been kept aloft to allow vessel passages. The warning bells and lights flashed throughout the lowering as will be the custom when the lift is elevated or lowered for marine traffic.

The new bridge has automatic gates, so there will be no need of watchmen. The gate tenders have been Roy Carpenter, Clarence Simmons, Douglass Simmons, Bernard DeMars, James Sullivan, Joseph Heineman, Leonard Christoferson and Edward Raymond. The bridge crew's supervising foreman is Bernard Huss.

Traffic over the newly opened bridge was reliably estimated at almost 15,000 cars for the first 13 hours. Figured by Engineer George Jacobson, acutal counts during several periods showed from 95 to 115 cars passing both ways. Figuring 100 cars to a period and multiplying the 12 periods in an hour by 100 gives a figure of 1,200 cars. Multiply this figure by 12 hours, from 8 a.m. to 8 p.m. gives approximately 14,400 cars within 12 hours.

One of the reasons for the large number of cars was the tendency for many people to cross the bridge several times during the day.

DMG 12/22/94

BRIDGES - PORTAGE LAKE LIFT BRIDGE (PRE-1959)

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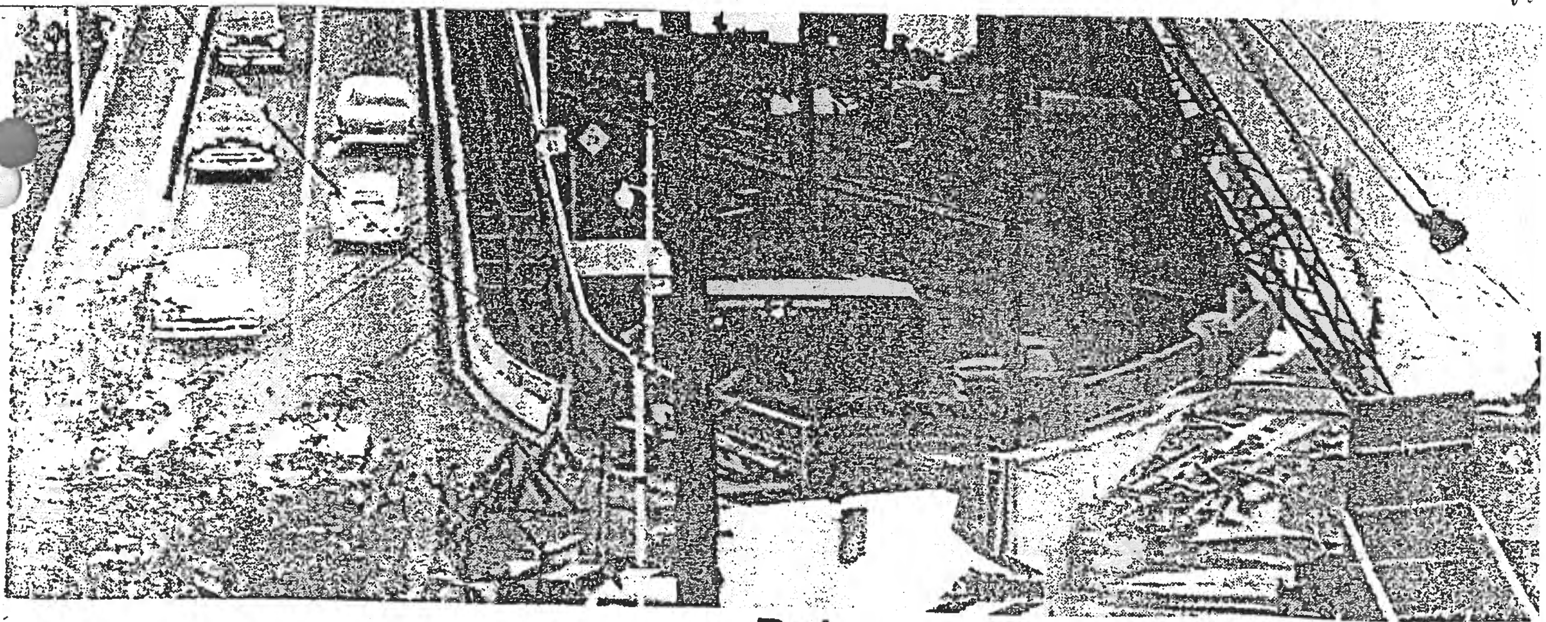


Detour

While workers riveted away on the new Portage Lake Lift Bridge in the late 1950s, people traveling between Houghton and Hancock used the old swing bridge. Carrying an $11 million price tag, the Lift Bridge would probably cost more than $50 million to construct today. In its day, the Lift Bridge per foot to construct than the Mackinac Bridge. (Gazette file phot

Bridge has only one official name

HOUGHTON, Dec. 4, 1968 — Copper Country people frequently tend to give the main artery between Houghton and Hancock a variety of names. Some call it the Portage Lake Lift Bridge, the Portage Canal Bridge, the Portage River Bridge, etc. According to the Houghton Canal's Charles McManiman, however, its official name is the Portage Lake Bridge. This, due to a resolution he put through the senate back in 1960, the year the bridge was officially dedicated in June.

Former State Senator McManiman well realized at the time that there were many persons for whom the artery could be title and that these had done notable work in achieving the ultimate construction of the bridge.

It also is widely known that L'Anse's Captain George Skuggen played a big part in promoting the building of the bridge in that it was he, who, at the time, brought the attention of the Lake Carriers to it through Admiral Spencer who pushed the issue to Washington.

In the 1950s it was Captain Skuggen who, with other lake skippers, declared the bridge a navigational "hazard" and it was due to this pronouncement that, in those days, the opinion concerning the structure that was in existence at the time, the drawbridge, was declared a menace to navigation and should be replaced.

The many plans made to name the bridge for an individual having failed at the time when McManiman was in the Senate, he put forth the resolution that it should merely be called Portage Lake Bridge. It has officially retained this title up to this time.

Steamer heads toward wrong passage

OF OLD BRIDGE

NOV. 28, 1958 — The Portage bridge engineer and two gatemen spent a few breathless minutes Wednesday midnight when they had to blow down the McCarthy Steamer J.F. Durston which was attempting to go through the southern draw opening against regulations in effect while the new bridge is being built.

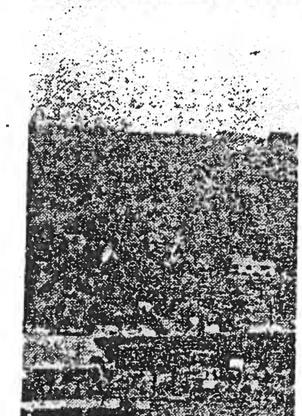
The three men saw the boat coming and immediately sounded the proper warning toots for a vessel to stop but by the time the Durston was able to halt, its bow was almost opposite the bridge's pilot house.

By this time the ship had dropped anchor and it was possible for the skipper to get instructions from the bridge personnel. The captain said he had been unaware that the southern opening should not be used. He then rang two bells in the ship's engine room and the 420 foot steamer reversed engines to a point from which it was possible to clear the north channel without difficulty.

Early in the navigation season all fleet members of the Lake Carriers Association had been informed of the bridge construction and that the southern passage could not be used because of the smaller draft in the area and the fact that movement of the propeller might cause instability of Cassion No. 5.

Skippers seem to be suspicious of the opening on the Hancock side because of its closeness to the shore. This is their reason for preferring the southern passage. The bridge opening on the north is narrower by more than 10 feet.

On Tuesday, one of the ships which anchored in Big Portage to wait out the early week's storm also came close to damaging piers at the bridge site. It touched one of the projections, as did the Durston. Neither did extensive damage, however.



A look at the Portage Lak tion from the Houghton side the double deck lift span in

Bridges - Portage Lake

New lift bridge lowers curtain on decade

By DAVID MAKI
The Daily Mining Gazette

1950-59 LANDMARKS 20th Century

HOUGHTON – The Portage Lake Lift Bridge, which replaced a bridge built in the 1890s, opened for business the morning of Dec. 20, 1959, and Hubert Peterson of Houghton Canal remembers it well.

Peterson drove the first car to cross the new bridge that morning, and while it might seem he'd have to race to be first in line, that wasn't the case.

"I didn't have to wait long, because the (police officer directing traffic) just told me to go," he said. "I just happened to get there at the right time. I didn't even know it was going to be open."

Peterson, now 74, said he and his wife had crossed the old swing bridge that morning to get to Hancock, where they were going to pick up his brother-in-law from the bus station. While they were in Hancock, they decided to eat breakfast at the then-Suomi Cafe downtown. As they finished their meal, a soldier on his way home from active duty asked for a ride, which Peterson readily offered. They wound up on the new bridge heading back to Houghton.

Since Peterson was the first to cross the canal via the lift bridge, he was awarded a free meal at Millie's Cafe in South Range. Instead of accepting the gift, he asked that it be given to the young soldier.

The maiden ride on the new bridge was not without incident, however.

"One guy said he was going to try to pass me," Peterson said. "But I don't remember anyone trying to pass. I wasn't looking back, I was looking forward (because) I didn't even know the bridge was going to be open.

"That was a surprise for me and my wife."

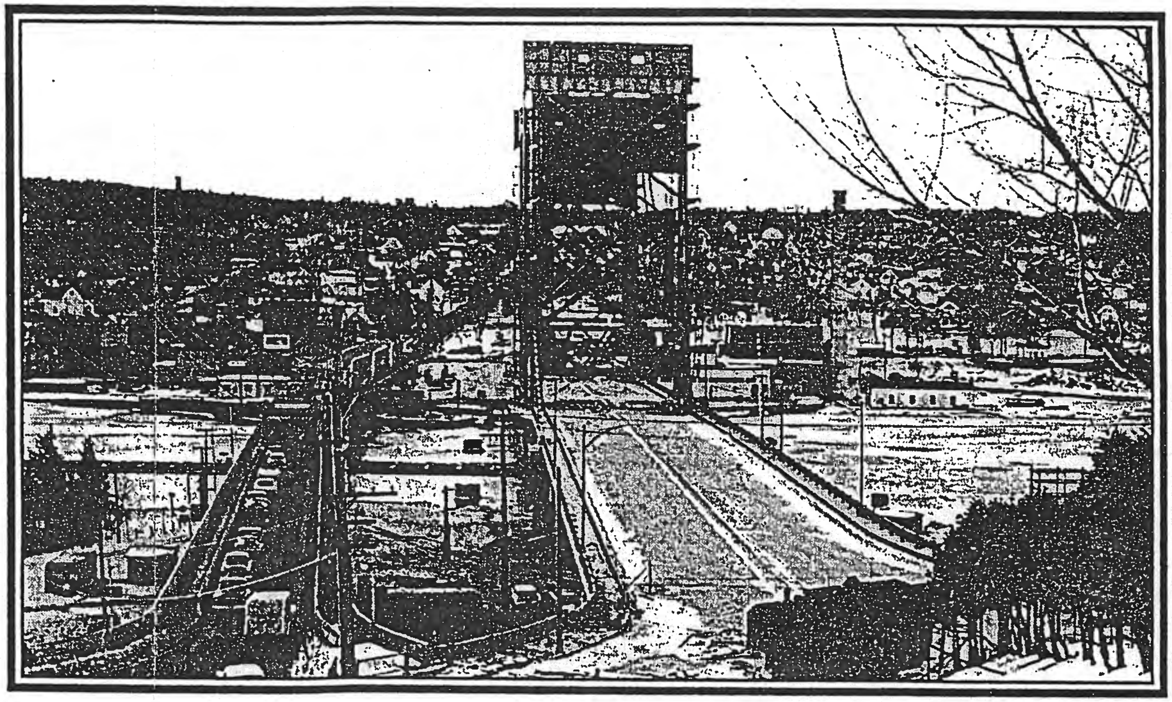
At least 14,000 cars traversed the 188-foot tall, quarter-mile long structure during the first half of that day, making life difficult for police officers like Matt Kobe of the Hancock City Police Department. Kobe, now deceased, was the officer who directed traffic that day. According to Kobe's wife, Catherine, there was no honor involved; he was just lucky enough to be scheduled for day shift that morning.

Strangely, the bridge's opening drew nary a story in the Dec. 19 Daily Mining Gazette. One day earlier, however, the Gazette announced the opening with a brief story at the bottom of page 1A.

"The (Highway Department) engineer said that the barricades would be removed from the north and south sides of the structure on the dot of 8 a.m. at the two approaches simultaneously," the article states. "Almost everything is ready for the bridge's vehicle opening ... all ice patches had been cleared from pedestrian lanes."

The Gazette's Dec. 21 issue trumpeted the bridge opening with a large headline on the top of page one.

"Immediately after the barricades were removed, the old and new engine houses began a series of salutes," the article read. "The bridge is already becoming a speedway. So fast was the traffic it was impossible to stop the first cars going north from Houghton."



The Portage Lake Lift Bridge sits vacant to the right of the swing bridge it was built to replace. The barricades were lifted Dec. 20, 1959 and more than 12,000 vehicles crossed the canal on the first day of operation. (Photo courtesy of Michigan Tech University Archives)

About 30,000 vehicles use the bridge each day, according to Houghton County Road Commission information. Bob Mayworm of Houghton, now 79, has traveled it many times. He remembers Keweenaw residents buzzing with anticipation about the new bridge opening.

"I think there was quite a bit of excitement about it," he said. "It was a costly bridge (about $11 million; $68 million by today's standards) and a lot of people said, 'We don't need that expensive of a bridge.' But we sure did. We can see it now."

Though the structure is primarily the same as it was in 1959, several repair projects have kept the bridge in top-notch condition. The most recent is a $3.2 million endeavor that involves putting a new surface on the approach and construction of new sidewalks and railings. The project will be complete sometime in the fall of 2000.

Mayworm said the 1959 opening wasn't hyped much in the community, but some residents saw the event as significant.

"I didn't see too much advertising," he said. "A lot of people went on about their normal things."

Like Peterson, who knew the budding landmark would open soon. He just never figured he'd be part of local history.

"There was a guy on the bridge saying, 'Go right up there,'" Peterson said, recalling the short drive. "I was just shocked."

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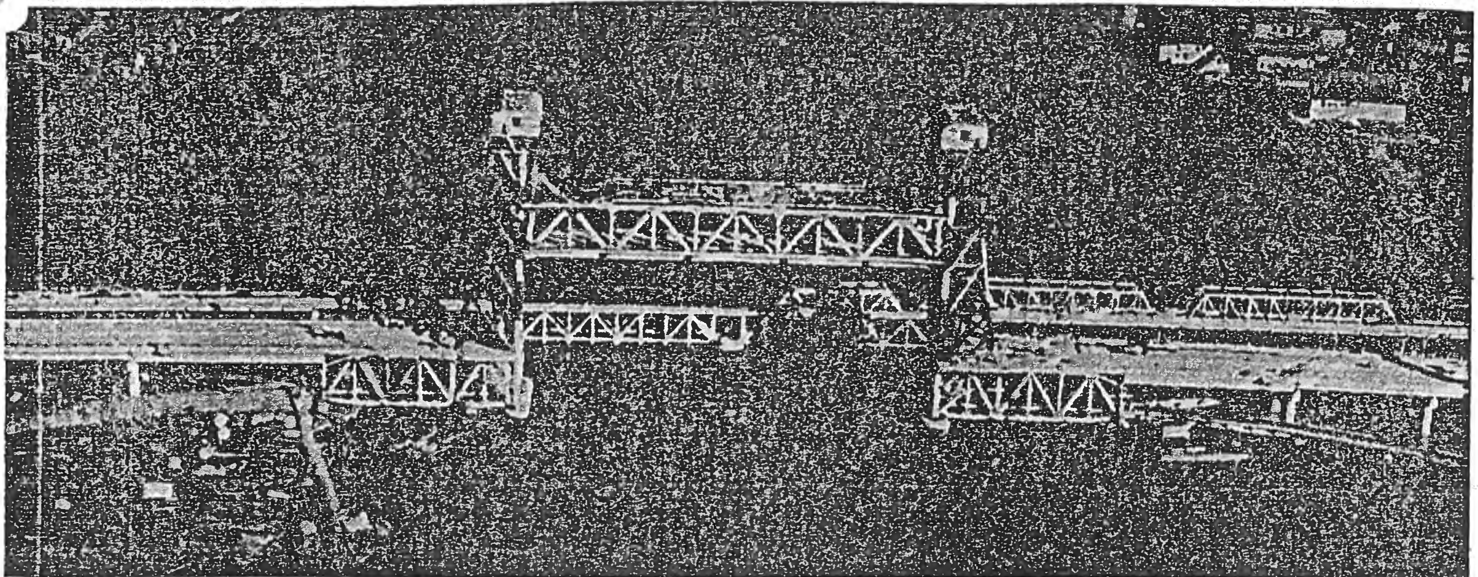
BRIDGES - PORTAGE LAKE LIFT BRIDGE (Pic 1959)



This is an aerial view of the mammoth Portage Lake Bridge. An awe-inspiring sight to visitors to the Copper Country and to residents alike.

Wow! What Dimensions!

Over the Portage Lake Shipping Canal stretches a structure of unusual appearance and proportion, the new Portage Lake Bridge. This monster of modernization is a mere 1310 feet long and some 200 feet high. It is composed of 7000 tons of structural steel and approximately 28,000 cubic yards of concrete.

For truck and auto use the bridge will have a clearance of 14' 2". There will be two 26 foot traffic lanes, divided by a 2 foot reinforced concrete center sprip.

Lift Span

In the center of the bridge is the lift span, weighing 2,300 tons and measuring 260 feet in length. It is raised and lowered by two 150 horse-power engines which carry the cables and regulate the two 1,150 ton counterweights. There are 42 cables at each end of the span. In case of a power failure there is an emergency gasoline-driven generator.

The bridge will have three positions at which it can operate. When large boats are passing through, the span will be in its full raised position which which will provide a 100 foot underclearance with 260 feet of clear channel. During the time when the span is up all traffic flow will cease.

The second position will be a half raised position which will provide 30 feet of underclearance and permit traffic to flow freely across. The last position will be that used when the train passes through at which point the span will be lowered and the traffic will flow across the middle lane.

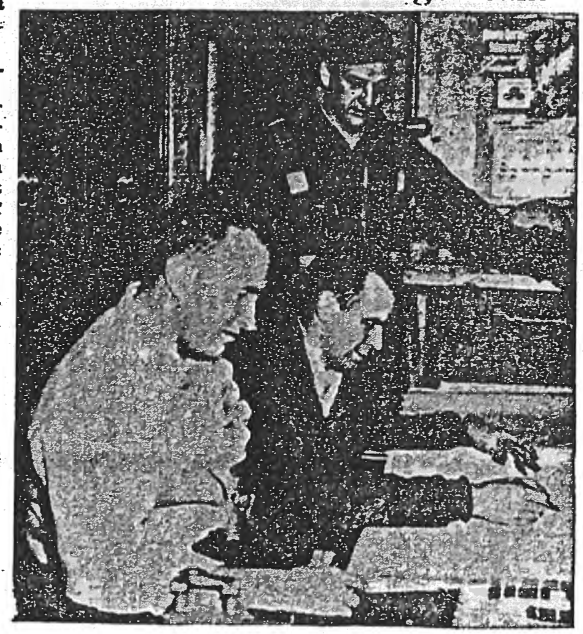
The two Selsyn motors coordinate the span movement so that the span rises on one plane without leaning one way or the other. The span rises to fully open position in 90 seconds and closes in a similar length of time.

From the Beginning

The first ground breaking was done on the project on December 18, 1957. The two main construction companies working on the Bridge are American Bridge Division of U. S. Steel which is working with the structural steel, and the Al Johnson Construction Company of Minneapolis, the general contractor. Together they have had up to 250 men working on the bridge at once.

The Michigan State Highway Department has maintained a staff of nine, among these the three Tech graduates pictured at right. These are, as pictured from left to right, John Michels, Assistant Project Engineer from Ontonagon, class of 1952, Tom Wiseman, the project engineer

Tech Grads On State Bridge Team



BRIDGES - PORTAGE LAKE LIFT BRIDGE (Pre-1959)

THE MICHIGAN TECH LODE COPPER COUNTRY VERTICAL FILE Thursday, October 15, 1959

Problems Licked, Completion Near

The new Houghton County Bridge, only thirty to forty-five days short of completion, is now showing some resemblance to a bridge. What is to be the heaviest known vertical-lift bridge in the world will be finished around the first of November.

Only a few major projects are yet to be finished. Probably the most noticeable is the approachway work being done by the Thornton Construction Company of Hancock. Other major jobs are welding the grid floor on the lift span and completing the machinery connections.

More than one problem confronted the engineers during the building of the bridge. Notable among these was the ancient barge which was found sunk near the south end of the bridge. It was loaded with Jacobsville sandstone and presumably had sunk around the end of the last century. The sandstone was a definite obstacle when it came time to sinking pilings. Another problem showed up when a work cell gave way. A project of major size coming up is the plumbing of the towers.

Two companies have all the contracts for the bridge: American Bridge, Division of U.S. Steel, and the Al Johnson Construction Co. of Minneapolis. All others are sub-contractors of these two. The State of Michigan is approving and inspecting all work. Tom Wiseman '49, project engineer, John Michels '51, assistant project engineer, and Don Kero '58, assistant to the assistant are all graduates of Tech working for the state.

New Bridge Sets World Record

Weather and other factors permitting, the new Houghton-Hancock bridge will be completed by the end of the month.
(Photo by Hemken)

Teacher: "How much is two and two?"

Gangster's child: "I refuse to answer on the grounds that it may tend to flunk me."

Tugs will move new bridge span

HOUGHTON (Sept. 8, 1959) — The American Bridge Co. plans to move the span of the new Portage Lake lift bridge into position tomorrow at 6 a.m.

The 2,200-ton array of structural steel will be floated to its proper place between the two 180-foot towers with the help of fuve tugs. Two of the tugs are owned by the Thornton Construction Co., two others by the Calumet Division of Calumet and Hecla, Inc., and the fifth is the property of the bridge firm.

It is expected that positioning the structure and making it fast will take the major portion of the day. The spectacular part of the work, however, will take place when the mass of steel is floated on two big barges. These same barges floated the south tower structural steel base into position.

The National Park headquarters in Houghton did not indicate this morning where the Ranger III would dock Wednesday. Two places west of the bridge were being considered, Lily Pond and the Naval Reserve wharf. Despite the smallness of the latter, the South and North American ships have touched there in the past.

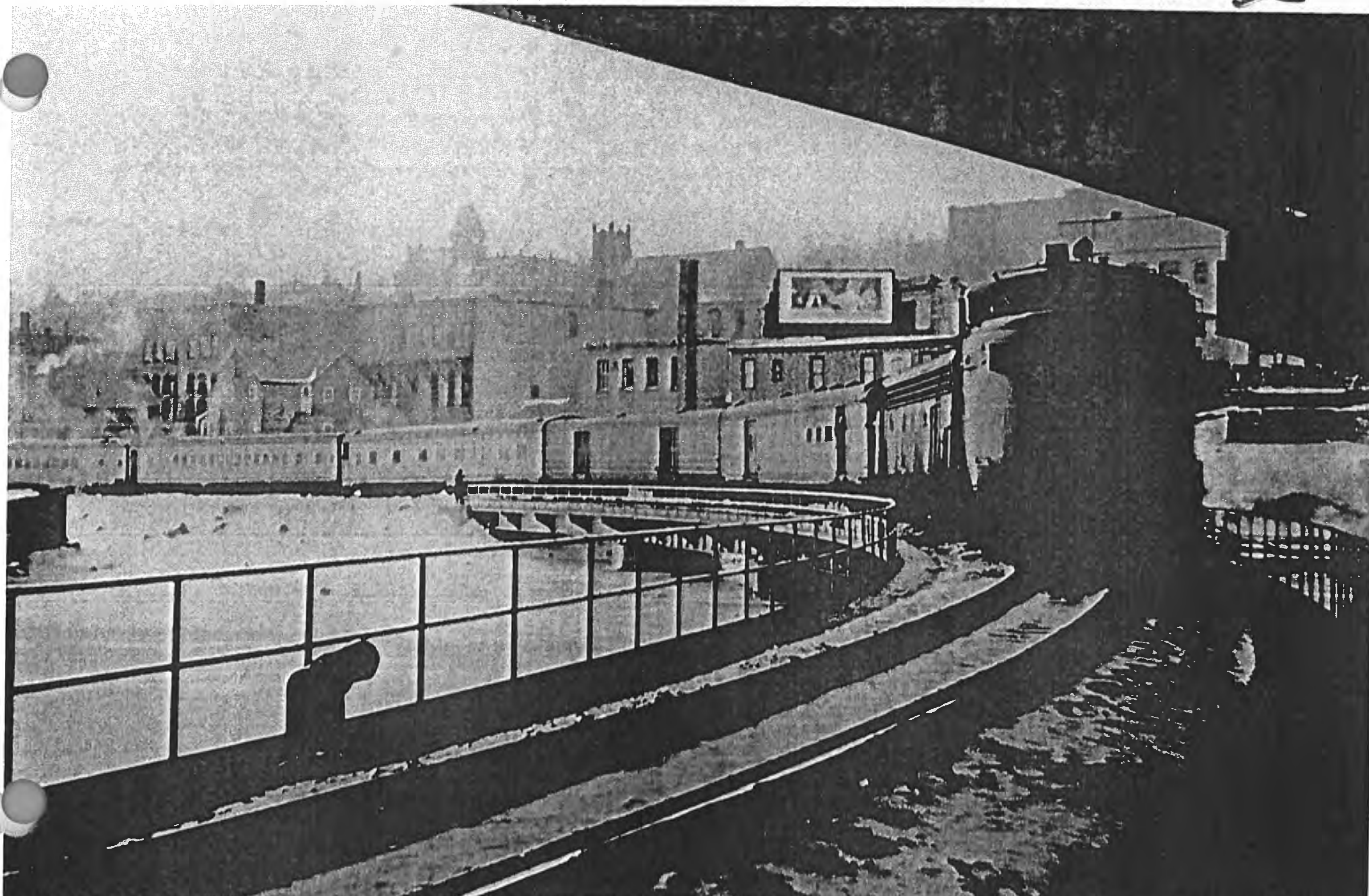
A number of prominent officials of the Michigan State Highway Department will be in attendance to observe the floating of the span. Among these are Commissioner John C. Mackie, Managing Director Howard Hil, Director of Engineering John Meyers and Construction Engineer C. B. Laird.

OMG 8/31/87

THE WEEK THAT WAS
SEPT. 1-5, 1959

BRIDGES - PORTAGE LAKE LIFT BRIDGE (Pre-1959)

First Train Across The Brige



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Brown

ENGINEERING NEWS-RECORD

FEB. 18, 1960

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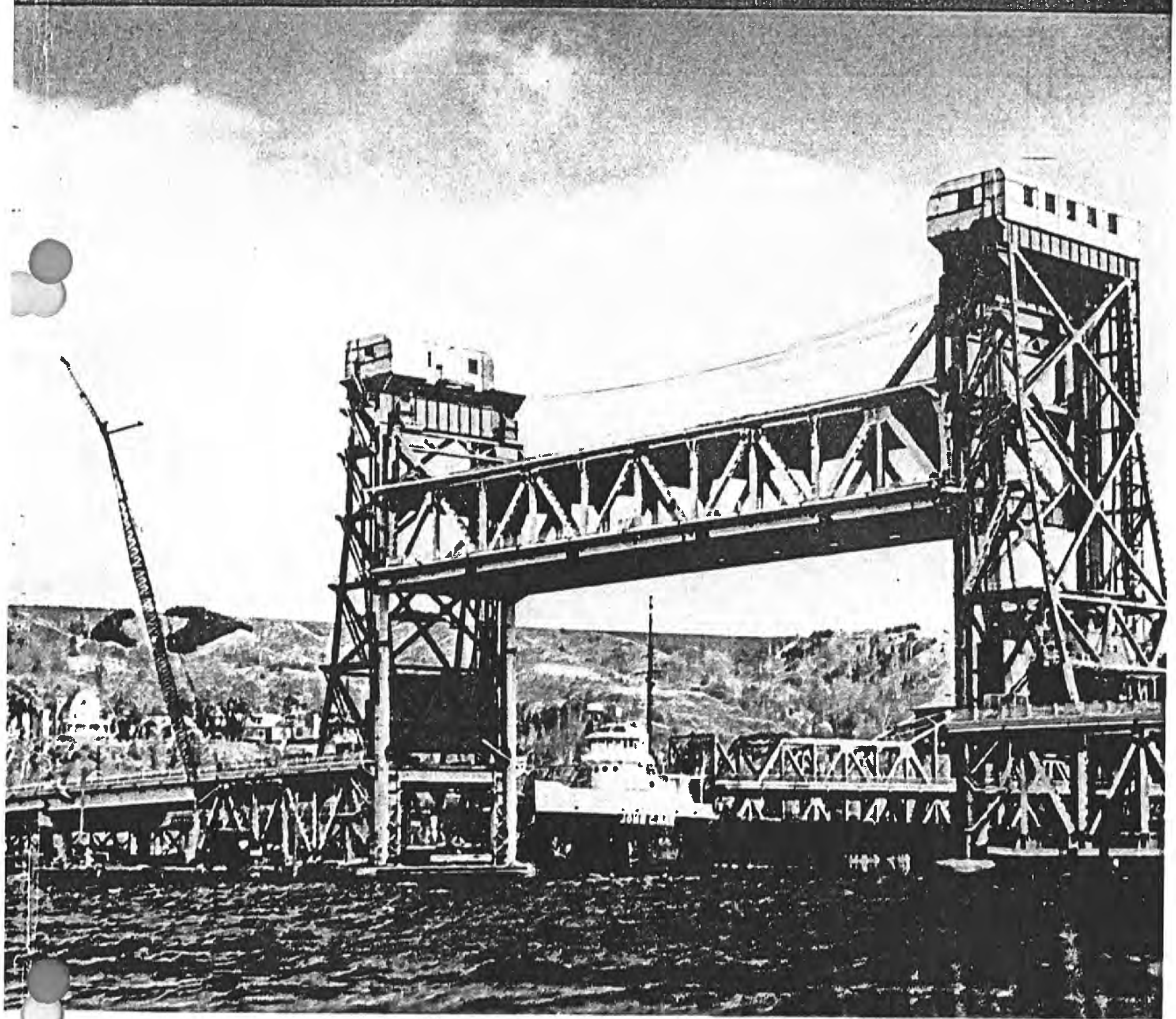
▶ Do management meetings help?

▶ How to use high-strength



Double-decker challenges builders

John J. Michels
410 Spar St.
Ontonagon, Mich.

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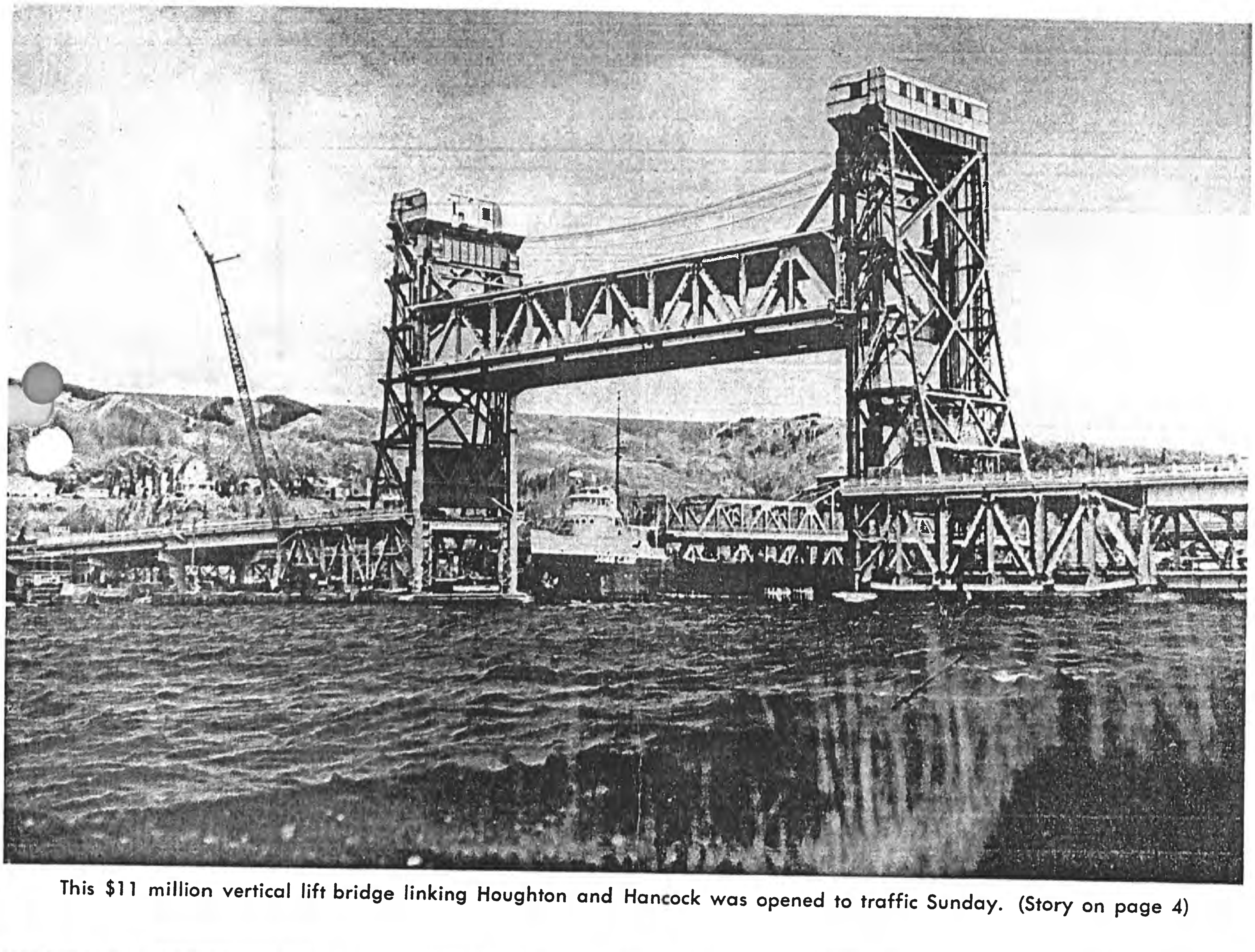
MICHIGAN ROADS and CONSTRUCTION



This $11 million vertical lift bridge linking Houghton and Hancock was opened to traffic Sunday. (Story on page 4)

NEWS OF THE MICHIGAN CONSTRUCTION INDUSTRY

Vol. 56, No. 52 THURSDAY, DECEMBER 24, 1959 Price: 20 Cents

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Houghton-Hancock Bridge Opened

(See Cover Picture)

The $11 million Portage Lake Bridge which links Houghton and Hancock in the Upper Peninsula was opened to traffic Sunday, December 20.

The new bridge replaces a narrow span originally built in 1895. The swing span of the old bridge was rebuilt in 1906 after it was struck by a large ship.

Highway Commissioner John C. Mackie said the new four-lane span will be able to carry twice as much traffic as the old bridge and will be able to carry three times as much traffic after approach improvements are made next year.

Designed to carry vehicular, railroad and pedestrian traffic, the new bridge has two levels of roadway and operates in three positions.

The lower level carries railroad traffic while the upper level carries motor and pedestrian traffic.

Seven feet of clearance is provided by a 4.5 million pound center span when in its first position, allowing trains to cross the canal.

When the railroad deck is raised to the roadway level, the bridge has a 32-foot clearance to allow passage of large pleasure craft and other boats.

The center span raises to a height of 100 feet when in its third position to allow large ships to pass through the canal.

Construction of the bridge began Dec. 18, 1957. American Bridge Division of U.S. Steel built the superstructure under a $5,933,887 contract while A. L. Johnson Co. of Minneapolis did the substructure and approach work under a $4,075,000 contract. Engineering, right-of-way and other costs came to approximately $1 million.

BIG BUILDING PERMIT

A $2.4 million building permit for a shopping center has been issued by the City of Wyoming to the Miller-Davis Co., Kalamazoo contracting firm. Site preparation has been started, and actual construction is to begin next spring.

AIRPORT DEVELOPMENT

Charles L. Barber & Associates, Toledo, Ohio, has been retained to provide engineering services in connection with development of the Muskegon County airport. An $800,000 runway and taxi strip project is scheduled for 1960.

Letter to the Editor

Sir:

Walton Construction Co. believes in starting them (grandchildren) out young!

Mrs. Leslie Walton,
Traverse City

(Mrs. Walton: Thanks for the delightful picture. These fine looking children have the right start toward a good education—the Editors.)

700 Expected at NBCA Convention

More than 700 members and guests are expected at the Sheraton-Cadillac Hotel in Detroit January 31 through February 3 for the fifth annual Convention of the National Bituminous Concrete Association.

Consistent with previous NBCA meetings, Michigan's Sheldon Hayes, committee chairman, has scheduled all general sessions in the mornings, leaving afternoons and evenings open for entertainment.

A feature of the Convention will be an Asphalt Workshop Program, to run concurrent with the regular program. The Workshop will bring together key personnel of asphalt contractors, inspectors, engineers and technicians with public agencies, and equipment manufacturer representatives to discuss field problems in bituminous concrete construction.

Ladies will be well occupied with a full program of activities. A new Ladies Auxiliary to NBCA will be formally organized and officers will be elected. Mrs. Scott Baker, of Michigan, has been serving as temporary president of this group. Throughout the four-day program, wives of Michigan members of NBCA will act as hostesses and generally take charge of activities for the ladies.

Door prizes at the annual on Wednesday, February 3 will include a Chevrolet Corvair, a mink stole, and a two-week expenses-paid trip to the Flamingo Hotel in Las Vegas.

Army Engineers

Detroit Army Engineer District, Corps of Engineers, has announced the following letting results:

ENG-20-064-60-23 — I. E. maintenance shop and covered storage at K. I. Sawyer AFB. Marquette county, successful bidder Omega Construction Co., Grand Rapids, $302,618.18.

ENG-20-064-60-28 — Ammo magazine additions at K. I. Sawyer AFB, Kincheloe AFB, Wurtsmith AFB, apparent low bidders (more than 15% over estimates): Schedule 1, A. J. Etkin Construction Co., $42,917.50. Schedule 2, Perron Construction Co.. $38,678. Schedule 3, A. J. Etkin Construction Co., $44,377.60, Schedule 4 (combined), A. J. Etkin Construction Co., $128,090.60.

ENG-20-064-29 — Base warehouse, Wurtsmith AFB, Oscoda, apparent low bidder Clark Gildersleeve, Oscoda, $144,977.70.

The following letting dates have been established:

ENG-20-064-60-30 — Central heating plant addition, Selfridge AFB, Mt. Clemens, 11 a.m. Dec. 30.

ENG-20-064-60-31—Addition to industrial building, Selfridge AFB, 2 p.m. Dec. 29.

ENG-20-064-60-32—Officers' quarters, K. I. Sawyer AFB, 2 p.m. Jan. 12.

ENG-20-064-60-33 — 2,000 lin. ft. chain link fence, double sliding gate, gate house, 1,060 sq. yds. bituminous road, etc., Selfridge AFB, 2 p.m. Jan. 21.

FORMER COMMISSIONER IS CLAIMED BY DEATH

Frank R. Himes, who was a member of the Gratiot County Road Commission for 35 years prior to his retirement Jan. 1, 1955, died in his sleep Dec. 13. He was 89 years old.

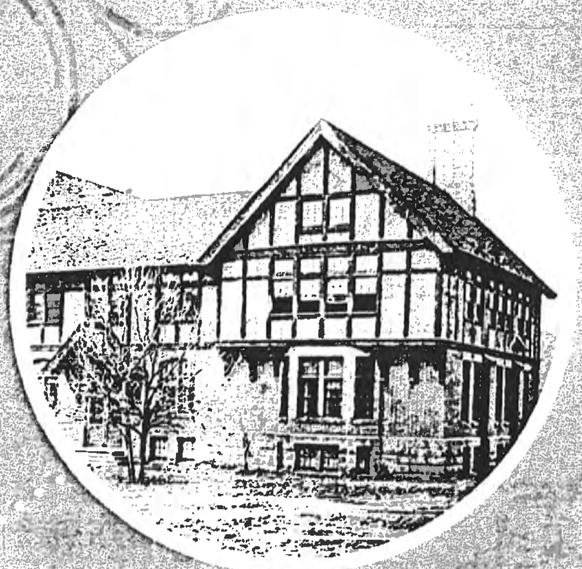
DORMITORY CONTRACT

General contract for a graduate dormitory on the Michigan State University campus in East Lansing has been awarded to The Christman Co., Lansing, at $1,506,500.

10-12-'10

Michigan Tech

MAGAZINE



1904
The Clubhouse/Gymnasium is built. In 2010, as the ROTC Building, it will be the oldest structure on campus.

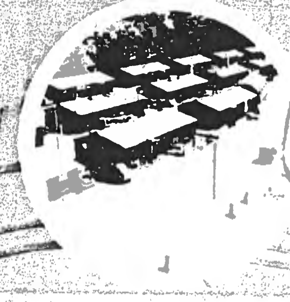
1909
Tech receives its first private gift: $2,000 for Chemical Sciences.

... Mining School ...

1927
Ella Wood, the first female faculty member, taught geography, political science, and history.

1948
The April 1 *Michigan Tech Lode* is printed largely in Finnish.

1949
Married student housing, aka "Trailertown" [illegible] returning GIs and their families.



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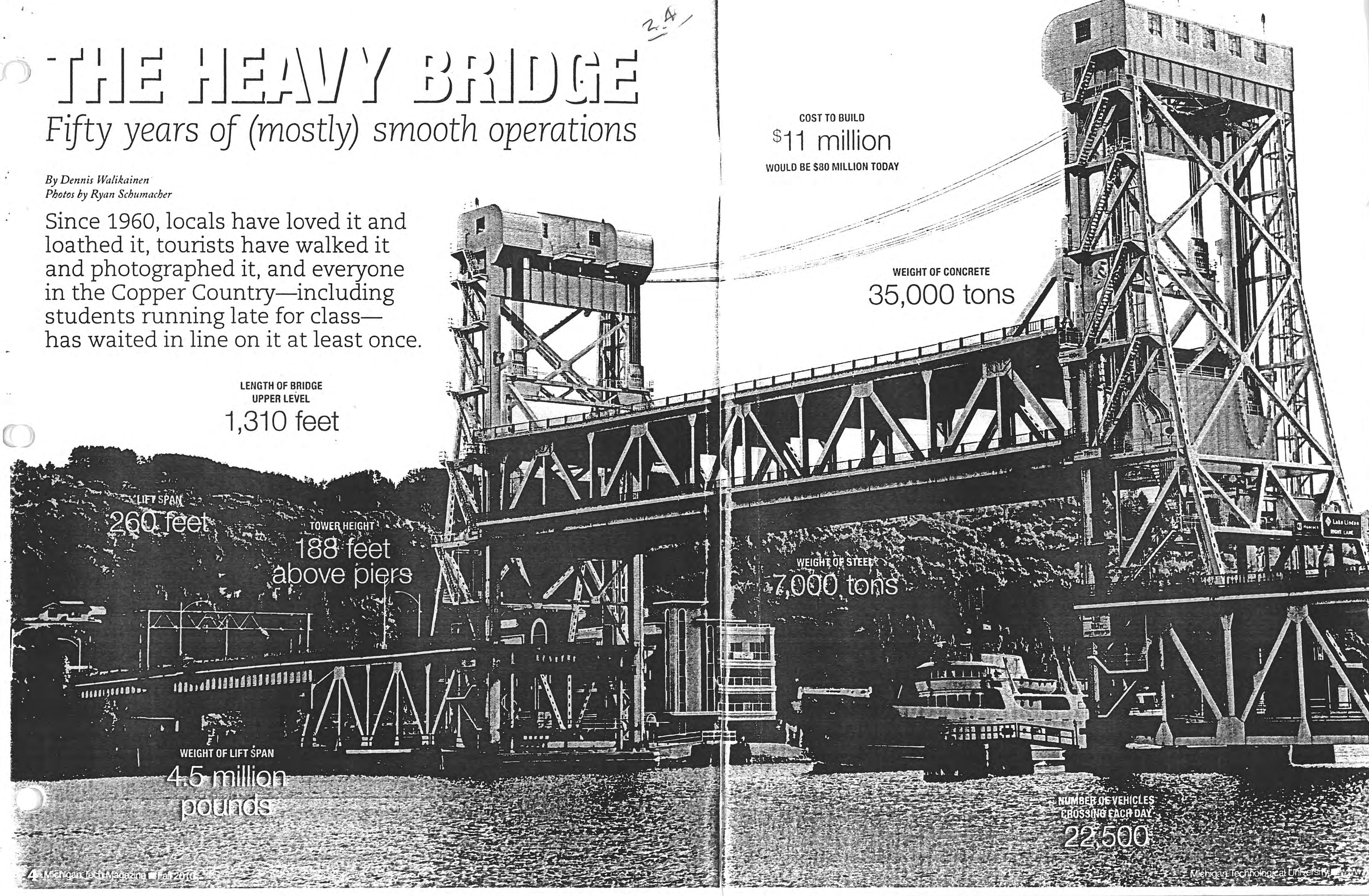
THE HEAVY BRIDGE

Fifty years of (mostly) smooth operations

By Dennis Walikainen
Photos by Ryan Schumacher

Since 1960, locals have loved it and loathed it, tourists have walked it and photographed it, and everyone in the Copper Country—including students running late for class—has waited in line on it at least once.



Bernie Smith
American Bridge

John Michels
& MDOT

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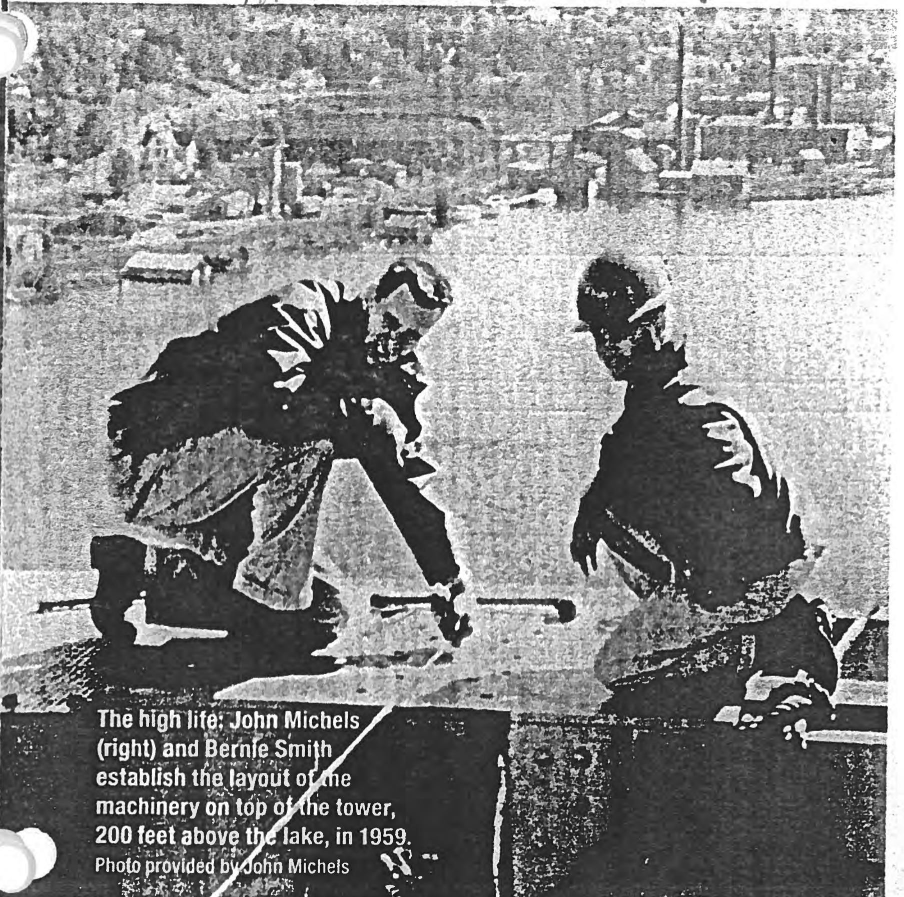
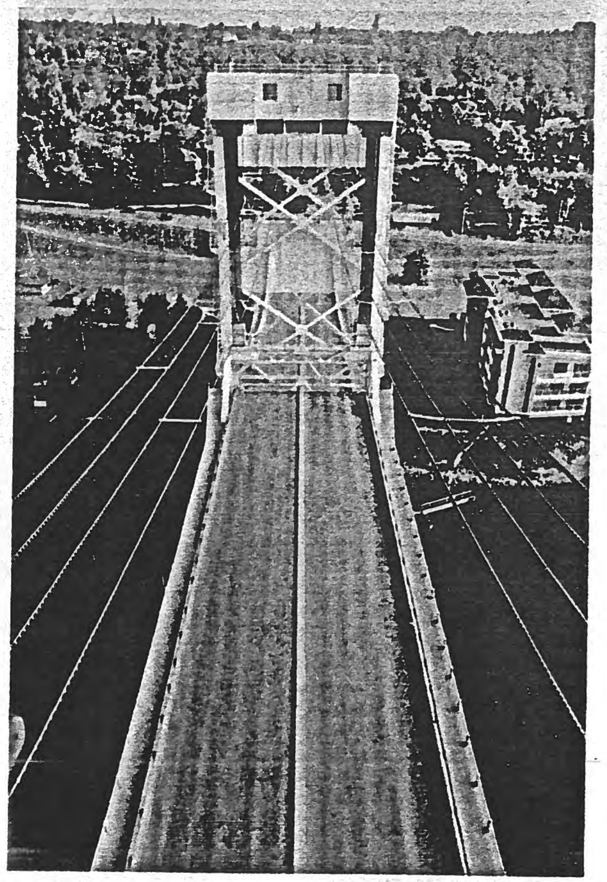


The high life: John Michels (right) and Bernie Smith establish the layout of the machinery on top of the tower, 200 feet above the lake, in 1959.
Photo provided by John Michels



Three Michigan Tech alumni were on the engineering team that helped build the Portage Lake (don't say "lift") Bridge, which marked its fiftieth anniversary in June. John Michels '51 of Ontonagon was a project engineer and remembers it as "quite a stressful engineering feat, especially erecting the steel."

The civil engineer, who worked with Tom Wiseman '49 and Don Kero '58, says the 2,200-ton center span was assembled on barges in Hancock and floated down the canal, pulled by tug boats. It was like threading a huge needle, with only four inches of clearance at either end of the lift span. The fact that it fit perfectly, including the expansion joints, was a relief to all involved, Michels said.

A crew of about one hundred worked on the bridge each day, including Bernard Gestel of Dollar Bay, who patrolled the waters in his boat to retrieve anything that fell in the water, humans included. Deep-sea divers toiled two hours on, four hours off. There were surprises: while workers were dredging the lake bottom, they unearthed a sunken scow, a hundred feet long and loaded with sandstone.

The lift bridge had three big advantages over the old swing bridge, says Michels.

"It was functional: you couldn't gain a large enough horizontal clearance for lake shipping with the swing bridge," he says. "It was also necessary for railroad traffic, and it was located at the shortest distance between the two towns."

That railroad bed (abandoned in 1982) would play a big role in the design and construction. It is the heaviest lift bridge of its kind (some 4.5 million pounds), in great part because of that deck.

"And the railroad is located more toward the west side," Michels recalls, "so the counterweights that balance the lift span are all heavier on the west side to account for the weight difference."

More delicate balancing is evident, according to Michels.

"The balancing chains are composed of steel blocks, and they offset the weight of the lifting cables," he says. "And the weight of the cables shifts from the lift span to the tower as it opens."

Smooth operators

Helping control the traffic via waterway, railway, or roadway has always been the responsibility of the bridge operators. Wayne Poisson worked the controls from 1963 to 1988.

He recalls one especially close call in the winter.

"The ore boat *Wilfred Sykes* was coming through, and it was snowing very heavy," he says. "I couldn't see him because of the snow, and he couldn't even find me on his radar, it was so thick. I looked up, and all of a sudden he was right at my door. I got the bridge up just in time. I don't know how he didn't hit me."

Poisson misses the work and camaraderie, particularly the signals that the boats and bridge would exchange: three long and two short signaling the master salute, "especially the old steam whistles," he says. "I would answer them anytime, day or night."

Today, five operators share the duties in eight-hour shifts, according to Bob "Butch" Paavola. These days, most of his traffic is sailboats, and August is the busiest month. "We get the tugboats and the *Ranger,* too." But ore boats are rare. "The thousand footers are too big," Paavola says.

It takes only five or six minutes to lift the span, although it seems much longer to motorists. And, there's no truth to the rumor that the operators wait to raise or lower it until traffic is heavy by Keweenaw standards—during the "rush minute" just before 8:00 AM or after 5:00 PM.

By mid-December, traffic flows freely. The sailboats are in dry dock, and, as the last boat, a Coast Guard cutter, goes through, the operators' jobs are done for the season.

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"I got the bridge up just in time. I don't know how he didn't hit me."

—bridge operator Wayne Poisson

Postscript

Michels returned to the Keweenaw recently and, thanks to Paavola, was able to visit the new control room and journey to the top of the towers. He was impressed by all the new machinery and undaunted by the heights.

Fifty years after he finished looking at blueprints, he says, "The height doesn't bother me."

After all, he built it. ■

Design engineer comes back to "his bridge"

After fifty years, Tom D'Arcy is back in town. The design engineer for the approach spans and the lift span of the bridge, this June he is visiting the Keweenaw to help celebrate his creation's golden anniversary.

"Structural engineers love bridges," he tells a crowd come to hear his stories about the link between Houghton and Hancock. "Our designs are exposed for all to see."

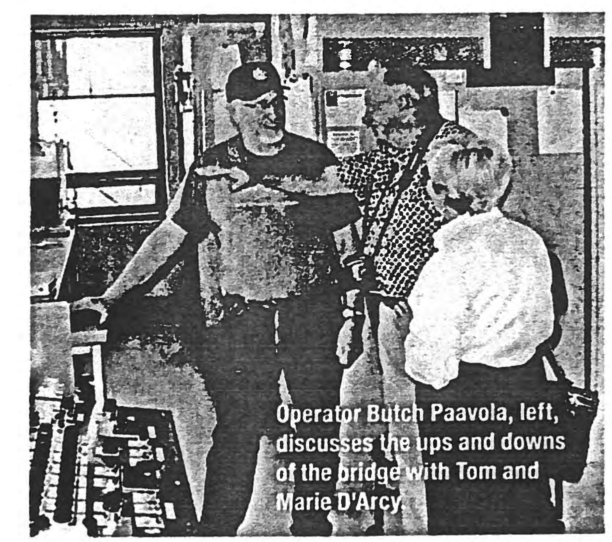
D'Arcy was a young engineer with the firm Hazelet and Erdel when he was assigned the task of designing the world's heaviest lift-span bridge. He remembers receiving some hard-knocks learning as he undertook the project. At a meeting in Lansing filled with gray-haired state engineers, his youthful—and in his opinion excellent—ideas were shot down one after another. On the long ride back home, he asked his mentor, "When are ideas accepted, regardless of age?"

"When you are the oldest guy in the room," his boss answered.

This day in the Keweenaw, in this room, D'Arcy was among the oldest, and the audience was rapt as he discussed the bridge that can mean more than just safely transporting people and vehicles.

"Bridges connect places, towns, even countries," D'Arcy says, but he also stressed the importance of building and maintaining those personal bridges that connect people's lives.

And, like the Portage Lake Bridge, D'Arcy says, if we make them strong, they will endure as they mature and age. ■



Operator Butch Paavola, left, discusses the ups and downs of the bridge with Tom and Marie D'Arcy.

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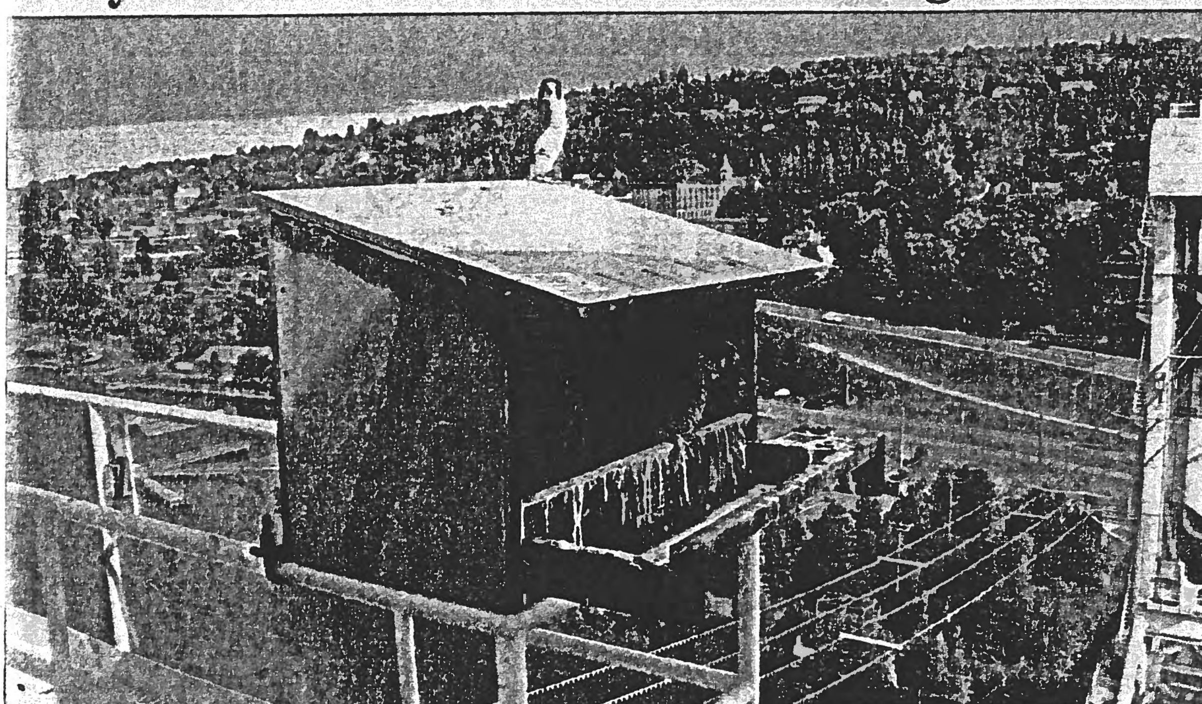
in Herald

"Serving Ontonagon County and Surrounding areas since 1881"

ugust 06, 2014 Ontonagon, Michigan 49953

Baby falcons fill nest box at Lift Bridge



DNR photo by Brad Johnson

Lift Bridge Falcons: A father peregrine falcon stands watch atop a nest box occupied by three falcon chicks on July 15. The box is one of two attached to the Houghton-Hancock Lift Bridge in 2012. The young birds were too old to be safely banded.

A trio of peregrine falcon chicks at the Houghton-Hancock Lift Bridge are starting to leave the nest.

The Michigan Department of Transportation (MDOT) installed two nest boxes - one each on the north and south bridge towers - in spring 2012 and a pair of peregrine falcons showed up the next spring. The falcons got a prime nesting spot and MDOT got a top-flight pigeon patrol.

According to head bridge operator Robert Paavola, the number of pigeons on the bridge has plummeted dramatically since the falcons took up residence and chased them away.

Please see Page 3

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Portage Lake Lift Bridge history preserved in documentary film

Contact: Dan Weingarten, MDOT Office of Communications
WeingartenD@michigan.gov
906-485-6322, ext. 136
Agency: Transportation

Fast facts:
- The massive double-decked Portage Lake Lift Bridge serves as the sole link between the Keweenaw Peninsula and the mainland.
- A documentary film detailing the bridge's late 1950s construction has been digitized and is now online at https://youtu.be/4D6Vx8XHMu0
- John Michels, 88, a retired Michigan Department of Transportation (MDOT) engineer, was as one of the project engineers on the original construction job and remembers it well.

June 16, 2016 -- The narration of a 1950s Michigan Department of Transportation (MDOT) documentary film highlights the geographical and historical reasons behind the Portage Lake Lift Bridge, one of one of the state's iconic bridges.

"Lake Superior ... is a temperamental lake. It can be serene and wildly beautiful ... or violently stormy, the equal of any of the oceans of the world," the narrator intones. "Thrust into the middle of the lake, like a giant finger, is Michigan's Keweenaw Peninsula."

Getting around that finger has been a problem as long as people have sailed boats on the Great Lakes. While it provided a crucial shortcut around the Keweenaw and shelter for maritime traffic, the 1860s construction of the Keweenaw Waterway essentially turned the Keweenaw Peninsula into an island. Since then, a bridge between Houghton and Hancock has provided the sole land link between the peninsula and the mainland. A series of bridges served that function, with the Portage Lake Lift Bridge, built from 1957 to 1959, the most recent and ambitious of the structures.

An MDOT documentary on the lift bridge's original construction has recently been digitized and restored, available online at **https://youtu.be/4D6Vx8XHMu0**. The film, "Keweenaw Crossing: Michigan's Elevator Bridge," details the engineering challenges of building one of the world's heaviest and widest double-deck vertical-lift spans.

A recent $8.4 million MDOT project was designed to keep the bridge performing its critical mission. The one-and-a-half year project included upgrades to the bridge's mechanical and electrical systems, along with concrete and steel structural improvements. It was one of the biggest overhauls since the Portage Lake Lift Bridge's original construction – and a key player in the birth of the bridge got to see it. John Michels, 88, was one of the original engineers in charge of construction.

"There were three project engineers during the life of the bridge project. I was the third," said Michels, who retired about 25 years ago after 38 years with MDOT. "I came on just after most of the foundation work had been completed."

The documentary was filmed by Bruce Deter, Michels said, a professional photographer who also worked on the project as a concrete plant inspector for MDOT when not shooting footage.

Michels said the film did a good job of capturing the challenges of the complex bridge construction: building the massive caissons, sinking the bridge piers, erecting the steel superstructure and delicately floating the central bridge span into place to create what the film calls a "ponderous yet nimble" structure.

While he worked on many projects during his time with MDOT, Michels said the bridge project was a serious test of his abilities. "There were civil engineering, mechanical engineering and electrical engineering components of the bridge project," Michels said. "Three main segments of my profession."

Current MDOT construction engineer Alan Anderson said he felt privileged that the recent bridge rehabilitation project gave him a chance to get to know Michels.

"John has an incredible memory of the construction and operation of the bridge," Anderson said. "He called me in the middle of last summer to check in on the progress of the bridge project. From that time on, we talked occasionally."

Michels contributed information and photos to a project presentation Anderson made at the annual Michigan Bridge Conference in Lansing in March, and he was invited to the conference as a distinguished guest.

"John was instrumental in producing the documentary film," Anderson said. "He has also written a valuable history of the bridge construction that is still being used to this day."

For his part, Michels said he's very proud of how well the bridge has functioned over the years. "The bridge has operated exceptionally well," he said. "But after more than 50 years, it needed an upgrade."

Some electronic components available today simply didn't exist when the bridge was built, he noted.

Michels said he's happy he's been able to see the bridge refurbished for its next 50 years of service. "I'm about the only one I know of who had any contact with the original bridge project who's left living," he said.

Bridgefest, an annual celebration of the Portage lake Lift Bridge's anniversary, which includes a parade, fireworks, concerts, contests, boat tours, and sporting events, runs Friday through Sunday, June 17-19, in Houghton and Hancock.

Download MDOT's Mi Drive traffic information app: www.michigan.gov/drive

Retired MDOT engineer John Michels, left, and current MDOT engineer Al Anderson attended a statewide bridge conference in Lansing this spring. Michels oversaw the construction of the Portage lake Lift Bridge in the late 1950s and Anderson managed the recent $8.4 million rehabilitation project. (MDOT photo)

Office of Regulatory Reinvention
Foreign Languages
Disability Resources

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ADA
MICHIGAN NEWS
POLICIES

Section 3 Attached Documents:

[3-2] Bornhorst, Theodore J. and Molloy, Lawrence J.. “Douglas Houghton- Pioneer of Lake Superior Geology,” pages 4-5. (2017). *A. E. Seaman Mineral Museum Web Publication 4, 9p,* (viewed Mar 15, 2019).

[3-3] Busch, Jane C.. “Copper Country Survey Final Report and Historic Preservation Plan,” pg. 62-63. (Aug, 2013). *Keweenaw National Historical Park Advisory Commission,* (viewed Mar 15, 2019).

[3-5] “Keweenaw Copper at War,” Date unknown. *National Park Service,* (viewed Mar 15, 2019). <www.nps.gov/articles/keweenaw-copper-at-war.htm>.

[3-6] Courter, Ellis W.. “Michigan’s Copper Country,” page 136. Date unknown. *State of Michigan,* (Mar 15, 2019).

[3-7] “Timeline of Michigan Copper Mining,” Date unknown. *Keweenaw National Historical Park and National Park Service,* (viewed Mar 15, 2019). <www.nps.gov/kewe/learn/historyculture/copper-mining-timeline-page-2.htm>.

[3-8] Cordua, Dr. Bill. “Why is there so much Native Copper in Michigan,” Date unknown. *University of Wisconsin- River Falls,* (viewed Mar 15, 2019).

[3-9] Oravec, J. F.. Letter to H. R. Puffer Re: B1 of 31-10-1 Houghton-Hancock Swing Span. October 8, 1953. Houghton County Road Commission Bridges, Portage Lake, 1953, RG77-104. Box 2, Folder 4. MTA & CCHC.

[3-10] Meyers, M. G.. Letter to Col. George Kumpe Re: Portage Lake Bridge. October 14, 1953. Houghton County Road Commission Bridges, Portage Lake, 1953, RG77-104. Box 2, Folder 4. MTA & CCHC.

[3-11] Winkler, C. F.. Letter to George M. Foster Re: October 15th Testimony. October 5, 1953. Houghton County Road Commission Bridges, Portage Lake, 1953, RG77-104. Box 2, Folder 4. MTA & CCHC.

[3-12] Robinson, Major General B. L.. Letter to Secretary of the Army Re: Public Hearing Under

Bridge Alteration Act, Houghton-Hancock Bridge over Portage Lake, Mich. March 7, 1955. Houghton County Road Commission Bridges, Portage Lake, 1954-1955, RG77-104. Box 2, Folder 5. MTA & CCHC. See attached document [2-1].

DOUGLASS HOUGHTON – PIONEER OF LAKE SUPERIOR GEOLOGY

by

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Douglass Houghton – Life Sized Oil Painting
On exhibit at the A. E. Seaman Mineral Museum
by Alva Bradish in the late 1870's.

Houghton is shown with his dog Meeme on the shore of Lake Superior at Pictured Rocks. A second original oil painting was purchased by the Michigan House of Representatives in 1879 (Act 135) and is on exhibit at the State Capitol Building,

Foreword

A special tribute to Douglass Houghton written by us was first published by the Michigan Basin Geological Society as a part of "A Geological and Historical Field Trip to the Keweenaw Peninsula for the 2016 dedication of a State historic marker in honor of Douglass Houghton" (Bornhorst and Molloy, 2017a). In this field guide we referred to Douglass Houghton as "Michigan's Pioneer Geologist." Rintala (1954) first labeled Douglass Houghton as “Michigan’s Pioneer Geologist.” Subsequently, in 2017, our nomination of Douglass Houghton to be honored as "Pioneer of Lake Superior Geology" by the Institute on Lake Superior Geology was approved. Houghton was the first Pioneer of Lake Superior Geology and recognized for his historic contribution to the geology of the Lake Superior region. The citation for this honor (Bornhorst and Molloy, 2017b) was modified with permission from the one first published by the Michigan Basin Geological Society. **This A. E. Seaman Mineral Museum Web Publication 4 is a modified version of Bornhorst and Molloy (2017a and b). Most of the text is identical to the previous publications and is reproduced here with permission from the Michigan Basin Geological Society.** We have added several pictures and have added a section on Douglass Houghton's personal mineral collection that is part of the University of Michigan mineral collection at the A. E. Seaman Mineral Museum under the Michigan Mineral Alliance.

When we prepared the earlier tributes to Douglass Houghton we principally relied on two sources: “Douglass Houghton, Michigan’s First State Geologist 1837-1845” by Helen Wallin (2004) and “The making of a mining district: Keweenaw native copper 1500-1870” by David Krause (1992). Wallin provided a detailed “sketch” of Houghton’s accomplishments, honors and other interesting facts. Krause provided historic context of Douglass Houghton’s impact on Michigan’s Keweenaw Peninsula. We will did our best fairly summarize Houghton’s contributions and to appropriately credit the source. We selected highlights from Houghton's accomplishments to enlighten the reader about him and to provide context to the life-sized oil painting of him on exhibit at the A. E. Seaman Mineral Museum. The A. E. Seaman Mineral Museum also exhibits specimens from Houghton's personal collection that are held under the Michigan Mineral Alliance.

Douglass Houghton: A Professional Scientist

Douglass Houghton’s ancestors settled in Massachusetts in the 1650's, more than 100 years before the American Revolution (Wallin, 2004). Douglass was born in Troy, New York in 1809 of Judge Jacob and Mary Houghton. In 1810 his parents moved with their children some 400 miles into the wilderness to Fredonia, New York (Wallin, 2004). At age 20, in late 1829, Douglass was among the earliest graduates from Rensselaer Scientific School (now Rensselaer Polytechnic Institute) with a B.A. degree in the areas of natural history (including geology) and chemistry. As a result of his exceptional performance in early 1830 he became an assistant professor at Rensselaer. Rensselaer is the oldest technological university in North America, established in 1824 in Troy, New York. Modern geology began with the publications of James Hutton in 1785, hence modern geological studies were still “young” by 1824 when Rensselaer was founded. Rensselaer was the premier educational institution for geology from its founding until the latter part of the 1800's and as such many prominent American geologists were graduates of Rensselaer (Krause, 1992). Thus, Houghton had recognized credentials as a professional scientist by being a graduate of Rensselaer and his formal scientific education was a key component to his success.

In 1830, the Territorial Governor of Michigan, General Cass, and others, asked Douglass Houghton's mentor at Rensselaer, Professor Eaton, to recommend someone to lecture in Detroit on geology, chemistry, and botany. Even though Douglass Houghton was quite young, he was offered the position and moved to Detroit in 1830. His lectures were such a success that he quickly became a scientific pioneer and an important citizen of Detroit and the Michigan Territory. In 1831, he returned to Fredonia and became a licensed physician leading to accounts of him as Dr. Douglass Houghton although he did not have a formal degree in medicine.

Lake Superior Copper

During the presidency of John Adams (president 1797-1801) the nation became interested in the potential for copper on the south side of Lake Superior and Congress passed a resolution to do an investigation (Krause, 1992). However, the expedition was canceled after Thomas Jefferson succeeded Adams as president (president 1801-1809) and the Lewis and Clark expedition (1804-1806) became a higher priority.

The Territory of Michigan was organized in 1805 and in 1813 President Madison appointed Lewis Cass as territorial governor. By then the reputation of Lake Superior copper had grown to a sufficient level of interest to warrant serious investigation. Secretary of War John Calhoun approved Lewis Cass's request in 1819 for an expedition to assess the potential of Lake Superior copper as the national need for copper was high. Henry Rowe Schoolcraft was selected by Cass to lead an expedition in 1820 with the special goal of seeing the reported "copper rock" on the Ontonagon River – the Ontonagon Boulder. Schoolcraft had no formal university scientific training although he showed promise as a chemist with an interest in rocks and minerals (Krause, 1992). Unfortunately for Schoolcraft, he was between an amateur and professional scientist and lacked credibility of his future colleague Houghton even though he is credited with recognizing, in 1819, the potential of discovering deposits of lead in Missouri. Schoolcraft visited the Ontonagon boulder and heard of reports from native Americans of additional masses of native copper. His reports in 1820-1823 heightened interest in Lake Superior copper although there was disagreement in the scientific community on Schoolcraft's initial opinion that the copper ores were native copper and not copper sulfides or carbonates. This opinion was opposite of conventional geological thinking at that time based on examples from Europe (Krause, 1992). Shortly after his reports, Schoolcraft waivered in his opinions as a result of some reading and subsequently recanted his initial views as other deposits consisting primarily of native copper were not know then. Little did he know that there are still no other similar native copper districts on Earth like the Keweenaw Peninsula.

The ownership of the land and mineral rights delayed additional expeditions until at last Schoolcraft, the Indian agent for the upper lakes, was directed to lead an expedition in 1831 to settle the land issue (Krause, 1992). By 1830, Douglass Houghton was recognized as Michigan's leading geological expert and Schoolcraft asked him to be part of the 1831 expedition. Houghton's subsequent report according to Krause (1992) "represented a major step forward in understanding the nature and structure of the district." While Schoolcraft was uncertain as to the source of the copper boulders, Houghton clearly connected them to the trap-rock bedrock (Krause, 1992). After a second expedition in 1832, politics and competing interests delayed more notable studies of Lake Superior copper. After the second expedition Houghton returned to Detroit and his interest changed from practicing geology to medicine and he started a family. His medical practice quickly enhanced his reputation in Michigan and he was a leader in combating cholera (Wallin, 2004).

Michigan's First State Geologist

Michigan was admitted to Statehood at noon January 26, 1837 after it yielded the Ohio strip of land for the Upper Peninsula with the known potential of a copper district as described by Douglass Houghton in 1831-1832. The new state legislature quickly created the state geological survey on February 23, 1837 (Wallin, 2004). Douglass Houghton was appointed the first State Geologist of Michigan and in 1838 the American Journal of Science published a review commending the new State of Michigan for initiating a survey of the geology of the state by Douglass Houghton, a recognized professional (Krause, 1992). In 1839, Douglass Houghton was offered the presidency of the newly formed University of Michigan but declined and instead accepted the position of Professor (second professor at the University of Michigan) in the fields of geology, mineralogy, and chemistry, becoming the founder of these departments (Wallin, 2004; Krause, 1992). As Michigan's State Geologist, Houghton's geological surveys of 1837 to 1839 were focused on Lower Michigan.

Before beginning his 1840 geological survey, Houghton attended a scientific meeting in Philadelphia, joining the prominent geologists of the day and his attendance was recognized by the attendees (Krause, 1992). Houghton was a founding member of the Association of American Geologists and Naturalists and was later President-elect at the time of his death. The Association of American Geologists and Naturalists today is the American Association for the Advancement of Science which publishes the prestigious professional journal, Science. Houghton's professional stature would soon serve the State of Michigan well.

Douglass Houghton at Eagle River, Michigan in 1840.

Painting by Robert Thom commissioned by Michigan Bell Telephone Company 1964-1967. Used on Bicentennial post card.

Houghton's 1840 geological survey focused on the Upper Peninsula (Wallin, 2004). His copper report published in 1841 was his greatest contribution to Michigan geology (Krause, 1992) and triggered the beginning of migration to the Keweenaw Peninsula in search of copper. Houghton's national and Michigan recognition gave credibility and instant recognition to his report. While Schoolcraft previously reported on the existence of copper in the Keweenaw Peninsula a decade earlier, but Schoolcraft did not have the professional credentials, recognition or stature of Houghton.

Douglass Houghton's famous copper report of 1841 ultimately led to discovery of many profitable mines in the Keweenaw Peninsula and production of about 11 billion lbs of refined copper from 1845 to 1968. Houghton's prediction of economic copper deposits was certainly correct! The Keweenaw Peninsula hosts the Earth's largest accumulation of native copper. Unfortunately for many "adventurers," Houghton's fears also came true as there would be more failures than success in the exploration for native copper:

> "While I am fully satisfied that the mineral district of our state will prove a source of eternal and steadily increasing wealth to our people, I cannot fail to have before me the fear that it may prove the ruin of hundreds of adventurers, who will visit it with expectations never to be realized. The true resources have as yet been but little examined or developed, and even under the most favorable circumstances, we cannot expect to see this done but by the most judicious and economical expenditure of capital, at those points where the prospects of success are most favorable." (Fuller, 1928)

From 1842 to 1844 Houghton's geological surveys waned due to lack of funding although the rush to the Keweenaw Peninsula was increasing (Krause, 1992). Houghton was elected major of Detroit in 1842 despite being absent and his success at being major led people to consider him as having potential for higher political office (Krause, 1992).

One of the biggest problems in developing the mineral potential of the Keweenaw Peninsula was that there were no boundaries and no existing maps with survey lines (Molloy, 2016). In 1844 Houghton presented a convincing paper at the meeting of the Association of American Geologists and Naturalists in Washington D.C. where he proposed to do land and geologic surveys at the same time. His colleagues were so impressed that they passed a resolution of support. This resolution resulted in the federal government funding Houghton's proposed survey (Krause, 1992). In 1844 Houghton was also lauded by Michigan newspapers for of his personal geological investigations having more impact that any single person in any state (Krause, 1992). By the summer of 1845 the first mining rush in North America to the Keweenaw Peninsula was well underway. Houghton's federal geological survey began in May of 1845. However, in October of 1845, only one month after he turned 36, Douglass Houghton drowned in a boating accident in Lake Superior not far from Eagle River, Michigan.

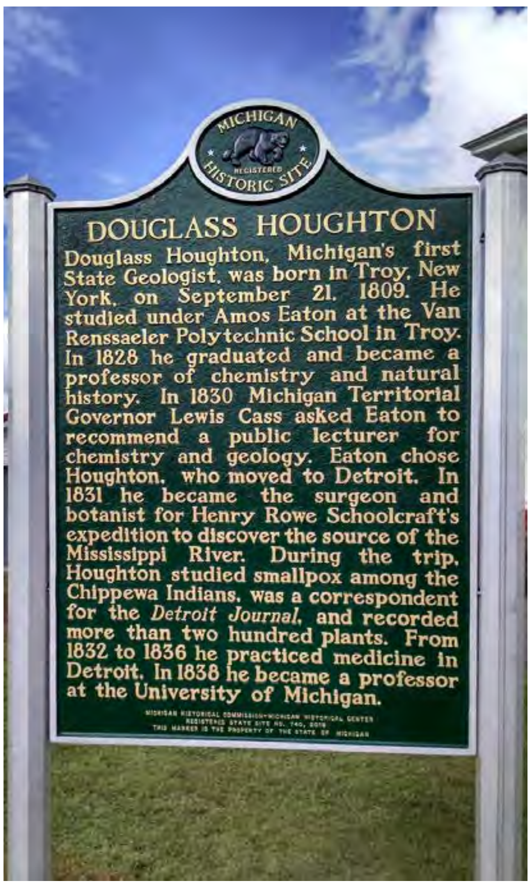
Houghton struggled to understand the significance of the predominance of native copper pebbles to boulders in glacial deposits and masses of native copper imbedded in surface outcrops in the Keweenaw Peninsula. He believed, consistent with scientific thought of the day that at depth there should be copper sulfides (Krause, 1992). While Schoolcraft initially recognized the significance of native copper he too subsequently struggled just as Houghton did. Unfortunately, Houghton died just before native copper began being produced in significant quantities from the Cliff Mine near Eagle River (Wallin, 2004). The Cliff Mine, the first modern mine in the district and produced 20,000 lbs of copper in 1845, the year of Houghton's tragic death and much more in subsequent years, totaling 38 million lbs of copper (Butler and Burbank, 1929). Schoolcraft lived to see that his initial opinion of the importance of native copper was correct.

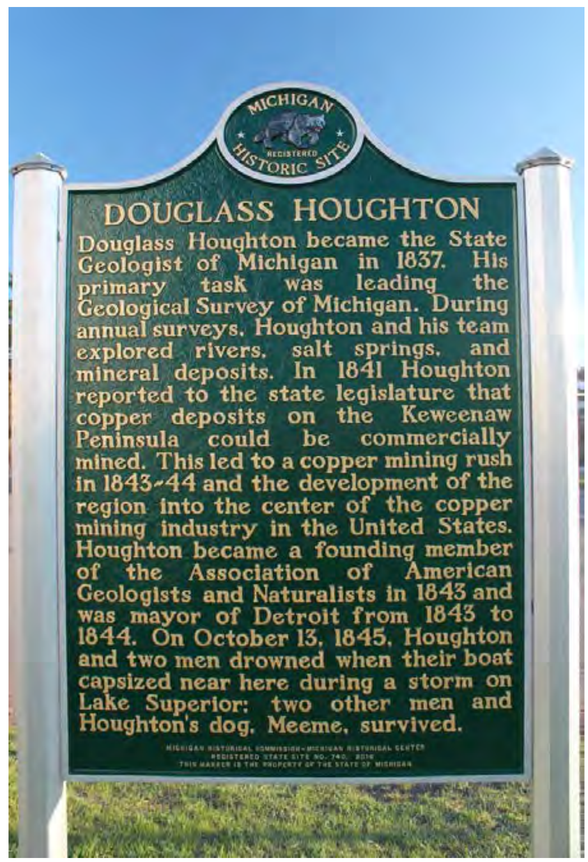
Epilogue

Monument in memory of Douglass Houghton on the west edge Eagle River., Michigan along M-26. The monument was dedicated in 1914 and is currently part of the Keweenaw County Historical Society.

Since his death, Houghton has been honored and recognized in multiple ways (see Wallin, 2004; Krause, 1992). In the Keweenaw Peninsula there are several geographic features are named after Houghton such as the City of Houghton, Houghton County, Mount Houghton, and Douglass Houghton Falls. In the lower peninsula of Michigan, Houghton Lake (the largest inland lake in Michigan) is named after him. There are monuments that recognize Houghton such as the stone monument in Eagle River, Michigan pictured above.

Douglass Houghton continues to be recognized such as in Eagle River, Michigan near the historic bridge across Eagle River and adjacent to the former Eagle River School there is an official State of Michigan historic marker which was dedicated September 10, 2016.





State of Michigan Historic Site Marker in Eagle River, Michigan

Douglass Houghton was a nationally-recognized modern professional geologist. He was among early modern geologists of the USA. He was the first official geologist of the newly formed State of Michigan. His geological investigations and copper report in 1841, about 175 years ago, led to the first mining rush in North America to the Keweenaw Peninsula of Michigan in search of riches from mining copper. Ultimately, these mines yielded 13 billion lbs of refined copper from 1845 to 1968. While the native copper mines are now all closed, Houghton's legacy lives on.

Douglass Houghton has been recognized as "Michigan's Pioneer Geologist" (Bornhorst and Molloy, 2017a; Rintala, 1954). The 63rd Annual Institute on Lake Superior Geology recognized Houghton as a "Pioneer of Lake Superior Geology."

Douglass Houghton (1809-1845)

Oil painting on board by Alva Bradish 1806-1901

University of Michigan Douglass Houghton Scholars Program [1]image: [2], Public Domain, https://commons.wikimedia.org/w/index.php?curid=6666069

Douglass Houghton's Mineral Collection

In 1838 at the urging of Henry Rowe Schoolcraft, at one of its first meetings the University of Michigan Board of Regents purchased a collection of mineral specimens from Austrian Baron Louis Lederer's, hence began the University of Michigan mineral Collection (Stefano et al, 2013). Douglass Houghton was the University of Michigan's second Professor in 1839 and he was chair of the geology and mineralogy department. Houghton prepared an exhibit of Lederer and other specimens. The University of Michigan purchased Douglass Houghton's personal mineral collection for addition to the University of Michigan mineral collection after his death (Stefano et al., 2013). In 2015, the University of Michigan mineral collection was relocated at the A. E. Seaman Mineral Museum of Michigan Tech under the Michigan Mineral Alliance. Thus, what remains of Douglass Houghton's personal mineral collection now resides in Houghton, Michigan.

There are 52 specimens attributed to Houghton in the University of Michigan mineral collection. Some of them were personally collected by Houghton while others were not. It is unlikely a specimen from Switzerland was collected by Houghton. Those specimens from the vicinity of Lake Superior were likely collected by him as were others in New York, Massachusetts, Vermont, and New Jersey as Douglass Houghton was on several expeditions n the Lake Superior region, lived and was a student in New York, and attended geological meetings on the east coast of the U.S. It is uncertain whether those specimens from Maryland, Virginia, Iowa, and Illinois, and Ohio were collected by him or otherwise obtained for his collection. Perhaps the most interesting of Houghton's specimens is an irregular mass of native copper that was likely chiseled from the Ontonagon Boulder during one of Houghton's expeditions to the Keweenaw Peninsula. By today's standards almost all of Houghton's specimens are low-quality. They are historically significant. The A. E. Seaman Mineral Museum exhibits a few of Douglass Houghton's mineral specimens.

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Copper Country Survey
Final Report and Historic Preservation Plan

Mandan *Photo by Ryan Holt*

Keweenaw National Historical Park Advisory Commission, Sponsor
Jane C. Busch, Principal Investigator
August 2013

CONTENTS

EXECUTIVE SUMMARY

The Copper Country survey is a comprehensive, reconnaissance-level survey of above-ground historic resources on the Keweenaw Peninsula. There are different definitions of the Keweenaw Peninsula; for the Copper Country survey the boundaries encompass all of Keweenaw, Houghton, and Ontonagon counties and the northwestern part of Baraga County. The cut-off date for inclusion in the survey is 1970. The purpose of the survey is to update and expand previous historic resource surveys conducted within the Copper Country region and to produce a survey report that identifies historic resources that are potentially eligible for listing in the National Register of Historic Places. In addition, the report incorporates a historic preservation plan that identifies the region's preservation needs with strategies for addressing those needs. This survey report and preservation plan is intended to guide the work of the Keweenaw National Historical Park and its Advisory Commission, preservation organizations, local governments, and others with an interest in preserving the Copper Country's historic resources.

Fieldwork began in 2009 and was completed in 2012. In consideration of the large geographic area of the survey, the district, rather than the individual resource, was adopted as the survey unit. A total of sixty-two survey districts were defined. Research and fieldwork provided the following information for each survey district: boundary description, historic and current uses, resource counts, architectural styles, materials, physical description, assessment of condition, assessment of integrity, historical themes, date span, names of architects or builders, historical overview, references, and preliminary National Register evaluation. This information is recorded in each district's database record. Survey products consist of the electronic database, maps, and photo files; sixty-two district survey forms generated from the database; two interim reports; the final survey report and historic preservation plan; and original field worksheets, field maps, and research materials. The photo files contain 1,598 photos. The final resource count was 27,646.

Seventeen historical themes were identified as significant in Copper Country history and applicable to the extant resources identified in the survey; these themes provided the context for evaluation. The themes are not equally important, however; some are more prominent in Copper Country history than others. The copper industry is the preeminent theme; it is what makes the region nationally significant. All of the other themes relate to the copper industry to a greater or lesser extent. The survey results section of this report contains a description of properties that may be eligible for listing in the National Register of Historic Places. It includes properties that may be individually eligible as well as potential districts. In some cases the description of the property is quite specific; in other cases it is more general, due to the methodology used in this survey. In all cases intensive level survey with additional research is needed to determine whether these places have the integrity and significance required for National Register listing. The survey results section includes recommended priorities for intensive level survey; places with concentrations of copper mining resources are accorded the highest priority.

The planning section of this report analyzes the framework for historic preservation in the Copper Country: the federal and state government agencies, local governments, nonprofit organizations, laws, and policies that support historic preservation activities. Stakeholders identified critical issues that affect historic preservation in the region, and goals and objectives were developed to address these issues. The five goals are:

Goal 1. Increase appreciation for historic places and awareness of the benefits of historic preservation.

Goal 2. Promote community revitalization and environmental and economic sustainability through historic preservation.

Goal 3. Build alliances and strengthen partnerships between federal and state agencies, local governments, organizations, and individuals who have an interest in historic preservation.

Goal 4. Use federal, state, and local legislation, including planning and zoning, to protect historic properties.

Goal 5. Increase financial and technical support for historic preservation, and allocate this support more effectively.

and prominent role in community life, any of these would be National Register eligible of it retains integrity; only the Kaleva Temple is currently listed. Artificial siding is a relatively minor, and reversible, change. But a hall that has been converted to a house would not be eligible, nor would a store with additions and other alterations that obscure its historic appearance. Because there are a larger number of churches, some will be more significant than others. For example, if there are three Finnish churches in a village, the one that is most intact may be preferred for National Register listing. But when a church is all that remains of a Finnish community, as is the case at Wainola, then vinyl siding is acceptable.

Saunas are numerous, but early log smoke saunas are not; therefore these early examples, some with later frame and board dressing rooms, may be individually eligible. Other saunas, along with granaries, hay barns, and other farm buildings, may be individually eligible if they display exceptional qualities of design and/or building technique. More frequently, farm buildings will contribute to an eligible farm, one that retains a full complement of farm buildings and its historic spatial arrangement along with other landscape features. Some buildings may have minor alterations as long as the majority retains integrity of design and materials. The National Register-listed Hanka Homestead, now a museum, is unusually intact, with more than a dozen log buildings built beginning in 1896. The aforementioned Johnson Farm near Pelkie is an outstanding example, but there appear to be several other Finnish farmsteads that meet these criteria.

Industry: Copper Industry

The Keweenaw Peninsula was the first major copper mining district developed in the U.S.; it dominated U.S. copper production until the 1880s. The Copper Range, the central highland of copper-bearing rock that runs lengthwise through the Keweenaw Peninsula, is unique among the world's copper mining districts in its abundance of elemental or native copper, unalloyed with other elements. Seven thousand years ago, Native Americans mined copper on the Keweenaw Peninsula and Isle Royale, digging shallow pits to mine veins of copper, which was traded extensively throughout eastern North America. When the French first visited the Keweenaw Peninsula in the mid-seventeenth century, they learned of copper from the Ojibwa. Reports of copper continued to lure French and British explorers, who made some unsuccessful attempts at mining. Beginning in 1820, expeditions led by Lewis Cass, Henry Rowe Schoolcraft, and Douglass Houghton provided additional information about copper in the Keweenaw, igniting public and government enthusiasm for copper mining. In 1842 the Ojibwa and the United States government signed the Treaty of La Pointe—the Copper Treaty—by which the Ojibwa ceded their lands on the southwestern shore of Lake Superior, including the Keweenaw Peninsula and Isle Royale.

In 1843 the federal government opened a land office at Copper Harbor, at first leasing but soon selling land to prospectors. There was much prospecting but little copper until 1845, when a large mass of copper was discovered at the Cliff mine, not far from Eagle River. The next major copper discovery came at the Minesota mine near Ontonagon in 1848. In that year Michigan (Keweenaw Peninsula and Isle Royale) copper mines produced one million pounds of copper, 92 percent of U.S. copper production.[36] In the decade that followed, the Cliff and Minesota mines led the way in profits, encouraging the opening of more mines and bringing growth to the region. Ontonagon County was the industry leader in the 1850s, with mines in the Rockland district that grew up around the Minesota mine, in the Porcupine Mountains district, in the Norwich district, and in the Greenland hills. In Keweenaw County,[37] the Central mine was second to the Cliff in profitability; other mines included the Phoenix, Copper Falls, and Delaware. In 1847 there were at least a dozen mines on Isle Royale, but all of them closed by 1855. Mining companies built housing for their employees on company land, the start of a system of paternalism that would define labor relations and employees' lives through the life of the industry.

The first generation of mines worked deposits of mass copper that formed in cracks or fissures in the rock. In the long term, however, amygdaloid and conglomerate deposits would be more productive. Amygdaloid copper was deposited in almond-shaped voids in rock formed by lava flows. Conglomerate copper was created when copper filled the spaces in beds of sedimentary rock. With amygdaloid and conglomerate deposits, stamp mills were used to separate the copper from the surrounding rock. During the 1850s, a cluster of mines opened south of Portage Lake to work amygdaloid lodes. North of Portage Lake, the Pewabic Mining Company discovered the rich Pewabic Amygdaloid lode in 1856; the Quincy Mining Company began mining the Pewabic lode that same year. About ten miles to the north of the Quincy mine, Edwin Hulbert discovered the first evidence of the Calumet Conglomerate lode, which would prove the richest lode of all. In 1850 Michigan copper mines produced 1.3 million pounds of copper, 88 percent of the U.S. total; by 1860 this had increased dramatically, to 12 million pounds of copper, 75 percent of the U.S. total. High copper prices during the Civil War led new mines to open, but many of these were marginal producers, and labor shortages limited overall production. In 1865, 14 million pounds of copper were produced, only slightly more than in 1860.[38] Many mines managed to produce some copper, but not profits. Between 1843 and 1865 approximately three hundred mining companies were created. Ninety-four of these were incorporated, but only eight of the ninety-four paid dividends by 1865.[39]

The drop in copper prices when the Civil War ended brought mine closings: the number of Michigan copper mines decreased from thirty-six in 1865 to twenty-four in 1870; by 1890 there were fifteen mines.[40] Some new mines opened as well, including a few on Isle Royale. But for Keweenaw and Ontonagon counties, the overall picture was one of decline. In contrast, copper mining in Houghton County, specifically the Portage Lake area, experienced phenomenal growth, with the Calumet & Hecla Mining Company (C&H) leading the way. In 1865 Edwin Hulbert and his investors organized the Calumet Mining Company, followed in 1866 by the Hecla Mining Company. In 1867 Alexander Agassiz took over management of the two companies, and in 1871 they merged to create the Calumet & Hecla Mining Company with Agassiz as president. Agassiz remained president until his death in 1910, wielding great influence in the Michigan copper industry. From 14 million pounds of copper in 1870 (as much

[36] William B. Gates, Jr., *Michigan Copper and Boston Dollars: An Economic History of the Michigan Copper Mining Industry* (Boston: Harvard University Press, 1951), 197.
[37] Keweenaw County was separated from Houghton County in 1861.
[38] Gates, *Michigan Copper and Boston Dollars*, 197.
[39] Lankton, *Hollowed Ground*, 18.
[40] Ibid., 64.

as the whole district produced five years earlier), C&H production grew to 32 million in 1880 and 60 million in 1890, 60 percent of the Michigan total of 101 million pounds. The number of C&H employees nearly tripled, from 1,201 in 1870 to 3,496 in 1890.[41] C&H was renowned for the capacity of its surface plant. The Quincy Mining Company was second to C&H, producing 8 million pounds of copper in 1890—8 percent of the Michigan total. The Osceola, Allouez, Atlantic, and Tamarack mining companies were also prominent. Improved technology, notably power rock drills, dynamite, and bigger and better steam engines, increased productivity at the mines. Stamp mills and a few smelters lined the shores of Portage and Torch lakes. The 1880s saw the beginnings of the electrical industry and with it an important new market for copper. That decade also saw the rapid growth of copper mining in Montana. Because of the western mines, Michigan's share of U.S. copper production decreased from 82 percent in 1880 to 44 percent in 1885 and 39 percent in 1890.[42]

Beginning in the 1890s there was a pronounced trend toward company reorganization and consolidation. The Quincy Mining Company purchased the neighboring Pewabic, Mesnard, and Pontiac mines. In 1897 the Iroquois, Kearsarge, Tamarack Junior, and Osceola mining companies were consolidated as the Osceola Consolidated Copper Company. Then in 1899 copper prices rose sharply, largely in response to a substantial increase in demand from the electrical and related industries. This led to the opening of new mines and reopening of old mines. In Ontonagon County, the Adventure Consolidated Mining Company at Greenland, the Michigan Copper Company at Rockland, the Mass Consolidated Mining Company, and the Victoria Copper Mining Company became minor producers. In southern Keweenaw County, the Mohawk Mining Company, Ahmeek Mining Company, and Allouez Mining Company all opened productive new mines. In northern Houghton County, the reorganized Wolverine Mining Company became an important producer along with the Isle Royale Copper Company south of Portage Lake. These were overshadowed, however, by the opening of the Baltic, Trimountain, and Champion mines on the recently-discovered Baltic Amygdaloid lode about six miles south of Portage Lake. By 1903 the Copper Range Consolidated Copper Company owned all three mines, and it quickly surpassed other companies in productivity, becoming second only to C&H. In 1910 Quincy accounted for approximately 10 percent, Copper Range 19 percent, and C&H 33 percent of the total production of 221 million pounds from Michigan mines, a 20 percent share of the national market. The new Copper Range mines had a distinct advantage over the older, deeper mines—rock was more difficult and expensive to extract from the deeper mines, and the ore was a lower grade. In 1906 C&H copper production reached a high of 100 million pounds; by 1910 this had dropped back to 72 million pounds. C&H countered declining yields by opening new mines and, once permitted by Michigan law,[43] purchasing controlling interest in other mining companies.[44]

The district-wide labor strike that began in July 1913 was a watershed event in Copper Country history. The costly and often violent strike ended nine months later in a victory for the mining

[41] This includes mines, mill, and after 1888, smelter. Gates, *Michigan Copper and Boston Dollars*, 208–09.
[42] Production statistics from Gates, *Michigan Copper and Boston Dollars*, 198, 230 and Lankton, *Hollowed Ground*, 125.
[43] In 1905 Michigan law was changed to allow mining companies to own stock in other mining companies.
[44] Production statistics from Gates, *Michigan Copper and Boston Dollars*, 198, 230 and Lankton, *Hollowed Ground*, 125, 137, 151–52.

companies, but it ushered in an era of chronic labor shortages and unrest. Three months after the strike ended, World War I began in Europe, and copper prices spiked due to wartime demand. In response, the region's copper production reached its peak of nearly 267 million pounds in 1916. But the market for copper collapsed after the war ended, and Michigan copper production dropped to 92 million pounds in 1921, beginning the long period of decline. Neither company consolidation nor technological advances could stem the decline, but they did slow it down. The most important new technology was for copper reclamation from the stamp sands, or tailings, in Torch Lake. C&H opened the first reclamation plant in 1915; by 1925 the plant had produced 121 million pounds of copper at about half the cost of mining new copper. Meanwhile, C&H had been buying stock in other mining companies. In 1917 it acquired the remaining stock of the Tamarack Mining Company, and in 1923 it merged with the Ahmeek, Allouez, Osceola, and Centennial mining companies to create the Calumet and Hecla Consolidated Copper Company. Following the merger, the company's share of Michigan copper production increased from about 30 percent to at least 50 percent and often more. Copper Range took an option to work the Globe mine; in 1929 it acquired the White Pine and Victoria mines and took control of the National mine, the last three in Ontonagon County. Copper production increased to 186 million pounds before the Great Depression sent it downward again, to a low of 47 million pounds in 1933. Production leveled off at about 90 million pounds in the late 1930s, accounting for 8 percent or less of the U.S. total.[45]

Copper production remained relatively steady during World War II and then dropped again to 43 million pounds in 1946. Quincy stopped mining in 1945; it operated its reclamation plant until 1967. C&H and Copper Range undertook limited mining while they diversified into other industries. Then in 1955 Copper Range began production at the White Pine mine, using new technology to extract copper from copper sulfide ore, which was unlike the native copper mined elsewhere in the Copper Country. The White Pine mine produced an average of 77 million pounds of copper a year in the late 1950s, increasing to about 122 million pounds a year in the 1960s. The final C&H shutdown in 1968 marked the end of native copper mining. Between 1843 and 1968, the Lake Superior mines produced about 11 billion pounds of native copper. By the time it closed in 1995**,** the White Pine mine had produced 4.4 billion pounds of sulfide copper.[46]

Property Types and Evaluation Standards

Mine, mill, and smelter sites represent the theme of copper mining. The most significant sites are those that retain the greatest percentage of their historic buildings, structures, and site features such as shaft openings and piles of mine waste rock. Buildings that are early, rare, or exceptional examples of their type may be individually eligible for the National Register. The eligibility of industrial buildings and structures and employee housing under National Register Criterion C has been discussed under the architecture theme. Buildings and structures may also be individually eligible under Criterion A in the area of industry. Under Criterion A, industrial buildings and structures have greater significance than employee houses, which contribute to the larger whole but are not likely to be individually eligible for industry. Buildings and structures

[45] Lankton, *Hollowed Ground*, 208, 229; Lankton, *Cradle to Grave*, 250; Gates, *Michigan Copper and Boston Dollars*, 199, 230.
[46]Lankton, *Hollowed Ground*, 2, 208, 259.

National Park Service(/)

Keweenaw Copper at War

Keweenaw National Historical Park (/kewe/)

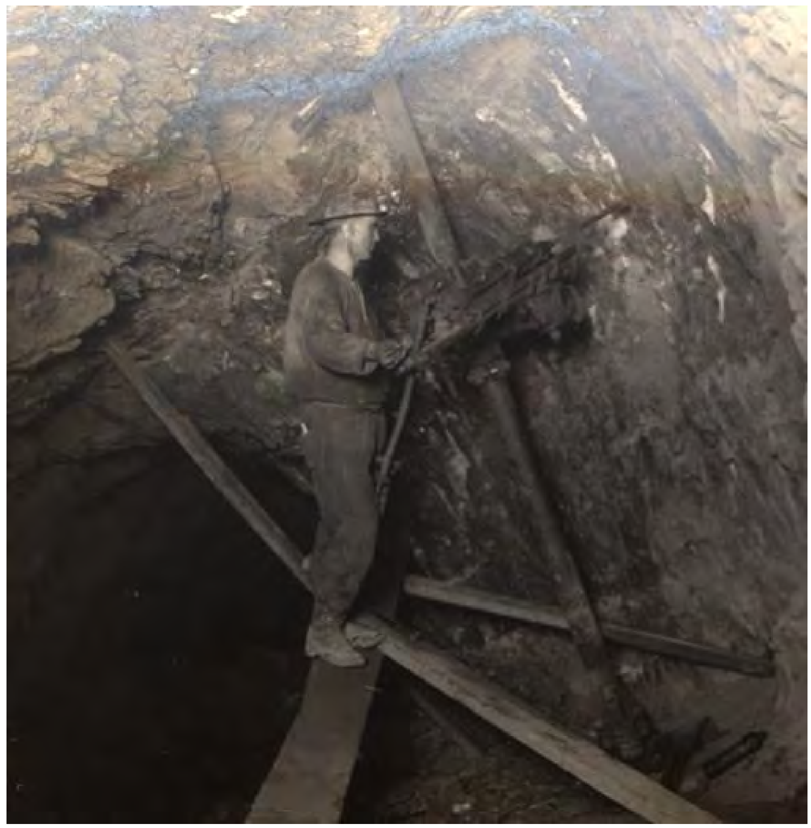
Keweenaw's pure, elemental copper - like the piece pictured here by park headquarters - was ideal for military applications.

NPS

As World War I entered its second year, the American Institute of Metals trade journal blithely remarked that "[i]t is almost impossible to kill a man in an up-to-date and scientific way without using copper." **1 (/articles/keweenaw-copper-at-war.htm#1)**

The journal was right. By 1914, copper had become an essential component of every weapon, vehicle, and piece of equipment used on the battlefield. Its ability to conduct electricity, withstand water, and transmit heat made it ideal for many different applications, as did its malleability and durability. Engineers used copper to improve weapons and develop machines that were far more deadly than those used in previous conflicts, including armored tanks and airplanes. Submarines had increased capacity and range; rifles and machine guns were more accurate than ever before.

At the time, Michigan's Keweenaw Peninsula was one of the most important copper mining regions in the United States.[2 (/articles/keweenaw-copper-at-war.htm#2)] Although it was no longer the country's leading producer—that distinction shifted to Montana and Arizona mines in the 1880s—Keweenaw copper was highly prized because it was nearly pure, elemental copper, which gave it exceptional conductive qualities. Actively mined over thousands of years by early American Indians, industrial-scale operations began in 1845, and the Keweenaw quickly became the most important copper mining district in the world. Many different companies operated along the mineral range, but they were led by two giants: the Quincy Mining Company (1846), and the Calumet and Hecla Mining Company (merged 1871). Their innovative and unique mining history is commemorated at Keweenaw National Historical Park.



Miners worked in dangerous conditions, as this image from 1910 illustrates. At the time, the United States exported most of its copper to Germany.

KHSC--Keystone--22034--Miner Drilling Copper Rock with Leyner Machine--Calumet-Hecla Mines--ca. 1910 crop (Keweenaw NHP Archives)

Germany had been the largest importer of American copper before the war, including copper from the Keweenaw. Germany relied on these imports to build its army and navy, including the unprecedented Untersee-boats that sunk merchant and passenger ships in the North Atlantic.[3 (/articles/keweenaw-copper-at-war.htm#3)] Trade with Germany ceased in 1914 when France, Britain, and its colonies (including Canada, Australia, and New Zealand) declared war, but exports to these and other Allied nations increased as they expanded their own forces and stockpiled copper for ammunition and artillery. In 1916, Keweenaw mines, mills, and smelters reported their single most productive year to date: more than 16 thousand men worked to produce 267 million pounds of copper that year alone.

To put the value of that production in a different light, a single bullet required nearly a quarter ounce of pure copper alone, and Allied forces needed a reliable supply.[4 (/articles/keweenaw-copper-at-war.htm#4)] The metal's price rose from 11.3 cents per pound at the beginning of the war to 36 cents per pound in 1917, before the United States declared war.[5 (/articles/keweenaw-copper-at-war.htm#5)] Knowing how critical copper was to Allied efforts, the government's War Industries Board negotiated price controls to stabilize the industry, which had been rocked by war-time uncertainty, fluctuating prices, and—particularly in Montana and Arizona—labor strife. At that time, Keweenaw copper became vital for mobilizing the American army and navy. Keweenaw soldiers from Company A, Michigan Engineer Corps also mobilized and deployed to France; on the way, their ship, the SS Tuscania, was torpedoed by a U-boat and sank. While 200 men were lost, all members of Company A survived. Designated part of the 1st Engineer Battalion, they formed part of the 32nd Infantry, the Red Arrow Division.

Keweenaw copper built armies and navies on both sides of World War I and became a critical component of the Allied war effort. It also left a lasting imprint on the battlefields themselves. Many former battlegrounds around Ypres, for instance, now fields and pastures, were recently discovered to have heightened levels of copper and other metals. Scientists attribute the contamination to the corrosion of unexploded ordnance, fragments of exploded ammunition, and leaking shells that have lain in the ground for 100 years. Many have defined this harmful legacy in Ypres, and other battlegrounds, as a form of collateral damage that residents continue to cope with, a century after the war ended.[6 (/articles/keweenaw-copper-at-war.htm#6)]

Soldiers from Company A marching to Calumet’s train station on June 30, 1917, bound for Europe on the SS Tuscania.

Coppertown--Box 20--[Soldiers Marching on 5th St]--ca 1917—recto (Keweenaw NHP Archives)

Notes:

1. Charles Vickers, Ed., Transactions of the American Institute of Metals, Volume 9 (Buffalo, NY: American Institute of Metals, 1916), 439. Accessed online at https://play.google.com/books/reader?id=ArxGAQAAMAAJ&printsec=frontcover&output=reader&hl=en&pg=GBS.PP1

2. See, among others, William B. Gates, Michigan Copper and Boston Dollars: An Economic History of the Michigan Copper Mining Industry (Cambridge: Harvard University Press, 1951); Larry Lankton, Cradle to Grave: Life, Work, and Death at the Lake Superior Copper Mines (Oxford: Oxford University Press, 1992); and F.E. Richter, “The Copper Mining Industry in the United States, 1845-1925,” The Quarterly Journal of Economics Vol 41, No. 2 (February 1927): 236-291.

3. Robert B. Pettengill, “The United States Foreign Trade in Copper: 1790-1932,” The American Economic Review Vol 25, No. 3: 432.

4. Christopher Capozzola, “The Only Badge Needed is Your Patriotic Fervor: Vigilance, Coercion, and the Law in World War 1 America,” Journal of American History Vol 88, No 4 (March 2002): 1336-1365.

5. Gates, 138.

6. See Eef Meerschaum et al., “Geostatistical Assessment of the Impact of World War 1 on the Spatial Occurrence of Soil Heavy Metals,” Ambio Vol 40 No 4 (June 2011): 417, accessed 29 Dec 2016, doi:10.1007/s13280-010-0104-6.

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Last updated: August 18, 2017

Michigan's Copper Country

Ellis W. Courter

Contribution to Michigan Geology 92 01

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Preface

Few people realize that Michigan's copper had a greater economic impact than the California Gold rush. "Michigan's Copper Country" lets you experience the excitement of the discovery and development of the copper industry. This publication is an attempt to acquaint the general public with the geology and history of the copper deposits of Michigan. Every effort has been made to present accurate information. The views expressed are those of the author and do not necessarily reflect the policies or practices of the Michigan Department of Natural Resources, Geological Survey Division.

The author, Ellis W. Courter, may not be well known in professional geological circles. Nonetheless, he was very well known by hobbyists in Michigan and surrounding areas. The National Rockhound and Lapidary Hall of Fame at the Pioneer Museum in Murdo, South Dakota, was dedicated in 1987 with the permanent installation of the first 26 names of deceased rockhounds and lapidaries who have had great influence on the hobby. The names engraved in the plaque were selected by the Pioneer Museum's Board of Consultants from a long list of names suggested from all parts of the country. The inductees included Ellis Courter. Ellis is listed as an officer in the Midwest Federation and American Federation of Mineralogical Societies and the Scholarship Foundation, author, and collector whose specialty was Michigan. He was also a past president of the Michigan Mineralogical Society and the award winning editor of the club bulletin the "Conglomerate," for ten years. He spent many summers researching material for this publication. Ellis died March 21, 1979.

Editing and printing a publication is not a small task. The resources needed to produce a book of this size and scope require the efforts of many people with different backgrounds. Thanks to the late Edward S. Wilson, of Westland, for making the Geologic Research, Investigations & Publications Committee of the Geological Survey Division aware of this manuscript late in 1986. There had been earlier attempts to ready the manuscript for publication before it was submitted to the Geological Survey Division. Thanks to Esther Clickner and Tyrone J. Black of the Geological Survey Division, Geologic Information Systems Unit. Esther Clickner converted the 500-plus page manuscript to the computer diskettes. Tyrone J. Black provided valuable assistance regarding style, editing and desktop publishing options, capabilities and output. Thanks to Elvin "Red" Evans, of Surface Water Quality Division, DNR, Lansing, who reviewed and edited an early version of the manuscript. Al Rarick of the Geological Survey provided a through edit of the manuscript. Stan Dyl, Curator of the A. E. Seaman Museum in Houghton added considerably to this work. A special thanks goes to the following members of the Midwest Mineralogical & Lapidary Society of Dearborn who reviewed and proofread this work: Kathryn Allen, Bill Baker Barr, Michael Cannaert, Margaret Collins, Hazel Feilen, Elspeth Gibbs, Joyce Hanschu, Norm Hanschu, Kathy Morris, Lillian Nadeau, Mary Whitman. Ellis would have appreciated all of the contributions and marveled at the automation and technology that helped bring his manuscript to press and now to the web.

It will be deemed a favor if readers will bring errors, omissions, incorrect information or other constructive comments to the attention of:

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The decline of Michigan's Copper Country was now well under way. The golden age of red metal prosperity was clearly past. The time had come for drastic readjustments if the copper industry was to survive. The cost of labor, freight rates, coal, and other supplies had all increased substantially, though, the price of copper was some 10 percent lower than it had been in 1913.

One of the obvious hopes in the Calumet area for restoring some of the lost prosperity lay in the direction of a complete integration of the Calumet companies. This had been attempted but failed a decade earlier. Consolidation made sense. It would make it possible to combine surface plants and facilities, and to allow the development of centralized smelting and milling facilities. Centralization would avoid the maintenance of duplicate shafts and hoisting. Shafts, which were bottomed at depth by the termination of property lines, yet were still in good ground, could be worked out.

It was felt that such possibilities, resulting from a single ownership, would bring about greatly reduced costs as well as a greater efficiency, and thus restore profits. Too, it would also eliminate the competition for labor, in short supply at the time because of the great exodus of workers.

Geologist knew that the northern and southern ends of the Kearsarge lode were barren. With this in mind, a plan was drafted for the consolidation. The plan would combine; the Calumet and Hecla with its immediate neighbors the Ahmeek, Allouez, Centennial, and the several properties of the Osceola Consolidated. The Isle Royale, although a controlled subsidiary of Calumet and Hecla, was not to be included. Its was too far away. However, the stock of the other Calumet and Hecla held companies; the Cliff, LaSalle, Superior, and White Pine, were appraised as part of the Calumet and Hecla assets.

Details of the plan and the relative values of the companies to be consolidated were determined by three engineers whose expertise and integrity were unquestionable. They were assisted by a committee made up of representatives from each of the five affected companies. The current assets and earnings of each company were attested to by Arthur Young and Company, certified accountants whose reputation was considered unimpeachable.

The plan called for the formation of a new company. It would be known as the Calumet and Hecla Consolidated Copper Company. The company would have an authorized capitalization of 2,500,000 shares. Each share would have a par value of $25.00 per share. Of these shares, 2,005,502 were to be issued to the shareholders of the constituent companies according to their predetermined value. The balance of the shares was to remain in the company treasury.

Surprisingly, there were no hitches in this undertaking. The directors met on August 2, 1923, approved the plan, and this was followed on September 7, by the approval of the stockholders. Three days later the new articles of association were filed and the consolidation of the companies was accomplished.

During the next few years some prosperity returned to the Copper Country. Aided substantially by the surge of good times throughout the country during the Coolidge and Hoover administrations. The price of copper held reasonably steady between 13 and 14 cents and in the boom year of 1929 climbed to 18 cents. Then, just as everyone was beginning to forget the grim post war days, came the disastrous market crash of 1929 followed by the great depression of the thirties. Once again the price of copper plummeted. This time to an all-time low of 4.75 cents a pound. This price made it impossible for any of the mines to operate at a profit. As a result there were a number of closings. Those that did remain open reduced their working time substantially to avoid a glut of copper.

Among those affected was the Quincy, Old Reliable, which after 83 years of uninterrupted operation, closed down its shafts in September of 1931. Quincy had an estimated ore reserve of 2,000,000 tons of copper. An additional 4,000,000 tons were partly developed in the lower levels. The low price of copper, coupled with the low copper content of the ore, made a profit impossible.

Not until six years later did the Quincy attempt to make a comeback. The 12,5000,000 pounds of copper it produced during the first two years of this resurrection were no match for the 22,500,000 pounds it had produced in 1910. Although the Quincy was not yet finished, its future, like its beginnings, was to be beset with many trials and tribulations.

As a result of the great depression, a wave of unemployment spread across the Copper Country. The annual Copper Country mining payroll dropped from $9,800,000 in 1929 to $3,300,000 in 1939. In 1934, 66.3 percent of the families in Keweenaw County and 37.8 percent in Houghton County were on relief. At the time this was claimed to be the highest relief load in the United States. Six years later, 37 percent of the people in Houghton County were still dependent on some form of public assistance. The future of the district, Calumet, a one industry community, was in serious trouble.

Even more portentous signs were visible. As early as 1929 the Calumet and Hecla annual reports began carrying ominous notes about the gradual deterioration of the ore at depths. The great lode was nearing the end of its life. And finally the 1932 annual report carried the fatal news of what in reality was the death warrant of the Calumet conglomerate. In sad but straight forward words it stated:

With the low price of copper, the loss attendant upon mining this lower rock is no longer justified; therefore in January of 1933 it was considered advisable to stop all work in this part of the mine and to confine production to the shaft pillars and old backs. As one of the large items in the expense of mining is that of pumping, it was decided to remove the lower pumps, together with all equipment of value and let this part of the mine fill with water.

Although this marked the end of the once rich Calumet conglomerate workings, the Calumet and Hecla Consolidated with its immense holdings was far from finished. As the thirties ran their coarse, the over abundance of refined copper on hand was gradually reduced and the economy began to brighten. In 1936 the Ahmeek mine was reopened. Attention was again directed toward reclamation of the copper in the old tailing sands. There was talk of reopening of the Lake Linden Reclamation plant and the Tamarack Reclamation plant.

Reclamation begun in 1915 and continued through the 1940s. Flotation and leaching processes were used, and the reclamation of the copper contained in the tailing sands, became a vital part of the industry. Reclamation and mining were enhanced and made profitable by the world wars, and particularly World War II. Perhaps a guiding hand in 1866 led to the building of the early Hecla, and Calumet, stamp mills on the shores of Torch Lake, not Lake Superior. A Lake Superior site would present many problems. In all likelihood the rugged winter storms would have washed away much of the sands. What sand was not washed away would become contaminated with barren lake sand. Of course little was it realized at the time that the day would come when they would be of such vital importance to the future of the industry. The location had been selected because Torch Lake provided an adequate supply of water for the mills and plenty of room for the disposal of the tailings. Too, the adjacent land was relatively flat and quite suitable for building purposes.

Before the reclamation work was begun, the tailings covered an area of over 150 acres and offshore reached a depth of 120 feet. Reclamation of the earlier sands dumped nearer the shore when the mills were lacking in efficiency, eventually produced 20 pounds of copper per ton of sand. Tailings from the later days which were farther offshore and derived from a more efficient mill operation gave up about 9 pounds of copper per ton of sand.

After the shutdown of the conglomerate workings, Calumet and Hecla explorations for new sources of copper were spurred on at a greater pitch than ever. A considerable amount of diamond drilling was done beyond the nearly worked out areas of Houghton and Keweenaw counties. Although most of this work was unproductive, two areas between the Allouez and the conglomerate did look promising. One of these was an amygdaloid lode, the Iroquois, and the other was in the Houghton conglomerate. Eventually, two new mines were brought into production on these lodes.

In 1939 the problems of organized labor returned to the Copper Country. This time it was the International Union of Mine, Mill, and Smelter Workers, CIO. Finding a fertile field among the smaller companies that were paying lower wages than the Calumet and Hecla, the union was able to conduct a successful membership drive. Workers at the Copper Range mines were brought into the fold during this first year of organizing. By 1941 both the Quincy and Isle Royale workers were operating under a CIO contract. It was not until a year later, however, that the Calumet and Hecla workers were unionized.

The advent of organized labor marked the beginning of new troubles for all the Copper Country mines. Just as soon as the union had been certified as the bargaining agent for the miners, its demands for increased wages began to present insurmountable problems. For instance, the Quincy at the time was operating under an informal agreement made between the government and the producers. The agreement stabilized the price of copper at 11.8 cents per pound. By no means was this a sugar coated plum and it certainly was not enough to cover the demands for the increased wages made by the union. Accordingly, when these demands were not met, the Quincy workers voted in February of 1941 to go on strike. Further negotiations, however, resulted in a 90 day truce while an appeal was made to the government for an increased subsidy that would satisfy both labor and management. This led to a new agreement whereby the government's Metals Reserve Company would purchase Quincy copper at 15 cents a pound. Temporarily, this calmed the situation. Later in October, a cost plus contract was given to Quincy which allowed a dollar a day increase to the miners and a profit of 1 cent a pound to the company.

In 1942 the Japanese attacked Pearl Harbor and the United States became directly involved in the war. As a result, a premium price plan on copper was effected by the government. It allowed a 5 percent premium on all copper produced over the 1941 production. Satisfying as this appeared, it only brought about more union problems. The workers demanded still higher wages to equal those being paid to Calumet and Hecla workers.

In 1943, the war labor board ordered substantial wage increases for all the copper miners. At the same time a new metals reserve contract with a complicated profit formula was drawn up. It was made retroactive to the first of the year. Shortly after the war ended this special price support was withdrawn. The Quincy was faced with the return of the old premium price plan which meant a flat 17 cents a pound for its copper. With the increased labor costs which had been imposed upon the company, this was not enough for a workable margin of profit. In September of 1945, the Quincy closed again. It resorted to the more profitable reclaiming operations, but the end of the tailings came in the 1960s. The tailings accounted for millions of pounds of copper. Reclamation had extended the working life of the company for more than twenty years.

Though the Quincy mines are now closed and many of its shaft and rock houses gone, the company still lives on as a going concern. It owns 4,300 acres of land in the center of Michigan's Copper Country and has three large buildings in New York. It still maintains an efficient supervisory management. On occasion it has excited Copper Country diehards into believing that the time might come when the Old Reliable would be resurrected.

At Calumet and Hecla, the outbreak of World War II and the Korean conflict brought about a flurry of activity. With the conglomerate mine already closed and the end of the tailings not too far away, there was a dire need for supplemental production. Accordingly, the North Kearsarge was rehabilitated and worked to the fullest extent, and the work at the Peninsula was speeded up at depth. A lease with Copper Range was effected for the operation of the Douglass to the south of the Ahmeek. Work on the newly discovered lodes, the Iroquois and the Houghton, was pushed and the mines brought into production. A project to dewater the old Centennial and hopefully reactivate it as a producing mine was set up under a government contract which guaranteed against a capital loss.

These measures, to some extent, were successful. However, they did not offset the drop suffered some two years later when the conglomerate tailings were finally exhausted. Production plunged from 52,000,000 pounds of refined copper to slightly under 4,000,000 pounds. Once again the giant of the Copper Country was staggering.

As the Calumet and Hecla crews began dewatering the old Centennial No. 3 shaft, it became an important factor in the future of the area. In a nostalgic sense, it became a glance into history, a graphic illustration of how mining was carried on before the turn of the century.

The Centennial had been idle since 1897 when the Centennial Mining Company abandoned its shafts as being unprofitable. History lay buried beneath the water. As the water receded, the old workings told their story better than it could be told on the yellowing pages of some old mining record.

The first five levels of the old shaft told of the hand drilling days when mining was a craft, almost an art. The work was slow and tedious, yet the evenly cut rock revealed the precision with which the miners worked. Below the fifth level came the evidence of mechanization. With drills operated by compressed air, the miners drilled deeper holes and accomplished their work faster. But the walls were more uneven and the drifts no longer appeared like carefully chiselled tunnels.

At this time in history, the lives of the miners underwent a change. Their job became easier. With better tools they could produce more, and so earn more. One might imagine, though, that some of the old timers were almost sorry at first. Undoubtedly they took great pride in the precision with which they drove a length of steel into the rock and placed the explosive. Progress in a large measure had destroyed their craft.

The change in the drilling method was further evidenced by old pieces of drill steel. The hand held steel was short, not more than two feet long, with a chisel bit. The machine steel was longer with a cross bit.

The early mining methods did not include leaving pillars of supporting rock in the stopes, and so considerable timbering was done. White pine logs as much as three feet in diameter were used. Plats in some places were timbered with hand hewn pine that was 24 inches square. Occasionally these were doubled for extra support. In later mines most of the plat timber was cut ten inches square. Only occasionally were pieces cut twelve inches square. Planks 24 to 36 inches wide were commonly used for converting plat sand to divide the compartments of the shaft. Planks of this size soon became a rarity and were not found at all in the later mines. Their presence in Centennial No. 3 reflects the magnificence of the timber stands that once thrived throughout the Keweenaw peninsula. The giant trees have disappeared along with the huge planks they made possible.

On the third level there was evidence that the early operators had an eye for cross cutting. Apparently they avoided the trouble and also the expense of hauling all of the poor rock to the surface, for here there was a space under the shaft. A small tram car, a quarter of the 7.5 ton cars used later, was pushed under the shaft to dump poor rock into it. The car was trammed by hand and apparently this poor rock was dumped and left in the old stopes.

Several pieces of equipment were found along the drifts as well as personal effects belonging to the miners. In most cases much of this material was too badly rotted to bring to the surface. Among the interesting items were the bowls of old clay pipes smoked by the early Cornish miners, a copper-toed boot, ends of tallow candles, and a hat of the type to which the candles were attached. Also found were two completely wooden wheelbarrows, probably used for certain tramming jobs, and a wooden skip. The stem of an old Cornish water pump was also discovered. These pumps, which passed from the scene early in the history of the district, were worked by engines on the surface. A long shaft containing a piston extended underground and the water was raised to the surface by the piston.

And so Centennial No. 3, the scene of a project that hopefully would improve the future of the district, gave up its relics and memories of the past. Perhaps a part of tomorrow may also be waiting there. Unfortunately, labor problems were coming. These difficulties would bring the entire Copper Country to its knees. It also would put it completely out of the copper business. The turmoil laid to rest the Calumet and Hecla plans before the old mine could be brought into production.

The last few years of Calumet and Hecla existence were mostly bleak ones. Dark and desultory, these were years beset with rising costs and a series of obdurate labor-management disputes. The Korean conflict caused a temporary return of 45 cents per pound for copper. This stimulated a mild boom. The boom was restricted because of tight government controls. Too, the constantly increasing costs accelerated by the union's persistent demands for annual wage increases and greater fringe benefits for the workers, left much to be desired. And so as the going became rougher, no longer could the company do as much for the people as in the days of old. Mostly it was forced to say no to those who came along with

Timeline of Michigan Copper Mining Prehistory to 1850

Colton's 1872 Lake Superior Map

Partial serpent artifact made of Lake Superior copper found at Effigy Mounds National Monument, Iowa.

NPS Photo

7,000 years ago
The earliest known metalworking in North America begins when Native peoples start mining copper on the Keweenaw Peninsula. Digging pits and using heavy stones to break waste rock away from copper masses, they fashion bracelets, beads, tools, fishhooks and other items for trade. Objects made of Keweenaw copper have been found in archeological sites across the continent.

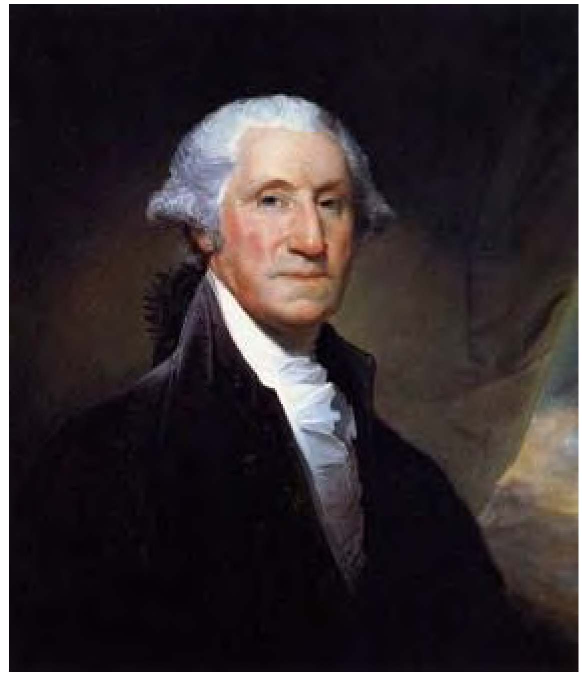
1771
Alexander Henry makes the first English attempt to mine copper on the Keweenaw Peninsula near the Ontonagon River. At the time, the nearest English settlement is nearly 300 miles away at Sault Saint Marie and the region is completely undeveloped and mostly unmapped. Poor planning cripples Henry's adventurous spirit, and in the spring of 1772 his mine collapses after producing little copper.

"The copper ores of Lake Superior can never be profitably sought for but local consumption. The country must be cultivated and peopled before they can deserve notice."
-Alexander Henry 1772

1776
Delegates to the Continental Congress convene in Philadelphia and on July 4, 1776, adopt the Declaration of Independence.

1789

George Washington is elected president of the United States in a vote by state electors. The U.S. Constitution goes into effect, after being ratified by nine states.



George Washington by Gilbert Stuart
Metropolitan Museum of Art, New York

1801

Paul Revere, who would later be made famous in H. W. Longfellow’s poem "Paul Revere's Ride," creates the Revere Copper Company, the first copper rolling mill in America. This Massachusetts-based company specializes in copper roofing and sheathing for ships. The limited U.S. supply of copper forces Revere’s company to import most of its metal.

Paul Revere by John Singleton Copley
Museum of Fine Arts, Boston

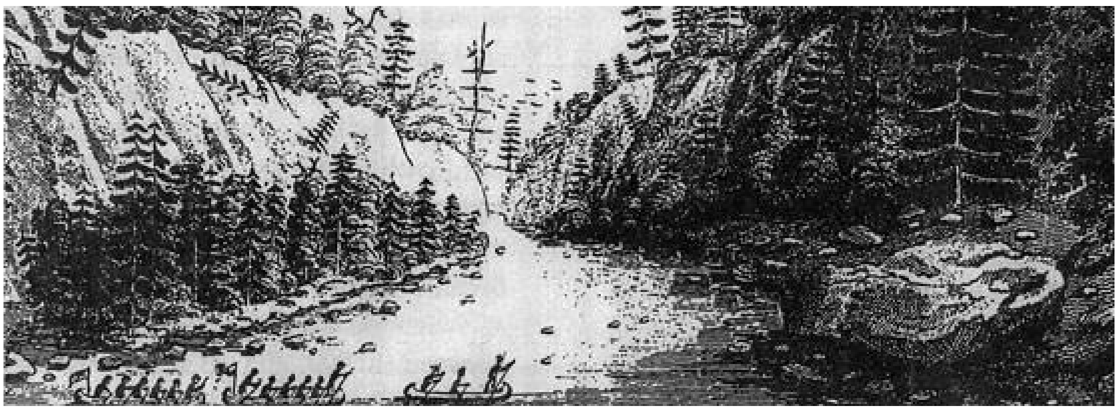
1803

The United States agrees to pay France $15 million for the Louisiana Territory, which comprises about 830,000 square miles and extends west from the Mississippi River to the Rocky Mountains. The addition nearly doubles the size of the country and includes rich copper deposits in the area now within the state of Montana.

1820

While leading an expedition through the Upper Peninsula, Michigan Territorial Governor General Lewis Cass visits the Ontonagon Boulder, a large piece of float copper along the Ontonagon River.

"One cannot help fancying that he has gone to the ends of the earth, and beyond the boundaries appointed for the residence of man."
- Henry Schoolcraft, describing
the Keweenaw Peninsula in 1820



Despite Douglass Houghton's description of the Ontonagon Boulder as "a mere stone, a large pebble," Henry Rowe Schoolcraft's illustration greatly exaggerated the real size of the boulder, making it larger than a six-man canoe.

1837

Michigan becomes the 26th state admitted into the Union. The Upper Peninsula is added to Michigan after the state relinquished its claim to land around Toledo, Ohio.

1840

Douglass Houghton, state geologist of Michigan, publishes a report on the geology of the Upper Peninsula and describes the Keweenaw's copper deposits. Despite his appeal for caution, a land rush would soon start as investors, miners and entrepreneurs attempt to acquire copper-rich real estate.

1842

The Ojibwe sign the Treaty of La Pointe ceding their mineral-rich lands in the Upper Peninsula to the United States.

1843

The United States Government opens a mineral land agency office in Copper Harbor.

1844

The Pittsburgh and Boston Mining Company begins mining near Copper Harbor. The operation is abandoned in 1845 after a $28,000 investment, but only $2,968 returned. Though the company produced little copper, it was the first serious American mining attempt.

Sale of copper wire leaps after the message "What hath God wrought" is sent by telegraph from Washington to Baltimore on May 24th, ushering in the electronic communication era. By 1846, iron wire replaces copper due to its greater tensile strength and lower maintenance costs.

1845

The Cliff Mine near Eagle River opens. It is the first large-scale, profitable mine on the Keweenaw Peninsula. Before it closes in 1870, Cliff Mine rewards its investors with $2,519,000.

The town of Clifton and Cliff Mine in Keweenaw County in the late 1800s.

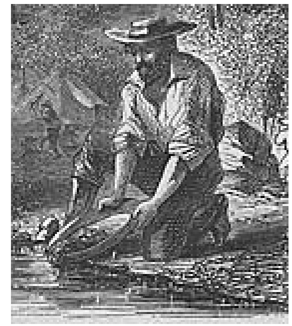
Keweenaw NHP Archives, Jack Foster Collection.

1846

The Portage Mining Company and the Northwestern Mining Company resolve a land lease dispute by forming the Quincy Mining Company. After exploring the hillside above Portage Lake, the company digs its first shaft in 1848.

1848

On January 24, gold is discovered at Sutter's Mill in California. The Gold Rush will reach its height in 1849



Panning on the Mokelumne

Harper's Weekly, 1860

1851 to 1900 ›› (/kewe/learn/historyculture/copper-mining-timeline-page-2.htm)

Last updated: December 18, 2018

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Timeline of Michigan Copper Mining 1851 to 1900

Mine workers pose outside the Hecla Mining Company #3 rock house in 1878.

NPS Photo

1852

Cliff Mine in Keweenaw County installs a 45-ton steam engine for stamping rock and pumping water out of the mine. While this increases output, miners still have to climb nearly 1,000 feet of ladders to get in and out of the mine. Once underground, they work in teams of three, boring holes into rock with only a drill bit and hammers. Drill holes are filled with black powder and exploded to clear waste rock away from the copper masses.

The **Washington Monument (https://www.nps.gov/wamo)** in Washington D.C. receives a memorial stone from the state of Michigan composed of 2,180 pounds of native copper and silver. The copper for the stone comes from Cliff Mine.

Kathleen Harter

1855

With the opening of the St. Marys Falls Ship Canal (today known as the Sault or **Soo Locks**

(http://www.lre.usace.army.mil/newsandevents/publications/publications/soolocks-saultste-marie/)) ships can now travel directly from harbors on Lake Superior to ports in Chicago and Detroit.

1856
The Quincy Mining Company begins work on the profitable Pewabic lode. Quincy soon becomes an important copper mine, and earns the nickname "Old Reliable" for its nearly constant profits.

1858
Surveyor Edwin J. Hulbert finds an ancient copper cache that leads him to the mineral-rich Calumet conglomerate lode. By 1864, he secures financing for two mining companies: the Calumet Mining Company and the Hecla Mining Company. Hulbert is replaced by Alexander Agassiz in 1867 who will serve as president of the consolidated company until his death in 1910.

1861
The Confederate attack on Fort Sumter, South Carolina starts the American Civil War. Demand for brass buttons, copper canteens and munitions increases. Despite the need, copper production at many older and profitable mines in the region actually decreases as new, speculative mines open, causing labor shortages.

1865
After four long years and the loss of over 600,000 lives, the Civil War ends with the surrender of Confederate general Robert E. Lee to Ulysses S. Grant at Appomattox Courthouse, Virginia. Copper prices fall as demand wanes at the war's end.

"The value of the mines, both Calumet and Hecla is beyond the wildest dreams of copper men, but with the kind of management many of the mines have had, then even if the pits were full of gold, it would be of no use."
-Alexander Agassiz 1867

1871

The Calumet & Hecla Mining Company forms after the Calumet and the Hecla mining companies merge. In just one year, C&H produces 16.2 million pounds of copper and pays $2,400,000 to its stockholders.

1876

"Mr. Watson, come here, I want to see you," heralds Alexander Graham Bell's successful telephone experiment. Two years later, the first North American telephone exchange, which uses copper wire, opens in New Haven, Connecticut.

1879

New technologies are sought to make mining easier. The Rand drill, powered by compressed air, is introduced and adopted at most mines. Until now, most miners still drilled by hand. Nitroglycerin explosives begin replacing black powder.

This 1875 photograph shows a team of three miners drills holes in the rock by hand.

NPS Photo

1887

The discovery of copper at a silver mine near Butte, Montana in 1881 transforms the small, poor town into "the richest hill on Earth." By 1887, Montana mines, such as the Anaconda, are consistently exceeding Michigan mine production.

1895

On September 7th, a fire breaks out in C&H's Osceola mine, spreading more quickly and producing more smoke than workers anticipate. The fire claims the lives of 30 men and boys.

While this remains the deadliest single accident in the history of Keweenaw mining, men continue to be killed or seriously injured from cave-ins, misfired explosions, and other mining accidents almost daily.

NPS Photo

1899

As more American homes are lighted and run on electricity demand for copper wire jumps. U.S. copper consumption increases by nearly one third in a single year.

Extravagant displays of electric lights became a feature of public events, such as in this picture from the 1897 Tennessee Centennial Exposition.

‹‹Prehistory to 1850 (/kewe/historyculture/copper-mining-timeline.htm) 1901 to 1950›› (/kewe/learn/historyculture/copper-mining-timeline-page-3.htm)

Last updated: October 6, 2016

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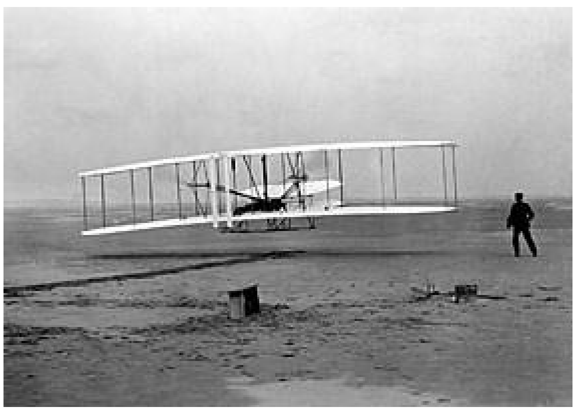
Timeline of Michigan Copper Mining 1901 to 1950

People fill the streets of Red Jacket (Calumet) during the 1909 July 4th celebration.

Adolf LaMuth Collection, Courtesy of Jim LaMuth



1903
On December 17th, at Kitty Hawk, North Carolina, Orville Wright pilots the Flyer for 120 feet into a freezing headwind. The achievement marks the first sustained powered flight in a heavier-than-air machine.

1913
On July 23rd, backed by the Western Federation of Miners, workers strike after company managers refuse to discuss demands for better pay and working conditions. A chief concern is the introduction of a "one-man" drill which will shrink the workforce. The Michigan National Guard arrives in the Copper Country to maintain order.

The horse-mounted unit of the Michigan National Guard assembles in Agassiz Park in Calumet during *the 1913-14 Strike.*

Keweenaw NHP Archives, Jack Foster Collection

A shout of *"FIRE!"* causes a panic during a Christmas Eve party at the Italian Hall in Calumet. The crowd rushes down the steep stairway to the doors. Unable to exit fast enough, those at the bottom are crushed by those on the top. Though there was no fire, 74 people, including 60 children, die in the calamity.

1914

Marked by episodes of violence and public division, the strike ends in April, almost a year after it began. Workers return to the mines on the companies' conditions. Though the companies feel victorious, copper mines in the Western U.S. are now established as the primary domestic copper producers.

The murder of Archduke Franz Ferdinand, heir to the Austro-Hungarian throne, starts a series of events that leads to World War I. A drop in copper prices at the start of the war causes mines to reduce their work forces or close. By the time the United States enters the war in 1918, the need for parts for vehicles, planes, ammunition, and shell casings raises prices and increases production, but the prosperity is only temporary.

Henry Ford offers a $5 per day wage, which more than doubles the pay of most of his workers. The move proves extremely profitable: instead of constant turnover of employees, experienced workers such as mechanics flock to the Ford Motor Company, raising productivity and lowering training costs.

1920

Quincy installs the largest steam hoist in the world to haul rock out of the mine. As copper prices remained low and mines had to dig deeper, technological fixes were relied on to try and reduce production costs and keep the mines going.

Women receive the right to vote in the U.S. after 36 of the 48 states ratify the Nineteenth Amendment to the U.S. Constitution.

1929

By the closing bell on October 29, known as Black Tuesday, the Wall Street Stock Market loses $14 billion in value, bringing the loss for the week to $30 billion - ten times more than the annual budget of the federal government at the time. Many industries, including area copper mines, close during the Great Depression that follows. Even with relief efforts sponsored by the federal government, the downturn in industry persists until the outbreak of World War II in 1939.

1933

After over 80 years of activity, Quincy Mining Company temporarily closes down. With little demand and low copper prices, other Keweenaw companies also suspend operations or dissolve. Only C&H and the Copper Range Mining Company continue underground mining. After copper prices rise in 1937, Quincy will resume mining at shafts No. 6 & No. 8.

1938

President Franklin D. Roosevelt signs the Fair Labor Standards Act. The law establishes a national minimum wage, guarantees time and a half for overtime in certain jobs, and prohibits most employment of minors in “oppressive child labor.”

1939

In September, Germany invades Poland, beginning World War II.

German troops parade through Warsaw, Poland on

October 5, 1939.

1941

On December 7th, Japan launches an unexpected attack on Pearl Harbor. On December 8th, the U.S. enters World War II after declaring war on Japan. Copper is placed under price controls to prevent war profiteering. Four companies on the Keweenaw Peninsula continue mining but they are only able to cover costs.

The USS California sinking at Pearl Harbor, December 7, 1941.

1945

Quincy, the oldest active mine in the Keweenaw, stops mining operations after a government contract for copper expires and the demand for copper for war purposes ends. Soon only C&H and Copper Range remain.

A row of vacant company houses in Lower Pewabic Location leads to the closed #2 Shaft-rockhouse at Quincy Mine.

1941 John Vachon photograph. Courtesy of the Library of Congress

Allied countries declare Victory in Europe on May 8. The war continues in the Pacific until the United States drops atomic bombs on Japan, first on Hiroshima on August 6, and then on the port city of Nagasaki on August 9. Japan surrenders on August 15. Estimates for the total casualties of the war vary, but most suggest that some 60 million people died, including about 20 million soldiers and 40 million civilians.

‹‹1851 to 1900 (/kewe/historyculture/copper-mining-timeline-page-2.htm) 1951 to Present›› (/kewe/learn/historyculture/copper-mining-timeline-page-4.htm)

Last updated: October 6, 2016

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(//www.nps.gov)
National Park Service
U.S. Department of the Interior

Timeline of Michigan Copper Mining 1951 to Present

An abandoned shaft-rockhouse meets its fate in January 1966.

Keweenaw NHP Archives, Jack Foster Collection

1955

Copper Range opens the White Pine Mine, which mines copper sulfide instead of native copper. After working through the difficulties presented by this different kind of mine, White Pine becomes the major producer of copper in Michigan.

1968

C&H closes. Since the Korean War, C&H's profits from its mines were small, but it continued to keep some small operations open while waiting to find another big lode. Earlier this year C&H was bought out by Universal Oil Products.

Between the mid-1840s and 1968, Keweenaw Peninsula mines produced an estimated 10.5 billion pounds of copper.

Scrap machinery and parts lie outside the closed Calumet & Hecla Foundry.

Keweenaw NHP Archives, Jack Foster Collection

"The company had been going for over a hundred years, and the workers just didn’t feel like they would possibly shut it down. I think we had something like fourteen hundred people on our payroll at that time. But when you can’t make a profit, it’s the only alternative that you have."

- Director of Geology, Randall Weege, describing the 1968 closure of C&H

1969

On July 20th, astronauts Neil Armstrong and Buzz Aldrin are the first humans to step onto the surface of the Moon.

1986

The Environmental Protection Agency places several sites along Torch Lake and the Quincy Smelter on the National Priorities List, making them eligible for cleanup through the Superfund program. For nearly 100 years, copper company mills and smelters produced mill tailings (also known as stamp sands) containing metals that contaminated the lake sediments and shoreline. About 200 million tons of tailings were deposited in Torch Lake alone, displacing about 20 percent of the lake's original volume. Remediation of the environmental impacts will begin in 1998 and continue until 2004.

Both C&H and Quincy mining companies used the dredge to reclaim copper from stamp sands dumped into Torch Lake. It was abandoned when Quincy closed.

NPS Photo/Dan Johnson

1992

With his signature of approval on October 27, 1992, President George H.W. Bush creates Public Law 102-543, establishing Keweenaw National Historical Park.

... to preserve the nationally significant historical and cultural sites, structures, and districts of a portion of the Keweenaw Peninsula in the State of Michigan for the education, benefit, and inspiration of present and

future generations.

- from Public Law No: 102-543

1997

The White Pine Mine in Ontonagon County suspends underground operations, closing the last industrial copper mine on the Keweenaw Peninsula.

2006

Kennecott Minerals Company submits a permit to mine a nickel and copper deposit located in Michigamme Township, about 25 miles northwest of the city of Marquette.

The growing economies of China, India and other industrializing nations, raises the demand for and price of copper.

‹‹1901 to 1950 (/kewe/historyculture/copper-mining-timeline-page-3.htm)

Last updated: April 10, 2015

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Why is there so much native copper in Michigan?

Each year many rockhounds, travel to the Keweenaw Peninsula of Michigan to collect copper, silver, datolite, etc. This peninsula contains the most famous outcrops of the volcanic rocks of the Keweenawan rift, which extends south to Taylor's Falls, and north to Duluth and Thunder Bay. In the years between 1845 and 1968 Michigan's Keweenaw Peninsula produced over $1 billion worth of copper. Why is there so much copper in Michigan and relatively little in similar rocks throughout Wisconsin and Minnesota?

The copper of the Keweenaw Peninsula occurs in the rocks of the Portage Lake volcanics, a sequence of over 200 lava flows forming a volcanic pile over 11,000 feet thick. This old volcanic pile has been lifted up along a large fault along the southeast side of the peninsula, so that the lava flows tilt toward the northwest. As one walks from northwest to southeast one goes from lavas that were not deeply buried to those thatwere buried under thousands of feet of hot lava. The deeper the burial, the more the rocks have changed mineralogical and chemically by processes geologists call burial metamorphism. This also controls where the copper occurs. The copper specifically is found in the broken up tops of lava flows, in conglomerate beds deposited by rivers active between volcanic eruptions or in veins along faults that cut across the lavas. The copper came from the lower part of the volcanic pile where hot fluids active during burial metamorphism leached out scattered copper. These fluids then deposited the copper higher in the pile along zones where the fluids moved and cooled.

The burial metamorphism produced minerals other than copper. Where the lava flows are not so deeply buried (less than 2,000 feet) zeolites such as laumontite form. Below this, zeolites are not stable and break down. Prehnite and pumpellyite become the dominant minerals that form from about 2,000 to 8,000 feet. When the lavas were buried deeper than 8,000 feet, epidote is dominant and prehnite and pumpellyite become increasingly rare. On the Keweenaw Peninsula the fluids preferentially deposited the copper in the prehnite-pumpellyite zone. The temperatures in that zone were apparently such that the fluids become saturated in copper.

The rocks on Lake Superior's North Shore are full of zeolites, meaning that we are not seeing very deeply into the volcanic pile. The prehnite-pumpellyite zone and presumably any major copper deposits are thus buried a thousand feet or more below the surface. In the Taylor Falls area, we are deep into the epidote zone, with no prehnite or pumpellyite. If there were large copper deposits in these rocks they were in lava flows long since eroded away.

So, it is not enough just to find Keweenawan-age lava flows. One has to find flows that experienced the right degree of burial metamorphism and interacted with the right composition of fluids. If it wasn't for having to little erosion-or too much-we might not have to drive all the way to the Keweenaw Peninsula for copper, silver, prehnite, pumpellyite or datolite.

- Dr. Bill Cordua, University of Wisconsin-River Falls

Hancock, Michigan
October 8, 1953

Mr. H. R. Puffer
Bridge Engineer
Michigan State Highway Department
Lansing, Michigan

Dear Sir:

Re: Bl of 31-10-1
Houghton-Hancock Swing Span

Attached please find a summary of a log kept by the bridge operators on the above mentioned bridge. This log was started last May 9, 1953, and is being continued. It is being submitted to your office for your review, as possible matter for the forthcoming public hearing scheduled for October 15, 1953. The sheets are carbon backed for possible printing, if you should wish to use same.

This is being submitted as per a 'phone conversation with C. H. Voss on October 7, 1953.

Yours very truly,

MICHIGAN STATE HIGHWAY DEPARTMENT

J. F. Oravec

J. F. Oravec
District Bridge Engineer

JFO-ack

Enc.
Summary of Log

cc: C.F.Winkler

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(k)

**SUMMARY OF A LOG
SHOWING NUMBER OF OPENINGS, DELAY
TIME, NUMBER OF VEHICLES DELAYED AT
THE HOUGHTON - HANCOCK BRIDGE.**

- - - - - - - - - - - - - - - - - -

Explanatory Notes: Taken from a log kept by the operators of the swing span. Log is in the possession of The Copper Range Railroad Company. Delay time as recorded is the time between the closing and opening of traffic gates.

Compiled by: J. F. Oravec
District Bridge Engineer

10-8-53

MAY 1953

DATE	TIMES OPENED	MAX. TIME DELAY PER OPENING	MIN. TIME DELAY PER OPENING	DAILY TOTAL TIME DELAY	MAX. VEH.* DELAYED PER OPENING	MIN. VEH. DELAYED PER OPENING	DAILY TOTAL VEH. DELAYED
5/9/53**	1	6 Min.	6 Min.	6 Min.	30	30	30
5/10/53	3	14 Min.	6 Min.	58 Min.	110	30	420
5/11/53	3	13 Min	11 Min.	37 Min	175	90	440
5/12/53	None						
5/13/53	None						
5/14/53	None						
5/15/53	2	10 Min.	7 Min.	17 Min.	120	61	181
5/16/53	3	9 Min.	7 Min.	24 Min.	124	83	317
5/17/53	2	9 Min.	7 Min.	16 Min.	40	30	70
5/18/53	3	15 Min.	7 Min.	29 Min.	70	10	175
5/19/53	3	12 Min.	5 Min.	23 Min.	100	30	175
5/20/53	1	7 Min.	7 Min.	7 Min.	70	70	70
5/21/53	2	14 Min.	9 Min.	23 Min.	95	40	135
5/22/53	5	12 Min.	4 Min.	41 Min.	70	15	219
5/23/53	2	13 Min.	8 Min.	21 Min.	80	70	150
5/24/53	2	6 Min.	4 Min.	10 Min.	115	57	172
5/25/53	None						
5/26/53	1	5 Min.	5 Min.	5 Min.	30	30	30
5/27/53	6	13 Min.	4 Min.	36 Min.	70	8	208
5/28/53	5	5 Min.	4 Min.	22 Min.	55	20	185
5/29/53	1	3 Min.	3 Min.	3 Min.	25	25	25
5/30/53	2	12 Min.	11 Min.	23 Min.	75	50	125
5/31/53	1	4 Min.	4 Min.	4 Min.	80	80	80
TOTAL FOR MONTH	48			6 Hr. 45 Min.			3227

VEH* - Vehicles. Includes Auto, Truck and Bus.
5/9/53** - Log started on May 9, 1953.

JUNE 1953

DATE	TIMES OPENED	MAX. TIME DELAY PER OPENING	MIN. TIME DELAY PER OPENING	DAILY TOTAL TIME DELAY	MAX. VEH. DELAYED PER OPENING	MIN. VEH. DELAYED PER OPENING	DAILY TOTAL VEH. DELAYED
6/1/53	4	14 Min.	4 Min.	28 Min.	100	40	287
6/2/53	4	16 Min.	7 Min.	44 Min.	100	5	281
6/3/53	1	7 Min.	7 Min.	7 Min.	55	55	55
6/4/53	4	5 Min.	4 Min.	17 Min.	60	30	180
6/5/53	3	13 Min.	5 Min.	23 Min.	55	30	135
6/6/53	2	5 Min.	5 Min.	5 Min.	95	95	95
6/7/53	8	9 Min.	4 Min.	43 Min.	75	45	463
6/8/53	1	12 Min.	12 Min.	12 Min.	75	75	75
6/9/53	2	10 Min.	6 Min.	16 Min.	70	35	105
6/10/53	2	13 Min.	5 Min.	18 Min.	75	50	125
6/11/53	3	10 Min.	6 Min.	23 Min.	100	50	225
6/12/53	6	11 Min.	6 Min.	51 Min.	72	3	186
6/13/53	6	9 Min.	4 Min.	38 Min.	108	12	348
6/14/53	5	5 Min.	4 Min.	21 Min.	95	40	282
6/15/53	2	5 Min.	5 Min.	10 Min.	45	43	88
6/16/53	1	5 Min.	5 Min.	5 Min.	25	25	25
6/17/53	2	5 Min.	4 Min.	9 Min.	65	58	123
6/18/53	3	13 Min.	4 Min.	22 Min.	84	10	160
6/19/53	3	11 Min.	3 Min.	18 Min.	187	50	292
6/20/53	4	6 Min.	4 Min.	20 Min.	66	51	237
6/21/53	3	7 Min.	5 Min.	17 Min.	106	67	260
6/22/53	1	5 Min.	5 Min.	5 Min.	25	25	25
6/23/53	4	7 Min.	4 Min.	20 Min.	75	75	209
6/24/53	4	9 Min.	4 Min.	23 Min.	70	30	175
6/25/53	2	5 Min.	5 Min.	10 Min.	46	45	91
6/26/53	7	15 Min.	5 Min.	75 Min.	150	22	649
6/27/53	4	10 Min.	6 Min.	30 Min.	100	45	275
6/28/53	8	8 Min.	4 Min.	45 Min.	100	50	720
6/29/53	5	6 Min.	4 Min.	22 Min.	80	8	247
6/30/53	5	18 Min.	6 Min.	44 Min.	100	30	377
TOTAL FOR MONTH	101			12 Hr. 1 Min.			6795

JULY 1953

DATE	TIMES OPENED	MAX. TIME DELAY PER OPENING	MIN. TIME DELAY PER OPENING	DAILY TOTAL TIME DELAY	MAX. VEH. DELAYED PER OPENING	MIN. VEH. DELAYED PER OPENING	DAILY TOTAL VEH. DELAYED
7/1/53	5	8 Min.	4 Min.	24 Min.	95	78	424
7/2/53	3	6 Min.	4 Min.	15 Min.	93	45	197
7/3/53	12	10 Min.	4 Min.	61 Min.	120	25	954
7/4/53	11	7 Min.	4 Min.	54 Min.	100	25	725
7/5/53	6	6 Min.	5 Min.	31 Min.	100	40	475
7/6/53	6	10 Min.	3 Min.	37 Min.	1020	50	1360
7/7/53	3	8 Min.	5 Min.	21 Min.	75	50	185
7/8/53	9	5 Min.	5 Min.	45 Min.	86	40	626
7/9/53	5	8 Min.	5 Min.	31 Min.	120	14	390
7/10/53	8	6 Min.	4 Min.	42 Min.	125	38	721
7/11/53	7	5 Min.	4 Min.	31 Min.	93	18	381
7/12/53	12	10 Min.	4 Min.	61 Min.	90	10	713
7/13/53	3	8 Min.	4 Min.	17 Min.	92	25	191
7/14/53	4	7 Min.	4 Min.	22 Min.	214	65	454
7/15/53	10	7 Min.	3 Min.	41 Min.	130	40	596
7/16/53	10	5 Min.	3 Min.	45 Min.	84	30	549
7/17/53	7	9 Min.	4 Min.	41 Min.	100	36	372
7/18/53	3	4 Min.	4 Min.	12 Min.	86	10	165
7/19/53	4	6 Min.	4 Min.	19 Min.	91	36	261
7/20/53	5	7 Min.	5 Min.	29 Min.	120	3	297
7/21/53	8	8 Min.	4 Min.	42 Min.	90	4	433
7/22/53	17	10 Min.	4 Min.	82 Min.	200	35	1188
7/23/53	15	6 Min.	4 Min.	67 Min.	95	21	827
7/24/53	13	10 Min.	4 Min.	58 Min.	110	22	862
7/25/53	5	6 Min.	4 Min.	24 Min.	88	42	328
7/26/53	13	6 Min.	4 Min.	63 Min.	90	40	848
7/27/53	9	5 Min.	4 Min.	39 Min.	105	50	688
7/28/53	10	9 Min.	4 Min.	54 Min.	210	52	937
7/29/53	8	5 Min.	4 Min.	35 Min.	79	56	547
7/30/53	7	5 Min.	4 Min.	32 Min.	80	40	445
7/31/53	8	9 Min.	4 Min.	47 Min.	100	50	666
TOTAL FOR MONTH	246			20 Hr. 22 Min.			17,805

(5)

AUGUST 1953

DATE	TIMES OPENED	MAX. TIME DELAY PER OPENING	MIN. TIME DELAY PER OPENING	DAILY TOTAL TIME DELAY	MAX. VEH. DELAYED PER OPENING	MIN. VEH. DELAYED PER OPENING	DAILY TOTAL VEH. DELAYED
8/1/53	8	10 Min.	4 Min.	42 Min.	90	50	562
8/2/53	15	6 Min.	4 Min.	65 Min.	94	30	947
8/3/53	6	6 Min.	5 Min.	33 Min.	80	45	410
8/4/53	4	10 Min.	4 Min.	23 Min.	185	50	365
8/5/53	9	6 Min.	4 Min.	43 Min.	100	50	695
8/6/53	1	4 Min.	4 Min.	4 Min.	120	120	120
8/7/53	5	9 Min.	4 Min.	29 Min.	250	71	681
8/8/53	3	7 Min.	4 Min.	15 Min.	186	50	236
8/9/53	15	18 Min.	4 Min.	88 Min.	185	45	1044
8/10/53	2	14 Min.	4 Min.	18 Min.	54	50	104
8/11/53	6	11 Min.	4 Min.	39 Min.	108	54	370
8/12/53	1	5 Min.	5 Min.	5 Min.	110	110	110
8/13/53	8	10 Min.	4 Min.	40 Min.	100	45	485
8/14/53	6	9 Min.	4 Min.	34 Min.	150	20	440
8/15/53	6	7 Min.	5 Min.	33 Min.	85	58	410
8/16/53	15	10 Min.	4 Min.	74 Min.	150	25	1137
8/17/53	7	6 Min.	4 Min.	33 Min.	125	45	597
8/18/53	11	12 Min.	4 Min.	82 Min.	260	38	903
8/19/53	4	7 Min.	4 Min.	20 Min.	75	4	166
8/20/53	3	5 Min.	4 Min.	14 Min.	125	70	285
8/21/53	7	14 Min.	4 Min.	47 Min.	96	51	520
8/22/53	4	5 Min.	4 Min.	18 Min.	100	22	296
8/23/53	16	12 Min.	4 Min.	81 Min.	105	10	951
8/24/53	4	4 Min.	4 Min.	16 Min.	80	24	212
8/25/53	8	10 Min.	4 Min.	43 Min.	200	52	834
8/26/53	6	7 Min.	4 Min.	30 Min.	95	7	346
8/27/53	4	5 Min.	4 Min.	19 Min.	100	48	323
8/28/53	6	7 Min.	4 Min.	33 Min.	140	48	600
8/29/53	10	8 Min.	4 Min.	55 Min.	96	42	763
8/30/53	10	6 Min.	4 Min.	46 Min.	92	25	709
8/31/53	5	8 Min.	4 Min.	27 Min.	82	50	345
TOTAL FOR MONTH	215			19 Hr. 9 Min.			15,966

SEPTEMBER 1953

DATE	TIMES OPENED	MAX. TIME DELAY PER OPENING	MIN. TIME DELAY PER OPENING	DAILY TOTAL TIME DELAY	MAX. VEH. DELAYED PER OPENING	MIN. VEH. DELAYED PER OPENING	DAILY TOTAL VEH. DELAYED
9/1/53	4	8 Min.	4 Min.	24 Min.	80	6	214
9/2/53	5	6 Min.	4 Min.	23 Min.	100	12	301
9/3/53	4	12 Min.	4 Min.	25 Min.	100	40	175
9/4/53	4	6 Min.	4 Min.	20 Min.	125	74	368
9/5/53	5	9 Min.	4 Min.	27 Min.	92	55	367
9/6/53	5	9 Min.	4 Min.	28 Min.	110	47	363
9/7/53	10	5 Min.	4 Min.	41 Min.	88	43	626
9/8/53	5	6 Min.	4 Min.	24 Min.	140	52	400
9/9/53	4	6 Min.	4 Min.	21 Min.	98	28	220
9/10/53	3	9 Min.	4 Min.	18 Min.	100	34	192
9/11/53	2	7 Min.	4 Min.	11 Min.	110	76	186
9/12/53	None						
9/13/53	3	5 Min.	4 Min.	13 Min.	78	68	221
9/14/53	2	10 Min.	10 Min.	10 Min.	70	70	70
9/15/53	2	5 Min.	5 Min.	10 Min.	92	22	114
9/16/53	3	11 Min.	3 Min.	20 Min.	95	44	199
9/17/53	7	11 Min.	4 Min.	50 Min.	108	3	337
9/18/53	3	13 Min.	6 Min.	30 Min.	350	68	488
9/19/53	10	15 Min.	4 Min.	85 Min.	110	6	685
9/20/53	9	18 Min.	4 Min.	71 Min.	110	6	411
9/21/53	5	10 Min.	4 Min.	36 Min.	155	46	485
9/22/53	7	12 Min.	4 Min.	53 Min.	146	53	791
9/23/53	6	23 Min.	4 Min.	56 Min.	66	5	255
9/24/53	12	19 Min.	4 Min.	88 Min.	170	10	710
9/25/53	None						
9/26/53	3	10 Min.	6 Min.	24 Min.	36	5	61
9/27/53	8	10 Min.	4 Min.	40 Min.	140	46	544
9/28/53	4	10 Min.	4 Min.	28 Min.	100	50	287
9/29/53	2	10 Min.	10 Min.	20 Min.	150	68	218
9/30/53	2	13 Min.	5 Min.	18 Min.	100	100	200
TOTAL FOR MONTH	139			15 Hr. 14 Min.			(9,488)

OCTOBER 1953

DATE	TIMES OPENED	MAX. TIME DELAY PER OPENING	MIN. TIME DELAY PER OPENING	DAILY TOTAL TIME DELAY	MAX. VEH. DELAYED PER OPENING	MIN. VEH. DELAYED PER OPENING	DAILY TOTAL VEH. DELAYED
10/1/53	3	10 Min.	5 Min.	24 Min.	100	50	250
10/2/53	5	11 Min.	5 Min.	46 Min.	90	24	291
10/3/53	9	18 Min.	4 Min.	93 Min.	235	32	1136
10/4/53	3	5 Min.	4 Min.	13 Min.	70	40	175
10/5/53	None						
10/6/53	5	10 Min.	9 Min.	48 Min.	164	60	382
10/7/53	None						
TOTAL TO DATE	25			3 Hr. 44 Min.			2,234

BOARD OF

County Road Commissioners

HOUGHTON COUNTY

M. G. MEYERS, Chairman
PAINESDALE
J. W. RICE
HOUGHTON
J. G. MASINI
HANCOCK

HANCOCK, MICHIGAN

C. F. WINKLER
COUNTY HIGHWAY ENGINEER

October
Fourteenth
Nineteen
Fifty-three

Re: Portage Lake Bridge

Colonel George Kumpe
Corps of Engineers, U. S. Army
Office of District Engineer
Milwaukee District
P. O. Box 744
Milwaukee 1, Wisconsin

Sir:

Attached hereto is a statement of the Board of County Road Commissioners of Houghton County, Michigan, containing information it desires to present to you at the Public Hearing to be held October 15, 1953, in Houghton, Michigan, relative to determining whether or not the Portage Lake Bridge is sufficient to accommodate Lake and Highway traffic in a safe and efficient manner.

Respectfully submitted,

BOARD OF COUNTY ROAD COMMISSIONERS

By M G Meyers
M. G. Meyers
Chairman

By C.F. Winkler
C. F. Winkler
Engineer

CFW-ack
Enc.
Statement

At the public hearing to be held before you at Houghton on October 15, 1953, to determine the hazard to navigation caused by the existence of the Portage Lake Bridge crossing Portage Lake and connecting the City of Hancock and the Village of Houghton, the Board of County Road Commissioners respectfully present this statement.

The Portage Lake Bridge is a vital link both for Highway Traffic and train movements. If, as has happened in the past, an accident occurring thru a collision by a Lake Steamer and the Bridge, traffic across the Keweenaw Waterway would virtually come to a standstill.
At the time the swing span was knocked down by a Lake Vessel, all lake traffic was undoubtedly delayed, pending the clearing out of the wreck and erection of a new swing span. Traffic was carried across the Lake by Scow Ferry, which moving slowly back and forth across the channel, caused delays and hazards to Lake Carriers.
A locomotive and tender being ferried across by this means was dumped into the water. The foregoing accident occurred in 1908, when traffic across the Bridge was only a fraction of that of today.
To ferry just the necessary traffic across the water would require almost continuous passage of towed scows, presenting by such movements serious hazard to Lake Vessels.

The Swing Span operates so slowly that even at the required reduced speeds of Lake Carriers, the vessels blow for the Bridge when they are approximately one mile from the Bridge.
If for any reason the opening is delayed, the approaching vessel must have adequate warning of such delay and, as has often happened, it is nip and tuck proposition if the approaching steamer can be stopped in time, with

anchors out and propellers operating astern.

When the new draw span was opened to traffic in 1908, Lake Steamers were smaller and had less draft. The south opening of the swing being somewhat wider, takes all the lake traffic.
Apparently the agitation of the propellers and the wash occasioned by boats passing thru the draw displaced the four or five feet of slimes deposited on the Lake Bed by the Stamp Mill operations.
The channel, therefore, has been dredged thru the south span opening and very likely has been deepened considerably for the passage of the much longer ships of considerably greater draft. Such deepening of the channel thru the Draw was certainly not contemplated in the erection of the center pier. It may also be that such dredging and channel deepening may have been a contributing factor to the apparent movement of part of the structure as described by the State Highway Department and herein discussed in a following paragraph.

It is perhaps not for a land lubber to judge, but it is quite a thrill to stand at the open Draw and watch a 600 foot vessel, operating at reduced speed, negotiate the 115 foot opening, while cross air currents are blowing.

During the past 10 or 15 years, the Road Commission has, from time to time, been forced to cut off a piece of the south end of the roadway on the Swing Span. Although no accurate measurements of such cutting of the slab has been kept, a conservative estimate would be that the swing span has been shortened about 8 to 12 inches.

Each such cutting operation was necessitated by failure of the swing to operate because it was bound tight to the fixed truss.
Twice during the past five or six years, it also became necessary to call out the two Fire Departments of Houghton and Hancock, in order to pour cold water on the steel trusses because the air temperature was so high as to cause the movable span to become bound too tight to move.
Had either of these conditions occurred while a Lake Steamer was approaching, an accident might not have been averted.

The present structure, if allowed to remain as is, will undoubtedly serve the road traffic, within certain limitations and with exceedingly great moments of exasperation caused by the slow opening of the draw. However this Commission is acutely aware of the possibility of a major accident to the Bridge because of the small span opening and the ever growing size of the ships. A failure of this crossing would not only be a terrible inconvenience, but would in all probability create havoc with business on the Keweenaw Peninsula, and would very likely cause curtailment of the Copper Industry north of the Lake and throw hundreds of people out of work.

The Commission has been informed that Mr. Charles Ziegler, State Highway Commissioner, is ready and willing to cause a new structure across the Lake to be built, which would likely eliminate all the road traffic delay. Such a Bridge would be built for highway traffic only at some as yet not determined location. However any structure that is not built in the immediate vicinity of the present location, around which the two towns have grown and which would not carry railroad traffic, would not be to the advantage of the economic conditions existing in the Copper Country.

October
Fifth
Nineteen
Fifty-three

Mr. George M. Foster
Chief Deputy Commissioner
Michigan State Highway Department
Lansing, Michigan

Dear George:

Since I may not be able to attend hearing on October 15, I have had transcribed my testimony. I believe that I have covered everything. Will you please look this over and let me know at once if anything should be added?

There is only one thing that I can now think of relative to highway traffic and that is that a traffic congestion occurs about three times each day. At 7:45 A.M. - 8:30 A.M. - from 11:30 A.M. to 12:30 P.M. and from 4:00 P.M. to 4:45 P.M. each day the traffic across this Bridge is so congested that it requires from three to seven light change intervals to get across the Bridge with a car.

How and by whom shall my testimony be presented? Will you take care of it?

Sincerely yours,

BOARD OF COUNTY ROAD COMMISSIONERS

C. F. Winkler
Engineer

KFW-ack

Enc.
Testimony

I have been employed as County Highway Engineer by the Board of County Road Commissioners of Houghton County, Michigan, since 1930. This is a legally created position. My duties are, under direction of the Road Commission, to have complete charge of the construction and maintenance of all roads, streets and alleys, outside of incorporated municipalities, of Houghton County. By virtue of the office, and under direction of the Michigan State Highway Department, I am also in charge of all maintenance of State Trunk Lines within the County, and am a member of the Advisory Board of the State Highway Department of Michigan.

Acting in this capacity during the years, I have gained intimate knowledge of traffic conditions in the County and specifically as the traffic is affected by the existence of the so-called Portage Lake Bridge, crossing Portage Lake between the Village of Houghton and the City of Hancock.

The Bridge has a road width clearance of 18 feet and its overhead clearance is 13 feet 7 inches. The number of vehicles using the bridge is large as shown by the State Highway traffic count. There are numerous street car bus crossings and a large number of commercial vehicles that measure the exact legal width of 96 inches. When two busses or any two vehicles of the extreme legal width chance to meet, there is so little clearance that extreme caution is needed in passing, thus slowing traffic numerous times per day to a walk.

Fortunately such precautionary measures have prevented, to a great extent, collisions between opposing traffic but have caused considerable damage to both the bridge structure and travelling vehicles by rubbing against the structure itself. All such accidents whether of minor extent or more serious, all tend to slow traffic.

The main equipment garage of the Commission is situated on the north side of the Lake about 1/4 mile East of the North end of the Bridge. Necessarily all heavy equipment used in the territory to the South of the Lake must cross the Bridge at least twice each day. Since snow plows, bulldozers, power shovels, are all 10 feet or more in width, it becomes necessary for each such passage across the Bridge to stop opposing traffic, causing delays of approximately five minutes to clear the Bridge of opposite bound vehicles and also cross the Bridge.

The Bridge has a center swing span opening. This span must be opened for all types of Lake Traffic except row boats. With a great number of fisherman's boats, pleasure traffic, government craft and bulk carriers, the Bridge is opened a large number of times and usually such lake traffic occurs during day-light peak hours. Depending on the type of craft, it takes from five to fifteen minutes to pass thru one boat. If, as often happens, the Keweenaw Waterway is being used as a harbor of refuge, the number of boats passing thru the Bridge may be anything from one to thirty boats depending on the severity and length of the storm. Occasionally, therefore, the Bridge is kept open for a string of Lake Carriers for periods of twenty minutes to three or four hours.

In order to highlight the above statement by a more specific account of boat passages over a definite period, the following facts are presented. The bridge log shows, 43 bridge openings in the seven days between September 14 and September 21, 1953, with a high of 10 for any one day and 83 openings for the two week period ending September 28,1953. This was not an extremely stormy period. One steamship line refuels its ships at its Portage Lake dock on the up-bound trip during the entire season. When the swing span is open, traffic piles up for about 3 blocks on each side of the Lake for one large boat or pleasure craft, to over a mile or more for a number of consecutive passings.

The Michigan College of Mining and Technology is situated in Houghton on the south side of the Lake. If the ships lying at anchor in refuge because of weather, begin passing thru the Bridge after daylight, at least one hundred automobiles driven by local students are delayed, the College routine is disrupted, the students loose their morning classes and, again, the Bridge is a cause of dislocating normal routine.

All of the above instances are a great inconvenience to the travelling public, cause considerable ill feeling against the State Highway Department, the Lake Carriers, pleasure craft owners, fishermen, et cetera.

Mr. Charles M. Ziegler, State Highway Commissioner, has stated that the Highway Department is ready and anxious to replace the present inadequate structure. The State cannot participate in any cost of the

Bridge other than for strictly highway purpose. Since both highway and rail traffic are carried on the Bridge, it would be to the great advantage of the local economy if the new Bridge would do likewise. Further, the present two towns have been built around the existing Bridge and not to rebuild the structure in as near to its present location as possible would create a terrible hardship.

Loss of the railroad crossing would, in itself, be an irreparable loss. Therefore the County Road Commission of Houghton County, taking all facts into consideration, recommends that the new structure be erected in approximately the same location as the old Bridge and that both highway and rail traffic be maintained.

The Commission further recommends that a four lane highway Bridge replace the present two lane crossing and that provisions be incorporated to provide for greater expedition in opening and closing the span.

Section 4 Attached Documents:

[4-6] Hayhow, Elizabeth (Sept 29, 1982). “Soo Line Trainmen Bid Adieu.” Daily Mining Gazette. Microfilm collection, MTA & CCHC. See attached document [1-6].

[4-8] Brodsky, A., Hoffman, R.. (2016). “Mechanical Rehabilitation of the Houghton-Hancock Vertical Lift Bridge.” *16th Biennial Movable Bridges Symposium,* Heavy Movable Structures, Inc., Tampa, FL.

[4-13] “History of the Bridge.” Date unknown. Houghton County Road Commission Bridges, Portage Lake, 1958-1961, RG77-104. Box 2, Folder 7. Michigan Tech Archives & Copper Country Historical Collections. See attached document [1-2].

[4-14] Robinson, Major General B. L.. Letter to Secretary of the Army Re: Public Hearing Under Bridge Alteration Act, Houghton-Hancock Bridge over Portage Lake, Mich. March 7, 1955. Houghton County Road Commission Bridges, Portage Lake, 1954-1955, RG77-104. Box 2, Folder 5. MTA & CCHC. See attached document [2-1].

[4-15] Winkler, C. F.. Letter to R. F. Rosatti. May 8, 1945. Houghton County Road Commission Bridges, Portage Lake, 1941-1945, RG77-104. Box 2, Folder 2. MTA & CCHC.

[4-16] Winkler, C. F.. Letter to George M. Foster Re: October 15th Testimony. October 5, 1953. Houghton County Road Commission Bridges, Portage Lake, 1953, RG77-104. Box 2, Folder 4. MTA & CCHC. See attached document [3-11].

[4-17] Puffer, H. R.. Letter to Col. George Kumpe Re: US-41 Crossing Portage Canal Between Houghton & Hancock. October 30, 1953. Houghton County Road Commission Bridges, Portage Lake, 1953, RG77-104. Box 2, Folder 4. MTA & CCHC.

[4-18] “$11 Million Elevator Bridge Open to Traffic,” Dec 20, 1959. Houghton County Road Commission Bridges, Portage Lake, 1958-1961, RG77-104. Box 2, Folder 7. MTA & CCHC.

[4-19] Michels, John J. Date unknown. “Interesting Facts.” Provided by John Michels, (Feb 2019).

HEAVY MOVABLE STRUCTURES, INC.
SIXTEENTH BIENNIAL SYMPOSIUM

September 19–22, 2016

Mechanical Rehabilitation of the Houghton-Hancock Vertical Lift Bridge

Andrew M. Brodsky, P. E.
Reid C. Hoffman, P.E.
Modjeski and Masters, Inc.

TAMPA MARRIOTT WATERSIDE HOTEL & MARINA
TAMPA, FLORIDA

Bridge Information

The Houghton-Hancock Bridge (also known as the Portage Lake Lift Bridge) is a 250 foot long double deck vertical lift bridge originally opened in 1959. The double deck bridge can have vehicular traffic on the upper or lower deck depending on whether the lift span is seated on the pier seats or intermediate seats. The movable span weighs approximately 4,600 kips. The bridge is at the same location as other movable bridges dating back to 1875. The bridge crosses over Portage Lake and connects Houghton, Michigan and Hancock, Michigan. This bridge is the only connection and a critical link between Copper Island and the lower portion of the Michigan Upper Peninsula main land. It is owned by the Michigan Department of Transportation (MDOT).

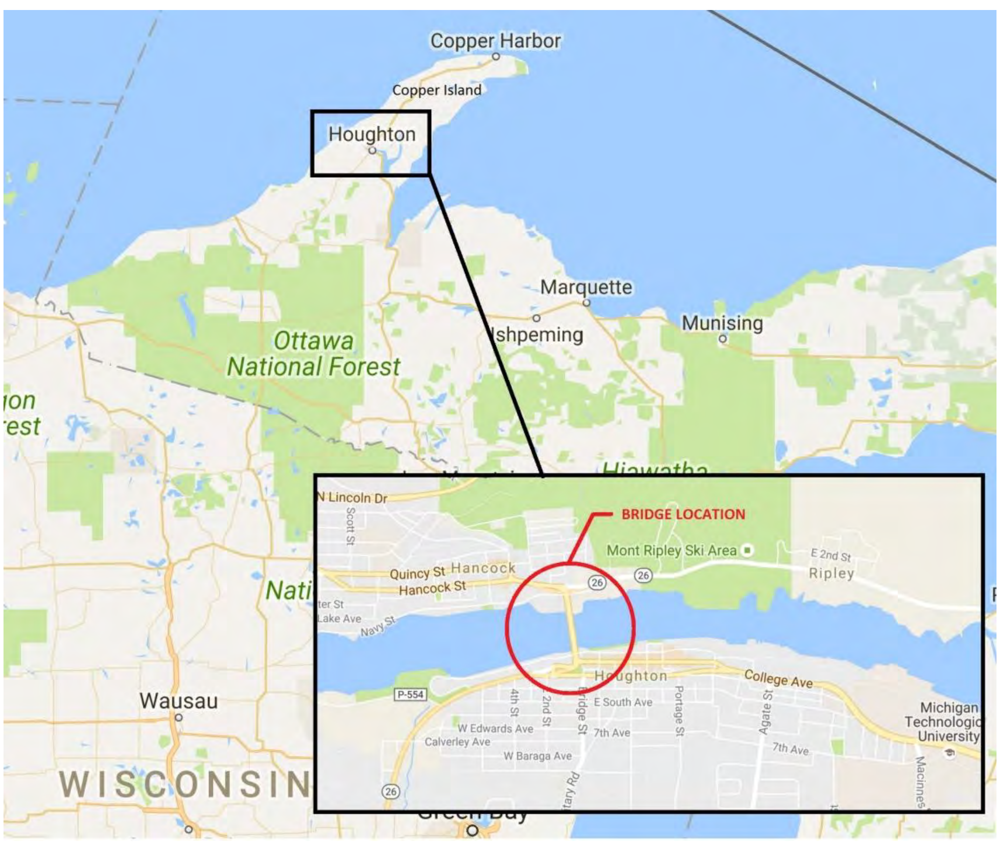

Figure 1: General Bridge Location Map

Bridge Rehabilitation Project Details

General

The scope of work included Structural, Mechanical and Electrical Rehabilitation. This paper will focus on the Mechanical aspects of the rehabilitation contract. The bi-level deck of the lift span remains on its lower seats during winter to accommodate snowmobile traffic on the lower deck and vehicular/pedestrian traffic on the upper deck. During the rest of the year, the lift span operates primarily from its intermediate seats to allow added clearance for navigation. Vehicular and pedestrian traffic utilize the lower deck of the lift span during the navigation season. This lift bridge is believed to be the world's heaviest and widest double-decked vertical lift bridge.

Design Phase

The scope of the mechanical rehabilitation included counterweight wire rope replacement, solution for shaft indexing between final pinions, repair of bridge operating machinery damaged by bridge seating issues and other ancillary bridge machinery system rehabilitation. Careful consideration of construction sequencing, extreme winter weather and material procurement times had to be taken into account during design to ensure vehicular and marine impacts were minimized. The average low temperature during the winter shut down work period is 9 degrees Fahrenheit during January/February and 17 degrees during March with highs typically only reaching just above freezing starting in March. Material procurement times for several long lead items including the wire ropes required an advanced procurement contract to be included as part of the mechanical design in order to meet the desired construction window for the project.

Construction Phase

The construction phase for this project began with an advanced material procurement contract in July of 2014 for all long lead mechanical items. The onsite construction work began in January of 2015 with an aggressive schedule that included several mechanical tests that had to be completed prior to removal of the existing wire ropes. The replacement of the existing wire ropes had to be completed during the annual winter marine closure with the bridge on the lower pier seats to eliminate the impact to the waterway traffic. The lower deck of the bridge also had to remain open to snowmobile traffic for winter, leaving the upper deck for vehicular traffic. Throughout construction, impact to the general public had to be minimized in order to keep this critical link open to traffic at all times.

Machinery Indexing

Design Considerations

At the start of the project MDOT indicated that the bridge has historically had several issues including transverse and longitudinal skew during operation and poor seating characteristics that resulted in live load pumping under traffic. During the initial site visit, strain gage balance testing was conducted and revealed poor load sharing between corners in each tower. Backlash measurements that were taken during the initial inspection revealed considerable differences in total cumulative backlash through each gear reduction between the east and west corner in each tower. As a result of this cumulative backlash difference between corners, adjustment of the indexing between the east and west shafts would only allow the machinery to share load evenly during raising or lowering. For example, if the pinions were rotated to contact their raising face in the bridge fully seated position this adjustment of the indexing with the existing machinery would only allow for equal load sharing in one direction (raising) and the pinion with less backlash would be ahead of the opposite pinion in the other direction (closing).

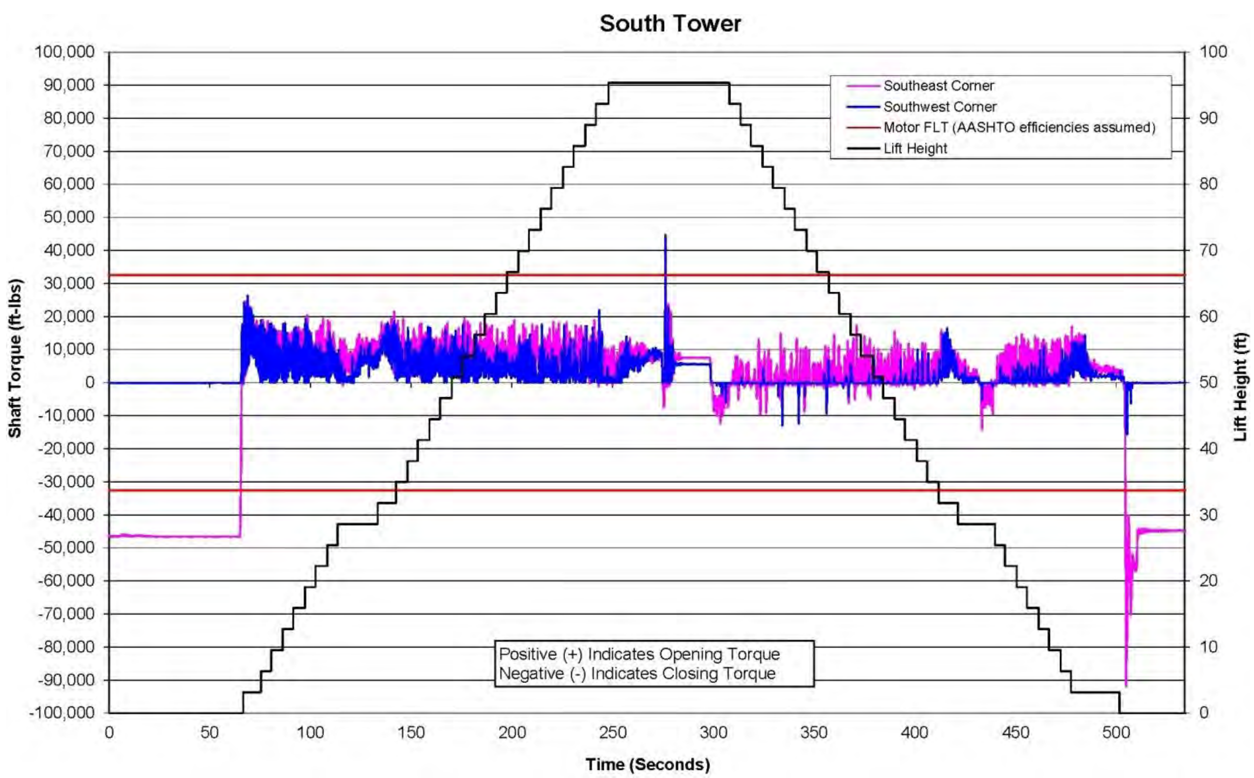

Figure 2: Initial Strain Gage Shaft Torque for South Tower (Source: Stafford Bandlow Engineering)

In addition, the existing machinery design did not include means to adjust corner to corner indexing of the drive machinery in the event of rope slip at the sheaves. The gear couplings at the primary reducer output shaft only provided adjustment in 5.25° increments. This adjustment is equivalent to a change in backlash at the final pinions of 0.054”. This change in backlash at the final pinions is not sufficient to provide precise indexing adjustment for load sharing. Implementation of a primary differential type reducer and replacement of the subsequent open gearing was considered during the preliminary design, but the configuration of the existing motor and machinery brakes, along with the costs associated ruled out this option. The solution to allow indexing between corners utilizes a new indexing coupling on one primary reducer output shaft (per tower). This new indexing coupling was a custom double engagement gear coupling with a shrink disc on one side to allow for infinite adjustability of the corner to corner indexing of the machinery. A new shaft was also included in the design to use with the new shaft indexing coupling. The new indexing coupling was included as part of the advanced material procurement contract with pilot-bores in each coupling half. The general contractor for the main construction contract was responsible for measurement of the exiting components to provide final bore dimensions to the coupling manufacturer for final machining of the couplings.

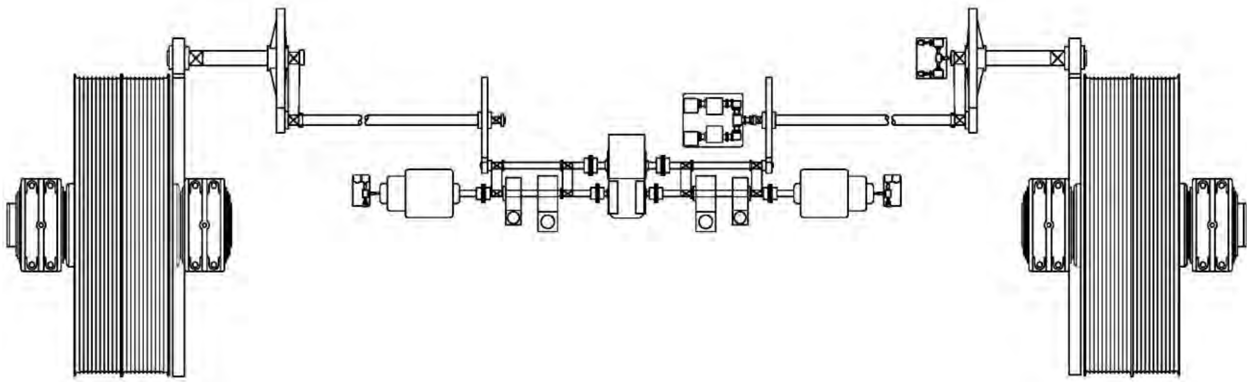

Figure 3: General Machinery Layout

To achieve good load sharing with the existing machinery configuration two possible options were explored. The first option was to alter the engagement (center distance) of the final pinion with the rack in order to increase or decrease the backlash at the final tooth mesh. Any movement of the final pinion would also affect the previous gear sets because the existing gearing is mounted in union style plain journal bearing housings. Adjustment to the engagement of the final pinions was ruled out because it would have required adjustment to all previous gear sets as well. The second option that was considered, and used for this project, was to machine new final pinions with custom tooth thicknesses to mitigate the differences in backlash between corners in each tower. Blank forgings for the new pinions were included as part of the advanced material procurement contract due to the long lead time. The general contractor for the main construction contract was responsible for all machining of the blank forgings, which included pinion bore, keyway and gear teeth.

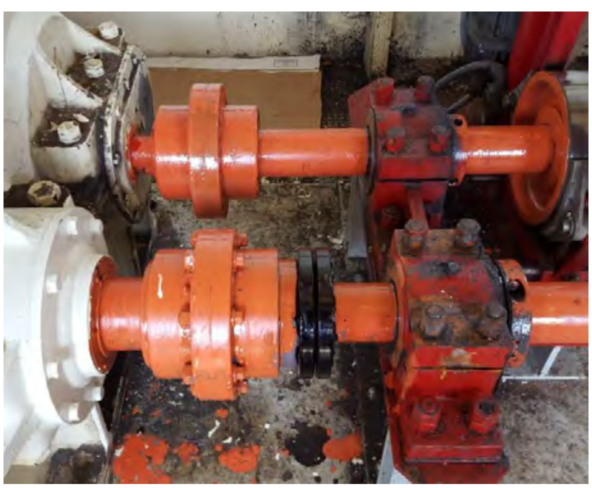

Photo 1: New Shaft Indexing Coupling Installed on Primary Reducer Output Shaft

Design Changes During Construction

Photo 2: Southwest Pinion Shaft on Lathe for TIR Measurement

The Contract for this project included taking several backlash measurements at each open gearset to determine the cumulative backlash from the primary reducer output to the final pinion in each corner of each tower. At the start of construction in January 2015 Stafford Bandlow Engineering (SBE) obtained the required measurements for Zenith Tech, Inc. (ZTI) and reported significant run-out of the southwest pinion shaft and the southwest pinion top land. The run-out measurements prompted an in-depth investigation on the southwest pinion shaft. This was not originally part of the project scope. The in-depth investigation required removal of the southwest pinion shaft from the tower top to take measurements of total shaft run-out in a machine shop. Prior to removing the southwest pinion shaft from the tower top, the remaining open gear measurements were recorded and showed measureable run-out at each final pinion. The shop measurements confirmed that the southwest pinion shaft was deformed.

The southwest pinion shaft was centered on a lathe at Calumet Machine in Hancock Michigan and measurements were taken at several locations along the pinion shaft after all paint had been removed. The total indicator reading (TIR) was recorded, and the highest documented reading for the southwest pinion shaft was 0.096” TIR. The measured TIR confirmed that the southwest pinion shaft was permanently deformed and was likely a result of an extreme event in the past. Upon confirmation that the southwest pinion shaft was deformed, the decision was made to replace all four pinion shafts during the 2015 winter bridge shutdown. The replacement of the four pinion shafts also included replacement of each final pinion, but re-used the existing gear mounted on the inboard end of each pinion shaft. The four new pinions had to be fabricated with custom tooth thicknesses to eliminate the total cumulative backlash difference between corners in each tower. While adjustment to the cumulative backlash difference between corners in each tower could have been achieved by reusing one pinion in each tower, the fabrication of four new pinions

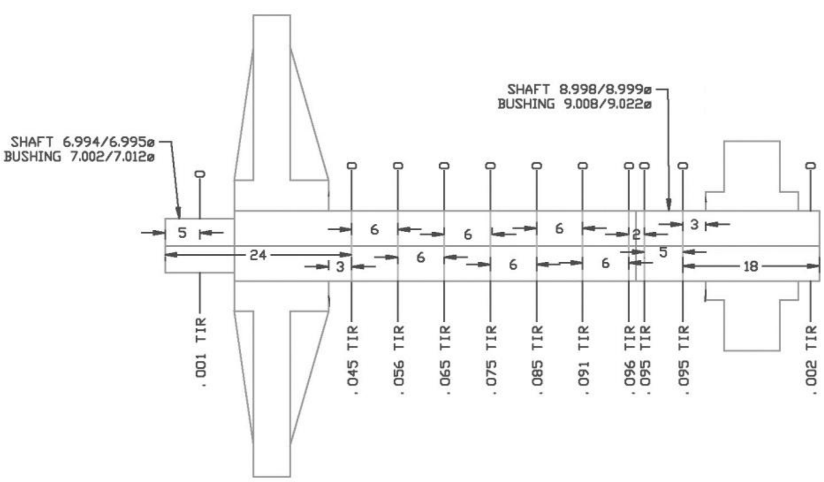

Figure 4: Southwest Pinion Shaft TIR Measurements

with custom tooth thicknesses allowed more flexibility in the final pinion tooth thickness. This flexibility in selecting new pinion tooth thickness allowed the final backlash at each pinion to be in a range close to the recommended backlash for this size of teeth.

Photo 3: Dummy Gear Measurement Jig to Measure Backlash at Final Rack

All backlash measurements that were taken at the final pinion/rack with the deformed shafts could not be used to determine the necessary tooth thickness modification for each new pinion. New measurements were taken by Modjeski and Masters (M&M) with a custom measurement jig, which was fabricated by Calumet Machine. The fabricated measurement jig included a two inch thick dummy gear with 3 precisely machined gear teeth of known chordal tooth thickness. This dummy gear was mounted on a shaft with round bearing inserts to rest in the existing pinion shaft bearing bases. Backlash measurements were directly measured along the tooth face using a dial indicator on the involute tooth profile of the dummy gear. Three measurements were taken along each tooth face with the dummy gear to directly measure for any tapered wear on the rack teeth. These measurements were repeated at several locations around the diameter of the rack for each sheave location. The new pinion/rack backlash measurements were used along with the original backlash measurements taken on the preceding gearsets by SBE to determine the required pinion tooth thickness at each location to compensate for the existing cumulative backlash differential.

Span Balance

At the start of the construction contract the lift span was approximately 11,500 pounds span heavy per tower with a significant transverse imbalance biased towards the east side of the lift span. The bridge has had a history of trouble seating on both the pier seats and intermediate seats. This construction contract included work to address the balance condition of the lift span, machinery indexing, live load shimming and poor seating characteristics of the bridge. The contract required the final balance condition of the bridge to be between 4,000 and 6,000 pounds span heavy per tower. Additionally the machinery indexing adjustments required a final maximum torque split of 60 percent to 40 percent at the final balance condition.

The initial live load shimming was completed to achieve good roadway alignment for on-coming and off-going traffic in both directions at both the pier seat and intermediate seat. The machinery indexing and balance adjustments were performed at the same time and were an iterative process. A small adjustment to the machinery indexing in one tower would affect the measured transverse imbalance of the lift span in that tower. Once good load sharing was achieved through indexing adjustments in each tower, small adjustments to the transverse imbalance in the counterweights were made to achieve as close to equal corner to corner imbalance as possible. The final changes to the transverse imbalance also resulted in better load sharing of the machinery. The final imbalance condition of the bridge at the completion of construction was 5,466 pounds span heavy in the north tower and 5,345 pounds span heavy in the south tower. The final transverse imbalance is presented in the table below.

Final Bridge Balance Condition (Fully Seated at Lower Seats)				
	East Corner	**West Corner**	**Split**	**Total Imbalance**
North Tower	2,317 lbs	3,149 lbs	42%/58%	5,466 lbs
South Tower	2,357 lbs	2,989 lbs	44%/56%	5,345 lbs

Final live load shim adjustments at the pier seats and intermediate seats were completed after final machinery indexing and transverse balance adjustments were complete. The final adjustments to the pier seat live load supports had no effect on the load sharing during operation and only influenced the machinery loads at seating. After shimming was completed on the pier seat live load bearings, the same process was repeated at the intermediate seat live load bearings.

While shimming the southwest intermediate live load bearing there was an issue achieving proper roadway alignment. Even with all of the shims removed, the span was too high relative to the approach roadway elevation. In an effort to find out if this condition predated the construction contract, M&M discussed the issue with MDOT personnel. The bridge operators were able to confirm that there have been persistent problems for years when operating the southwest span locks with the bridge on the intermediate seats. This new information led to an investigation of the southwest span locks. Adjustments to the span lock elevation are made from inside the tower leg, and after inspecting the southwest span lock it was clear that it had been adjusted up as high as possible and was still rubbing when actuated. All parties involved came to agreement on the solution to mill down the bottom of the southwest live load bearing ½ inch, which solved the issues relating to seating loads, roadway elevation, and span locks. Equalization of the seating loads through shimming of the live load supports virtually eliminated any seating problems that were evident in the past.


Photo 4: North End of Span Roadway Alignment

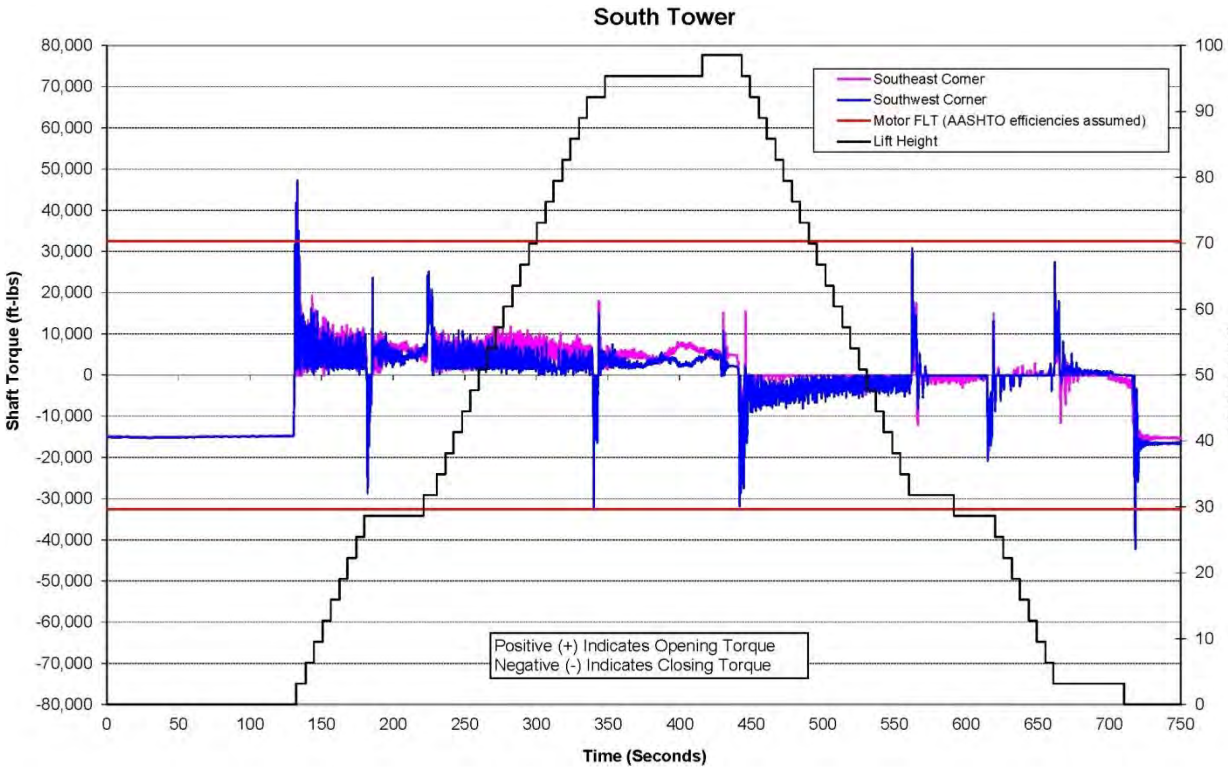

Figure 5: Final Strain Gage Shaft Torque for South Tower (Source: Stafford Bandlow Engineering)

Balance Chain Rehabilitation

Design Considerations

The balance chains had been rehabilitated in 1996. After approximately fifteen years of service, several of the balance chain links on the Houghton-Hancock Bridge became seized. The purpose of a properly functioning balance chain is to provide appropriate counterweight for the lift span in all positions of lift by compensating for counterweight rope weight transfer as the bridge is raised and lowered. With the links seized, the counterweight system loses its ability to adjust incrementally, as designed, and puts unnecessary stress on mechanical components.

A review of the 1957 shop drawings and the 1996 rehab drawings showed that self-lubricating bushings were specified for the balance chain links. The design intent was to provide a relatively maintenance-free low friction bearing surface between the link pin and the clevis bore. The approved rehab drawings from Calumet Machine; however, called for a "Oil-Lite" bushing made of, "CA911 with double loop inside diameter groove, graphite filled."

Photo 5: Balance Chain Bushing from 1996 Rehabilitation

Photo 6: New Deva Metal 101 Balance Chain Bushing

The bushings manufactured for the 1996 rehab failed to meet the design intent. Although the cast bronze used has a high yield strength it has no self-lubricating properties. Bronze bushing manufacturers also do not recommend double loop style grooves for graphite filled lubrication, especially with limited shaft rotation like in this application. This style groove is much better suited for grease lubrication only. Over time the graphite had likely worn and was no longer providing the intended “self lubricating” properties to the bushing. Moisture and debris had likely also penetrated the voids in the harsh environment. In an attempt to combat debris build up and corrosion, the rehab designer included lubrication ports and passages on both sides of the link pins to provide fresh lubrication for the bushings. However, the balance chains are nearly inaccessible for hands-on inspection and maintenance. Because of this, the passages were plugged at initial installation and fresh lubricant had never been added, thus further accelerating the propagation of contamination and link seizure.

During design, M&M recommended replacing all balance chain link bushings with self lubricating bronze bushings homogenously impregnated with solid graphite lubricant (Deva Metal 101). The original Ø2.50” RC6 fit between the bushing and the pin was increased to 1/16” total clearance between the bushing and pin. The intent of this design change from the original design was threefold: first it provided a larger gap for corrosion to span, second it allowed the pin to move radially and dislodge any deposits, and third it enabled remote maintenance by means of a pressure washer to flush out any debris that may have accumulated. The press fit between the bushing outside diameter and balance chain link inside diameter was coordinated with the bushing manufacturer and an LN3 fit was selected. The existing stainless steel clevis pins are ideally suited for this application and environment, and were reused with the new balance chain bushings during the winter shutdown.

Photo 7: Balance Chain Link with Pin Removed (Note Corrosion at Interface with Mating Link)

Due to the long lead time for the 560 new balance chain bushings required, the bushings were part of the advanced material procurement contract. The inside diameter of the existing balance chain links was not known at the time of design therefore it was critical that the new bushings could be provided with oversized outside diameters to be machined after measuring the inside diameter of the balance chain links.

Construction

Photo 8: Balance Chain Link (Left Side: Boss not Removed, Right Side: Boss Removed

The removal of the balance chains required taking down each of the eight chain assemblies individually and shipping them by flat bed truck to Calumet Machine for disassembly and reassembly. During disassembly Calumet Machine discovered that the existing balance chain links did not match the details shown in the 1996 rehabilitation plans that were used to develop the current plans. A boss was present with a counterbore for the existing bushings on each link at the female end. Upon disassembly this boss showed signs of significant corrosion on each link and was likely part of the cause for the seized links. Without modifications, the new balance chain bushings could not be installed in the existing balance chain links. The Contractor was directed to re-machine each balance chain link to accept the new balance chain bushing details as shown in the contract plans. A total of 264 balance chain links were machined to accept the new balance chain bushings.

Wire Rope Replacement

Design Considerations

Photo 9: Hydraulic Jacks Supporting Lift Span During Rope Unloading

The Ø2-5/8” 6x19 IPS Fiber Core Wire Ropes that were installed on the bridge prior to this construction contract were original to the bridge and date back to 1959. There are a total of 84 counterweight ropes. The 159’7” long existing ropes had stretched 5-1/2” over the 56 year service life from their original rope length. The new wire ropes were included as part of the advanced material procurement contract due to the long lead time for fabrication. Special consideration for storage of the wire ropes was included in the Contract Special Provisions to provide directive to the advanced procurement contractor where and how to store the wire ropes. In general, all items that were provided as part of the advanced procurement contract were required to be stored by the advanced procurement contractor until the items were requested by the installation contractor.


Photo 10: Tugger Connection to New Wire Ropes for Rope

The replacement of the wire ropes required careful consideration of the sequencing to minimize bridge closures and also allow the ropes to be removed and installed during short nighttime lane closures. Additionally, emergency vehicles had to be able to cross the bridge at all times throughout construction. A recommended procedure was provided in the Contract plans that required two overnight bridge shutdowns. One for unloading of the existing wire ropes, and one for reloading of the new wire ropes after making the lift span side connection. The recommended procedure also included a single lane closure for removal of the existing wire ropes one at a time after cutting the rope above the counterweight side block socket. A temporary tugger line connected to an air tugger was to be used to lower each existing counterweight rope down to the roadway level. A similar procedure was recommended for hoisting the new counterweight ropes over the sheave to make the counterweight side connection. The recommended procedure only required the bridge to be closed to vehicular and snowmobile traffic for two overnight periods and allowed the remaining rope removal and installation work to be completed with only short vehicular traffic interruptions.

Construction

Prior to removal of the existing counterweight ropes the tension in the ropes had to be unloaded. This work required the bridge to be shutdown and included provisions for an emergency ramp in the event that emergency vehicles needed to cross the bridge after the jacking. Hydraulic jacks were used to raise the lift span approximately 2’-10” to hang the counterweight from the existing counterweight hangers and completely relieve the load from the counterweight ropes. The hydraulic jacks had a total lifting capacity of 8,000 kips with a 6 inch stroke. After the load was relieved from the ropes, the rope block sockets were pulled out from under the lifting girder rope connection and restrained to prevent interference with the remaining work to lower the bridge back to the pier seats. The entire bridge jacking procedure and releasing of the lift span socket connections was completed in an overnight shutdown that began at 9:00PM and was completed at 5:30AM. The low temperature during this work was 17 degrees Fahrenheit with snow.

ZTI elected to use a procedure for wire rope removal and installation similar to the recommended procedure provided in the Contract Plans, but did not cut each counterweight rope on the counterweight side. An air tugger mounted to a truck was used to lower the existing ropes and hoist the new ropes from the top of the lift span deck. An auxiliary air tugger was mounted in the machinery room to assist with control of the rope over the sheave on the counterweight side of the sheave. Each existing counterweight rope was attached to the tugger line with a double choked nylon strap. Fabricated “cable stop clamps” were attached to each counterweight rope to prevent the nylon strap from slipping up the rope. After each rope was connected to the tugger line it was lowered to the top of the lift span deck and stretched out in the closed lane.

Installation of the new wire ropes was similar to removal of the existing ropes. The new wire ropes were uncoiled from the shipping reel and laid out on sheets of plywood along the length of the lift span prior to attaching each rope to the main tugger line. Care was taken to ensure that the surface of the plywood was free from moisture and debris. A second air tugger was added to assist with handling of the new counterweight ropes when re-rigging of the assembly was required in order to get the new counterweight rope over the sheave. Each new rope was individually hoisted over the sheave and attached to the counterweight side connection. Several new ropes were able to be installed in one night with limited interruptions to vehicular traffic using this procedure. After all of the new counterweight ropes were in place, the lift span was again jacked, but this time to reconnect the lift span side rope sockets to the lift span. The entire bridge jacking procedure and releasing of the lift span socket connections was completed in an overnight shutdown that began at 9:00PM and was completed around 6:00AM. The low temperature during this work was 10 degrees Fahrenheit.

Cold Weather Considerations and Issues

The extreme winter weather conditions in Houghton, Michigan were a concern that was considered by the design team for all work that was to be completed during the winter shutdown on the bridge. These concerns included the man hours required to perform any outdoor tasks in below freezing weather and if it was possible to complete the work in the winter conditions. During the wire rope replacement ZTI discovered that connection pieces that were intended to be used to attach the new counterweight rope below the tugger line attachment to help guide the rope as it was hoisted became brittle in the cold temperatures and broke easily. Additionally, duct tape would not stick to itself at these temperatures because the adhesive was frozen. Another concern during construction was the use of hydraulic jacks in sub-freezing temperatures with the HPU’s pumping cold hydraulic fluid, but to combat this issue ZTI provided HPU’s with integral heaters to keep the fluid warm during the initial span jacking to remove the ropes. ZTI elected to use HPU’s without heaters during the final span jacking for reconnecting the wire ropes. Without the HPU tank heaters, the fluid was very thick and could not be pumped without tripping the breaker on the generator for the HPU pump. After two hours of heating the HPU tanks with open flame propane torches the HPU’s were able to pump the fluid and jack the span.

Conclusion

The overall construction cost at the time of bid for the rehabilitation project was $7.35 million. This cost included all mechanical rehabilitation work, electrical control system upgrades, warning and barrier gate replacement, and various structural repairs. Careful consideration during design was critical to completing the required mechanical work during the 2015 winter closure. Without consideration for long lead time materials during design that were included as part of the advanced procurement contract that began in

July 2014, it would not have been possible to procure the materials in time to begin the contract work in January 2015. The shrink disc indexing coupling provided simple adjustment to the indexing of the drive machinery during testing and will allow for any future adjustments necessary to re-index the machinery. Bridge seating issues have been resolved with the adjustments to the live load bearings, balance condition and custom tooth thickness pinions to provide good corner to corner load sharing during operation.

May
Eighth
Nineteen
Forty-five

Re: Bl of 31-10-1

Mr. R. F. Rosatti
District Engineer-Maintenance
Michigan State Highway Department
Crystal Falls, Michigan

Dear Sir:

It appears that your bridge crew should do some work on the Portage Lake Bridge draw. I would suggest that something better than mere tightening of bolts and placing of temporary sheaves be done.
Last night, a whole block of concrete fell thru' and I'm told that the end stringers at both ends of the draw are rotted.

In the past it appears as if the bridge crew did not relish working so far from home and preferred to spend their time at St. Ignace. Unless some major repairs are made soon somebody is going to get hurt.

Yours very truly,

BOARD OF COUNTY ROAD COMMISSIONERS

C. F. Winkler
Engineer

CFW-ACK

GEORGE M. FOSTER
CHIEF DEPUTY COMMISSIONER

HARRY C. COONS
DEPUTY COMMISSIONER
CHIEF ENGINEER

C D Winkler

6

MICHIGAN
STATE HIGHWAY DEPARTMENT
LANSING 13

CHARLES M. ZIEGLER
STATE HIGHWAY COMMISSIONER

October 30, 1953

B1 of 31-10-1
US-41 Crossing Portage Canal
Between Houghton & Hancock

U. S. Army, Corps of Engineers
Col. George Kumpe, District Engineer
P. O. Box 744
Milwaukee, Wis.

Gentlemen:

I am transmitting herewith three copies of a tabulation showing the number and size of vessels that required opening of the bridge during 1953, from March until October, inclusive.

This information was compiled from the log kept by the operators of the bridge, and is being transmitted to you for whatever use you may care to make of it in connection with your report in regard to the above structure.

Very truly yours,

H. R. Puffer
Bridge Engineer

HRP/GE
cc - G. M. Foster
J.F. Oravec
C. F. Winkler

TABLE SHOWING NUMBER AND SIZE OF VESSELS THAT REQUIRED OPENING OF BRIDGE DURING 1953.

MONTH	SMALL VESSELS*	LARGE VESSELS**
March		3
April		12
May	13	39
June	67	47
JULY	221	61
August	176	48
September	73	73
October	13	52
TOTAL	563	335

* Small motor boats, Fish boats, Pleasure craft.

** 30 Ton and over.

NOTE: March total begins March 22; May total begins May 9; October total ends October 21.

This information compiled from a log kept by the operators of the bridge.

File

Dec 20-59

$11 MILLION "ELEVATOR"
BRIDGE OPEN TO TRAFFIC

HOUGHTON---The $11 million Portage Lake Bridge which links Houghton and Hancock in the Upper Peninsula is open to traffic.

The big "elevator" span, which replaces a narrow bridge originally built in 1895, was opened almost two years to the day after construction began. Bridge open 8 am Sunday Dec 20, 1959

Highway Commissioner John C. Mackie said the new four-lane span will be able to carry twice as much traffic as the old bridge when it opens and will be able to carry three times as much traffic after approach improvements are made next year.

The old two-lane bridge has a 1,000-vehicle-per-hour capacity which will be increased to 2,000 right away and 3,200 after the approach improvements are made.

The new span, designed to carry vehicular, railroad and pedestrian traffic, has two levels of roadway and operates in three positions.

The lower level carries railroad traffic while the upper level carries motor and pedestrian traffic.

The 4.5 million pound center span provides seven feet of clearance when in its first position which allows trains to cross the canal.

When the railroad deck is raised to the roadway level, the bridge has a 32-foot clearance to allow passage of large pleasure craft and other boats.

The center span raises to a height of 100 feet when in its third position to allow large ships to pass through the canal.

Construction of the bridge began Dec. 18, 1957. The American Bridge division of U.S. Steel built the super structure under a $5,933,887 contract while A. L. Johnson Co. of Minneapolis did the substructure and approach work under a $4,075,000 contract. Engineering, right-of-way and other costs came to approximately $1 million.

-0-

INTERESTING FACTS

HOUGHTON*HANCOCK BRIDGE
CARRYING US-41 & M-26 OVER PORTAGE CANAL

ITEM	QUANTITY
Type of Bridge	Double Deck Vertical Lift
Total Length	1310 feet
Lift Span Length	260 feet
Clear Channel Width	250 feet
Lift Clearance-Lowered	7 feet
Intermediate	35 feet
Fully Raised	100 feet
Lift Span Weight	4,584,000 pounds
Structural Steel Weight	13,600,000 pounds
Roadway Width	4 - 13 foot lanes
Tower Height	188 feet above piers
Caisson Depths - Pier 4	67 feet
Pier 5	78 feet
Pier 6	74 feet
Cement, Total Used	134,212 sacks
Concrete, All Units	23,342 cubic yards
Total Number of Rivets	240,000 - Field Rivets
Total Cost	Approximately $ 11,000,000
Prime Contractors	Al Johnson Construction Company - Substructure American Bridge Division - Superstructure

The Houghton-Hancock Bridge is believed to have the heaviest lift span in the world.

Section 5 Attached Documents:

[5-1] D'Arcy, Tom (Feb 8, 2019). "Houghton Hancock Bridge." Written supplement to personal call on Feb 11, 2019. See attached document [2-11].

[5-2] Michels, John J. Circa 1957-1960. "Interesting Facts." Provided by John Michels, (Feb 2019). See attached document [4-19].

[5-4] "Traffic Data on US-41 & M-26 Over Portage Lake Bridge Between Houghton and Hancock, Houghton County, Michigan," May 4, 1955 to June 18, 1956. Houghton County Road Commission Bridges, Portage Lake, 1956-1957, RG77-104. Box 2, Folder 6. MTA & CCHC.

[5-6] Brodsky, A., Hoffman, R.. (2016). "Mechanical Rehabilitation of the Houghton-Hancock Vertical Lift Bridge." 16th Biennial Movable Bridges Symposium, Heavy Movable Structures, Inc., Tampa, FL. See attached document [4-8].

[5-7] Hayhow, Elizabeth (Sept 29, 1982). "Soo Line Trainmen Bid Adieu." Daily Mining Gazette. Microfilm collection, Michigan Tech Archives & Copper Country Historical Collections. See attached document [1-6].

[5-8] Anderson, Al (Feb 7, 2019). Email exchange about Portage Lake Lift Bridge. See attached document [1-7].

TRAFFIC DATA
On US-41 & M-26 over Portage Lake
Bridge between Houghton and
Hancock, Houghton County, Michigan

Date	Day	Volume	High Hour Time	High Hour Volume
May 4, 1955	Wed.	12,272	4-5 PM	1121
May 5, 1955	Thurs.	11,833	4-5 PM	1064
May 6, 1955	Fri.	13,954	7-8 PM	1276
May 7, 1955	Sat.	13,478	1-2 PM	992
May 8, 1955	Sun.	11,923	6-7 PM	919
May 9, 1955	Mon.	11,548	4-5 PM	983
July 23, 1955	Sat.	15,647	2-3 PM	1098
July 24, 1955	Sun.	11,477	8-9 PM	910
Aug. 11, 1955	Thurs.	13,098	4-5 PM	1137
Aug. 12, 1955	Fri.	13,973	4-5 PM	1115
Sept. 23, 1955	Thurs.	11,708	4-5 PM	1074
May 15, 1956	Tues.	14,814	4-5 PM	1247
May 16, 1956	Wed.	15,546	5-6 PM	1437
June 5, 1956	Tues.	12,196	4-5 PM	1002
June 6, 1956	Wed.	12,239	4-5 PM	1009
July 18, 1956	Wed.	13,520	4-5 PM	1099

1955 Average Daily Traffic ——————12,500

Section 6 Attached Documents:

[6-1] Michels, John J. Circa 1957-1960. "Interesting Facts." Provided by John Michels, (Feb 2019). See attached document [4-19].

[6-2] Puffer, H. R.. Letter to Col. George Kumpe Re: US-41 Crossing Portage Canal Between Houghton & Hancock. October 30, 1953. Houghton County Road Commission Bridges, Portage Lake, 1953, RG77-104. Box 2, Folder 4. MTA & CCHC. See attached document [4-17].

[6-3] D'Arcy, Tom (Feb 8, 2019). "Houghton Hancock Bridge." Written supplement to personal call on Feb 11, 2019. See attached document [2-11].

[6-4] Michels, John J. "Construction History: Houghton-Hancock Vertical Lift Bridge." (1961). *Michigan Department of Transportation.* Provided by John Michels, (Feb, 2019). Pages 35-36. See attached document [1-12].

[6-7] "Traffic Data on US-41 & M-26 Over Portage Lake Bridge Between Houghton and Hancock, Houghton County, Michigan," May 4, 1955 to June 18, 1956. Houghton County Road Commission Bridges, Portage Lake, 1956-1957, RG77-104. Box 2, Folder 6. Michigan Tech Archives & Copper Country Historical Collections. See attached document [5-4].

[6-8] Busch, Jane C.. "Copper Country Survey Final Report and Historic Preservation Plan," pg. 71. (Aug, 2013). *Keweenaw National Historical Park Advisory Commission,* (viewed Mar 15, 2019).

[6-10] Robinson, Major General B. L.. Letter to Secretary of the Army Re: Public Hearing Under Bridge Alteration Act, Houghton-Hancock Bridge over Portage Lake, Mich. March 7, 1955. Houghton County Road Commission Bridges, Portage Lake, 1954-1955, RG77-104. Box 2, Folder 5. MTA & CCHC. See attached document [2-1].

[6-11] Cordua, Dr. Bill. "Why is there so much Native Copper in Michigan," Date unknown. *University of Wisconsin- River Falls,* (viewed Mar 15, 2019). See attached document [3-8].

[6-12] Meyers, M. G.. Letter to Col. George Kumpe Re: Portage Lake Bridge. October 14, 1953. Houghton County Road Commission Bridges, Portage Lake, 1953, RG77-104. Box 2, Folder 4. MTA & CCHC. See attached document [3-10].

[6-13] Rockwell, O. A.. Letter to Charles M. Ziegler Re: Portage Crossing Importance to Company. May 19, 1952.Houghton County Road Commission Bridges, Portage Lake, 1949-1952, RG77-104. Box 2, Folder 3. MTA & CCHC.

[6-14] “Copper Range Railroad Daily Train Log,” January 3, 1963. Copper Range Company Records, MS-080. Box 415. MTA & CCHC.

[6-15] “Copper Range Railroad Lines,” 1917. Copper Range Company Records, MS-080. MTA & CCHC.

[6-16] “Milwaukee Railroad Brochure Map,” February 18, 1957. Copper Country Vertical File: Railroads- Milwaukee Road. MTA & CCHC.

[6-17] Hayhow, Elizabeth (September 29, 1982). “Soo Line Trainmen Bid Adieu”. Daily Mining Gazette. Page 1,3. Microfilm Collection, MTA & CCHC. See attached document [1-6].

Copper Country Survey
Final Report and Historic Preservation Plan

Mandan *Photo by Ryan Holt*

Keweenaw National Historical Park Advisory Commission, Sponsor
Jane C. Busch, Principal Investigator
August 2013

CONTENTS

EXECUTIVE SUMMARY

The Copper Country survey is a comprehensive, reconnaissance-level survey of above-ground historic resources on the Keweenaw Peninsula. There are different definitions of the Keweenaw Peninsula; for the Copper Country survey the boundaries encompass all of Keweenaw, Houghton, and Ontonagon counties and the northwestern part of Baraga County. The cut-off date for inclusion in the survey is 1970. The purpose of the survey is to update and expand previous historic resource surveys conducted within the Copper Country region and to produce a survey report that identifies historic resources that are potentially eligible for listing in the National Register of Historic Places. In addition, the report incorporates a historic preservation plan that identifies the region's preservation needs with strategies for addressing those needs. This survey report and preservation plan is intended to guide the work of the Keweenaw National Historical Park and its Advisory Commission, preservation organizations, local governments, and others with an interest in preserving the Copper Country's historic resources.

Fieldwork began in 2009 and was completed in 2012. In consideration of the large geographic area of the survey, the district, rather than the individual resource, was adopted as the survey unit. A total of sixty-two survey districts were defined. Research and fieldwork provided the following information for each survey district: boundary description, historic and current uses, resource counts, architectural styles, materials, physical description, assessment of condition, assessment of integrity, historical themes, date span, names of architects or builders, historical overview, references, and preliminary National Register evaluation. This information is recorded in each district's database record. Survey products consist of the electronic database, maps, and photo files; sixty-two district survey forms generated from the database; two interim reports; the final survey report and historic preservation plan; and original field worksheets, field maps, and research materials. The photo files contain 1,598 photos. The final resource count was 27,646.

Seventeen historical themes were identified as significant in Copper Country history and applicable to the extant resources identified in the survey; these themes provided the context for evaluation. The themes are not equally important, however; some are more prominent in Copper Country history than others. The copper industry is the preeminent theme; it is what makes the region nationally significant. All of the other themes relate to the copper industry to a greater or lesser extent. The survey results section of this report contains a description of properties that may be eligible for listing in the National Register of Historic Places. It includes properties that may be individually eligible as well as potential districts. In some cases the description of the property is quite specific; in other cases it is more general, due to the methodology used in this survey. In all cases intensive level survey with additional research is needed to determine whether these places have the integrity and significance required for National Register listing. The survey results section includes recommended priorities for intensive level survey; places with concentrations of copper mining resources are accorded the highest priority.

The planning section of this report analyzes the framework for historic preservation in the Copper Country: the federal and state government agencies, local governments, nonprofit organizations, laws, and policies that support historic preservation activities. Stakeholders identified critical issues that affect historic preservation in the region, and goals and objectives were developed to address these issues. The five goals are:

Goal 1. Increase appreciation for historic places and awareness of the benefits of historic preservation.

Goal 2. Promote community revitalization and environmental and economic sustainability through historic preservation.

Goal 3. Build alliances and strengthen partnerships between federal and state agencies, local governments, organizations, and individuals who have an interest in historic preservation.

Goal 4. Use federal, state, and local legislation, including planning and zoning, to protect historic properties.

Goal 5. Increase financial and technical support for historic preservation, and allocate this support more effectively.

The Quincy Mining Company Stamp Mills Historic District encompasses the community of Mason, with employee housing and the ruins of Quincy's stamp mill and reclamation plant. There are no extant stamp mills in the Copper Country, only ruins—some quite large—with auxiliary buildings and expanses of stamp sands, or tailings. Mason could be part of a larger Torch Lake and Portage Lake Historic Industrial District that includes stamp mill and smelter sites in Lake Linden, Hubbell, Tamarack City, Dollar Bay, and Point Mills.

Tailings (stamp sands), slag heaps, and piles of mine waste rock are important—and disappearing—elements of the historic industrial landscape. Tailings and waste rock are being removed for new uses such as road construction, and tailings are being covered to mitigate their negative effects on the environment. Sean Gohman conducted a survey to identify and evaluate tailings, rock piles, and slag heaps; his report includes recommendations for National Register listing.[47]

Industry: Lumber Industry

Logging transformed the landscape of the Copper Country, removing nearly all of its original forest cover. Today there are two notable stands of virgin timber on the Keweenaw Peninsula—an extensive stand in the Porcupine Mountains and a smaller stand at Estivant Pines in Keweenaw County; there is also virgin timber on Isle Royale. Copper mines and mining communities provided a substantial market for lumber into the early twentieth century. Once railroads connected the Copper Country to Chicago and other Great Lakes cities, lumber exports gained importance. During the waning years of the copper industry, lumber and wood products increasingly replaced copper in the local economy, but the lumber industry was declining as well and could not stem the region's decline.

Logging began as soon as the first mines passed the exploration stage. Logs were used for constructing buildings, for mine timbers, and for fuel for both home and industry. Sawmills, which produced sawn lumber, were a sign of progress from frontier to settlement. A sawmill built at Eagle Harbor in 1845 was likely the first in the region. By the 1850s there were sawmills in the villages of Ontonagon and Houghton and at a number of mining locations; by the 1860s there were more. Town building and copper mining consumed a large amount of timber. Pine was preferred for building lumber and mine timbers. Sections of tree trunks called stulls were used to hold up the roofs of mine tunnels and shafts. Until C&H came on the scene, however, mining companies timbered sparingly. The greater demand was for cordwood to fuel steam engine boilers. Wood for fuel was sold by the cord—a stack measuring four by four by eight feet—hence the name cordwood. Hardwood was preferred for cordwood. At first logging took place in the vicinity of the mines and villages, but as timber in those areas was depleted, the mining and lumber companies expanded their reach. By the 1860s logging was taking place along the northern shores of Portage and Torch lakes and into the Bootjack area.

[47] Sean M. Gohman, "Identification and Evaluation of Copper Country Mine Waste Deposits Including Tailings, Waste Rock, and Slag in Parts of Baraga, Houghton, Keweenaw, and Ontonagon Counties, Michigan," Draft (Calumet: Keweenaw National Historical Park Advisory Commission, 2012).

Sawmills and lumber companies were typically owned and managed by Anglo-Americans, while most of the loggers and mill workers were French Canadians. The exception, in many ways, was Joseph Grégoire (Gregory) and his sawmill near Lake Linden. Born in Quebec, Grégoire came to Portage Lake in 1859, purchased timberlands, and began supplying wood to mining companies and other customers. In 1867 Grégoire and two associates built a sawmill on Torch Lake, a short distance from Lake Linden. Five years later, Grégoire bought out his associates, expanded the sawmill, and built a factory to manufacture flooring, windows, doors, and altar railings. The community of Gregoryville grew up around the mill. Grégoire rebuilt the sawmill after it burned in 1876; the new mill had a capacity of forty thousand feet of lumber per day. While Grégoire supplied lumber to C&H and other mining companies in the Portage Lake area, he also shipped his products as far away as Chicago. By the early 1880s Grégoire owned 6,500 acres of timberlands, both pine and hardwood,[48] and he employed eighty men at his mills, many of them French Canadian immigrants who came to the area because Grégoire promised them jobs. Grégoire was a leader in local politics and in the French Canadian community. He retired from work in the late 1880s and died in 1895. The sawmill closed in 1910 after operating almost forty years, an unusually long span for a sawmill.

The Sturgeon River Lumber Company was the second of Houghton County's leading lumber companies. A group of six investors organized the company in 1872 to log the rich pine lands of the Sturgeon River Valley; Orrin Robinson was superintendent. In 1873 the company built a sawmill in Hancock. In 1875 the same investors organized the Sturgeon River Boom Company, which cut a canal from the Sturgeon River across marshland to Pike's Bay. The Sturgeon River Lumber Company purchased John Chassell's farm on Pike's Bay in 1881. In 1887–88 the company replaced the Hancock operation with a new sawmill, planing mill, and lumberyards on the former farm and platted the company town of Chassell. In 1888 the Duluth, South Shore & Atlantic Railroad (DSS&A) established a railroad stop at Chassell, enabling the lumber company to ship its products by rail. The company employed more than two hundred people, many of them French Canadians; the mill had a capacity of twenty million board feet a year.

In the early 1880s, lumberman Thomas Nestor sold his property on Saginaw Bay and invested the money in sixty thousand acres of timberlands in the Sturgeon and Ontonagon river valleys. Nestor built his mill in the village of Baraga. By then, logging was taking place at many locations around the Keweenaw Peninsula. Before railroads reached an area, most logging took place close to the lakeshore or—for pine—near rivers where the logs could be driven to the lakeshore. At the lakeshore, logs were rafted to sawmills, some as far away as the Hebard and Thurber sawmill in Pequaming, on the eastern shore of Keweenaw Bay. During the 1880s mining companies transitioned from wood to coal to fuel their steam engines, but there remained a large demand for mine timbers. Not only were there new and bigger mines, but C&H used more mine timbers than other mining companies. The Calumet Conglomerate was harder than other types of copper-bearing rock, making the roofs of the mines more fragile and less stable. During the 1880s C&H began using milled square-set timbers in addition to stulls; there were so

[48] In his *History of the Upper Peninsula of Michigan* (Chicago: Western Historical Society, 1883), A. T. Andreas gives two different figures for Grégoire's timberland holdings: 6,500 (p. 11) and 65,000 (p. 313); the former is more likely the correct figure.

many timbers in its mines that they were described as a forest underground. In 1885 C&H owned approximately eighty million feet of standing pine to supply timbers for its mines.[49]

In Ontonagon County, there was little copper mining by the 1880s, but the village of Ontonagon was poised to become one of the Upper Peninsula's biggest lumber boom towns. White pine was the mainstay of the American lumber industry that began in New England and worked its way west. Pine logging was well underway in the northern Lower Peninsula by the mid-nineteenth century, moving northward as the pine was depleted. Large-scale commercial logging began in Ontonagon County in 1881, when a group of Chicago investors organized the Ontonagon Lumber Company, purchased thirty thousand acres of pine lands, and built a sawmill and shingle mill in the village of Ontonagon. The company's lumber was shipped to Chicago. In 1882, Sisson & Lilly—previously of Ottawa County in the Lower Peninsula—built a larger sawmill and shingle mill in Ontonagon. In September 1882 the Diamond Match Company, a giant matchmaking monopoly, bought control of both of these lumber companies and began buying timberlands in southern Ontonagon County. Thomas Nestor also owned extensive timberlands along the Ontonagon River. Commercial logging in Ontonagon County remained relatively limited in scope, however, until the late 1880s, when a rail line linked the port of Ontonagon to Milwaukee, and two additional railroad lines were built in southern Ontonagon County. In addition to Diamond and Nestor, many smaller lumber companies and logging contractors established logging and milling operations along the railroad lines in the south. Both Diamond and Nestor drove pine down the Ontonagon River to the village of Ontonagon,[50] but railroads were instrumental in transporting lumber to market and in supplying lumber towns that in turn supplied the logging camps. Paulding, Robbins, Craigsmere, Choate, Calderwood, Trout Creek, Paynesville, Baltimore, Ewen, Matchwood, and others served as supply centers and mill towns for dozens—perhaps hundreds—of logging camps in the surrounding woods. In southernmost Houghton County, the lumber towns of Pori, Frost, Sidnaw, Kenton, and Kitchie were established along some of the same railroad lines.

By the early 1890s, the Diamond Match Company's sawmills in Ontonagon operated around the clock, producing up to seventy million board feet of lumber per year and employing between 250 and 400 men, depending on the season. Pine logging in Ontonagon County peaked during the winter of 1894–95, when Diamond organized a massive logging operation to harvest trees that had been scorched in a forest fire the previous summer. By spring, 185 million feet of pine logs had been piled by the banks of the Ontonagon River. Logjams on the river slowed the processing of these logs, which was still underway in August 1896 when a forest fire destroyed Diamond's Ontonagon mills along with most of the village. With the county's pine timber nearly depleted, Diamond decided not to rebuild its Ontonagon mills. By the early 1900s there was little white pine left in the Copper Country.

Throughout the north woods, the lumber industry turned to hardwood, hemlock, and cedar once the white pine was depleted. The first two decades of the twentieth century were the peak years for hardwood and hemlock logging in the Upper Peninsula. Hardwood was used for lumber, furniture, and flooring. Hemlock became the preferred wood for mine timbers and was also used for lumber, railroad ties, and pulpwood; the bark was harvested for tanning bark. Cedar was

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[49] Lankton, *Hollowed Ground*, 81.
[50] From Ontonagon, Thomas Nestor moved his timber by barge to his mill in Baraga.

used for shingles, railroad ties, paving blocks, utility poles, and posts. Some of the lumber companies that logged pine stayed to log hardwoods and hemlock, but most often the pine lumber companies moved on and new companies moved in. Hardwood and hemlock logging required new techniques and equipment. Because hardwoods do not float, logging railroads were built to access the timber. In Ontonagon County, the C. V. McMillan Company and its successor the Greenwood Lumber Company led the way in harvesting hemlock west of the village of Ontonagon. One of Greenwood's logging camps became the community of Green, designed as a model company town. Farther south, Gunlek Bergland purchased seventeen thousand acres of timberland north and west of Lake Gogebic. Bergland built his sawmill at the north end of the lake, where he platted the community of Bergland. Other lumber companies that were active in Ontonagon County included the Holt Lumber Company, Weidman Lumber Company, and Sawyer-Goodman Company.

In southern Houghton County, construction of the Copper Range Railroad and Mineral Range Railroad opened new areas for logging. Alston, Nisula, and Donken were all established as lumber towns during this period. Logging took place in other parts of the Keweenaw Peninsula, and there were even logging ventures on Isle Royale. But the biggest operation was in Chassell. Having logged all of its pine, in 1902 the Sturgeon River Lumber Company sold its timberlands, mills, and remaining property in Chassell to Charles H. Worcester of Chicago. The Worcester Lumber Company began operation in 1903. The company built a logging railroad into the Pike and Otter River valleys and employed 300 to 400 men in the woods in addition to 30 on the railroad and 120 at the mill. By then, Finns had largely replaced the French Canadians who had worked for the Sturgeon River Lumber Company. With one of the largest sawmills on the Great Lakes, the Worcester Lumber Company produced 750 million feet of soft and hardwood lumber in addition to lath, shingles, hemlock tanning bark, and cedar poles and ties between 1903 and its closing in 1928.[51] Chassell was part of C. H. Worcester's larger logging empire; he owned more than one hundred thousand acres of timberland in the Upper Peninsula[52] and had a national reputation as a leading lumberman. Worcester chose Chassell for his summer home (built 1908; destroyed by fire 1974), and he introduced a number of improvements to his company town there, including new housing, wooden sidewalks, and electricity.

Even at its height, hardwood and hemlock logging was never as big an industry as pine logging, and by the 1920s it was declining. By 1929 some lumber companies had already ended their Keweenaw operations; more closed during the Depression. Contrary to the general trend, the Horner Flooring Company opened a plant in Dollar Bay in the 1930s, the Dion Lumber Company opened a sawmill in Gay in 1933, and the Boniface-Gorman Lumber Company began manufacturing cedar poles, ties, and posts in Lake Linden in 1934. By the 1930s, pulpwood for papermaking rivaled lumber as the primary product of the forest. At first hemlock was the preferred pulpwood, but as hemlock played out, spruce became the primary pulpwood. Balsam fir and jack pine were used as well. Spruce, balsam fir, jack pine, birch, aspen, and maple were all components of the second-growth forests that were growing on cutover lands by the 1930s and 1940s. The Northern Fibre Company built one of the first pulp mills in the Upper Peninsula

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[51] Stephanie Atwood, Shannon Bennett, and Alison K. Hoagland, "Chassell School Complex" (Washington, D.C.; National Register of Historic Places, 2008), 14.

[52] Theodore J. Karamanski, *Deep Woods Frontier: A History of Logging in Northern Michigan* (Detroit: Wayne State University, 1989), 195.

in the village of Ontonagon in 1920. The Northern Fibre Company was short-lived, but in 1923 the Ontonagon Fibre Company took over the mill and added a paperboard machine. In 1931 the company was reorganized as the Ontonagon Fiber Corporation. The company struggled during the Depression, but did well during World War II, so well that it was purchased by the National Container Corporation. The pulp and paper mill in Ontonagon was the only one in the Copper Country; otherwise pulpwood was shipped to pulp and paper plants in northern Wisconsin.

During the 1930s trucks began to replace logging railroads for getting timber out of the forest. In addition, landowners began to adopt the principles of scientific forestry, managing timberlands as renewable resources by practicing selective cutting instead of clear cutting. The Michigan College of Mining and Technology established a forestry department in 1936, at once a sign of the growing forestry profession and also a sign of the importance of the industry in the region. Scientific forestry was one outgrowth of the conservation movement, which also included reforestation programs and the establishment of state and national forests. During the 1920s and 1930s large areas of cutover land in the Lake Superior region reverted to county governments as the result of tax delinquency. Government agencies used some of this land to create county, state, and national forests, including the Copper Country State Forest and Ottawa National Forest. Much of the timber in these forests was managed for timber harvest using the sustained yield methods of scientific forestry. It was also during this time that mining companies began to sell logging rights to the standing timber on their lands.

The lumber and wood products industry played a major role in the Copper Country's post-World War II economy. Logging took place in regenerated forests on much of the Keweenaw Peninsula, and scientific forestry became common practice. Pulpwood predominated, but there was also a sizable hardwood lumber industry. Many of the loggers were small operators, but there were several larger logging, milling, and manufacturing operations. The Dion Lumber Company in Gay operated into the 1960s, producing up to ten car loads of lumber a week. The Horner Flooring Company in Dollar Bay had a national reputation for its maple flooring; it is still in operation today. In Donken, the Vulcan Corporation's lumber mill was probably the largest in the Copper Country until it closed in the mid-1960s. Based in Antigo, Wisconsin, Vulcan employed eighty men in the mill and one hundred men in the woods in 1956; in addition to lumber its products included shoe lasts and bowling pins. In Ontonagon, the National Container Corporation closed abruptly in 1953 when the softwood that it used to make paperboard was no longer available. Four years later the Huss Ontonagon Pulp and Paper Company reopened the plant with new equipment to make paper from second-growth hardwoods. By 1967 Huss had become part of the Hoerner-Waldorf Corporation. Eventually the Smurfit-Stone Container Corporation owned the much-expanded paperboard plant.

Copper Range and C&H both continued to sell timber from their extensive landholdings. By the 1950s timber sales from its 185,000 acres of timberlands on the Keweenaw Peninsula provided Copper Range with its primary source of revenue. In 1955, C&H took the next step and entered the forest products business with its purchase of the Goodman Lumber Company of Goodman, Wisconsin—a company known for its excellent forestry practice. In addition to Goodman's mills and 70,000 acres of Wisconsin timberlands, the Goodman acquisition brought C&H the expertise to manage the 104,000 acres of timberlands that it already owned on the Keweenaw Peninsula. The Goodman Lumber Company became the core of the C&H Forest Industries

Division. C&H built a sawmill near Calumet that produced birch and maple veneer for furniture, maple flooring, construction lumber, and softwood for industrial crating and mine timbers. The division also produced pulpwood for papermaking. In 1968 Copper Range opened its Northern Hardwoods Division and built a sawmill near South Range; later this became part of the Mead Corporation. Logging, milling, and wood products manufacturing continues today in the Copper Country. In some places it is a community's primary employer, but it is no longer a major part of the regional economy.

Property Types and Evaluation Standards

Logging camps, lumber mills, and manufacturing plants are the property types most directly associated with the lumber industry theme. Logging camps are represented only by archaeological sites, and since the scope of this survey was limited to what was visible from improved roads, no logging camp sites were identified during the survey. Two sawmills were identified in the survey. The sawmill at the site of the CCC camp in Sidnaw is relatively new; if there are historic buildings, they do not retain integrity. At Donken, the extensive lumber mill complex comprises about a half dozen large brick and concrete block buildings that appear to date from the 1920s to the 1950s. Most of the buildings are in ruins, and the complex as a whole does not retain integrity. A mill pond remains at Trout Creek, and while it would contribute to a potential Trout Creek Historic District, it is not National Register eligible by itself. In the village of Ontonagon, the Smurfit-Stone Container Corporation, built around the original 1920 pulp plant, closed in 2009 and was demolished two years later. The Hawley Lumber Company is significant as the sole surviving lumber company in the village. The company was established in 1881; most of the current buildings were built after World War II and appear to retain integrity. In Dollar Bay, the Horner Flooring Company is a dense complex of industrial buildings built of wood, tile, brick, concrete block, and metal. A number of the buildings appear to be relatively new, though some buildings clearly pre-date World War II. Horner Flooring is significant as one of very few extant wood products plants, but additional research is needed to determine if the plant retains integrity.

Company housing is not as central to the lumber industry theme as the mills and plants themselves, but there are places where only worker housing survives to represent vanished lumber mills. Two streets of one-story front-gabled worker houses built by the Hawley Lumber Company survive in Ontonagon Village; these may constitute a National Register historic district. There are four clusters of lumber mill worker housing in and near the village of Trout Creek, consisting mostly of one- and one-and-one-half-story front-gabled houses. On Weidman Street in Trout Creek, two rows of five houses apiece face each other across the street. Eight of these are one-and-one-half-story front-gabled worker houses. At the end of each row is a foursquare manager's house. The mill owner's house (destroyed by fire) once stood on a hill overlooking the street. These houses would contribute to a potential Trout Creek Historic District. In Donken, houses associated with the Vulcan lumber mill date to the 1950s and 1960s; most of these are in fair or poor condition and others lack integrity. Company houses at Chassell would contribute to a potential Chassell Historic District. Chassell was built as a company lumber town in the 1880s and remained so through 1928. The village of Chassell is significant as a company town for two of the Copper Country's leading lumber companies. Intensive level survey will determine if there are enough contributing buildings to support a historic district.

C. V. [illegible]

CALUMET AND HECLA CONSOLIDATED COPPER COMPANY

CALUMET DIVISION

CALUMET, MICHIGAN

O. A. ROCKWELL
VICE PRESIDENT & GENERAL MANAGER

May 19, 1952.

Mr. Charles M. Ziegler
State Highway Commissioner
State Highway Department
Lansing, Michigan

Dear Mr. Ziegler:

This Company and the entire population of the Keweenaw Peninsula have to depend on the Houghton bridge for movement of supplies, food and egress.

Twenty-three hundred (2300) employees (who, in most cases, are family heads) are dependent on this Company's continuous operation. If, through accident, the present bridge was made inoperable, this Company would have to close down a sizable portion of its operation almost immediately. The balance of the operation would be able to operate for a month or six weeks before having to close down.

My reason for bringing this condition to your attention at this time is the fact that a week or ten days ago an oil carrier just avoided a disaster by stopping just short of ramming the Houghton bridge. The bridge attendants did not hear the vessel's approaching signal until nearly too late.

The fact remains that something should be done about a new bridge, with both highway and railroad facilities.

What would you suggest that we of the Keweenaw Peninsula do to get a new, safe bridge under early consideration?

Yours very truly,

Vice-President & General Manager

OAR/P

COPPER RANGE RAILROAD COMPANY

FLBC—10-61—500

TIME TABLE NO. 103

Houghton, Mich., Thursday January 3rd 1963

Main Line

NORTH BOUND					Telegraph Calls	Station	Distance	SOUTH BOUND			
ENGINEMAN / CONDUCTOR	Hurley Merrill	Labby Laurn	Labby Laurn	Labby Laurn				Labby Laurn	Labby Laurn	Labby Laurn	Hurley Merrill
TRAIN	X	X	X	X				X	X	X	X
ENGINE	200	100	100	100				100	100	100	200
Time Called Engine Crew / Time Called Train Crew				10:00 am							5:00 am
					CA	CALUMET	0.0				
						2.0 CALUMET JCT.	2.0				
					KN	4.4 LAKE LINDEN	6.4				
	Thru 455 pm	Thru 815 pm				1.7 HUBBELL	8.1				
						1.1 MILLS	9.2				
						2.9 ATLAS	12.1				
				1115 am 0/1	SX	1.2 DOLLAR BAY	13.3	1131 am 1/0			
				–		3.4 HANCOCK	16.7				
	435 am	740 pm 0/2		1100 am 0/0	HO	0.4 HOUGHTON	17.1	1152 am 1/0	1212 pm 1/0		535 am
	–	–				5.0 ATLANTIC	22.1	–	–		–
	–	–	333 pm 26/0		NA	1.5 MILL MINE	23.6	–		pm 0/26	–
	–	–	–		SR	1.1 SOUTH RANGE	24.7	1240 1250	–	26	–
	–	0/2	–			1.9 TRIMOUNTAIN	26.6	– 0/1	–	0	–
	325 335	658 pm	212 pm 26/0		DA	1.0 PAINESDALE	27.6	100 pm	630 pm	26	625 645
	–					6.3 TOIVOLA	33.9				–
Donken	250 210					11.7 WINONA	45.6				800 855 Donken
	1215 pm					11.0 LAKE MINE	56.6				–
					MC	2.6 McKEEVER	59.2				1035 am
CARS HANDLED		0/2	26/0	0/1				1/0	0/1	0/26	

Gay Branch (North Bound / South Bound)

Telegraph Calls	Station	Distance
G	GAY	16.9
	3.8 SNOWSHOE	13.1
	2.2 TRAVERSE	10.9
	2.5 HEBARDS	8.4
	4.1 FULTON	4.3
	1.1 MOHAWK	5.4
	1.1 FULTON	4.3
	0.6 NICHOLS	3.7
	0.4 COPPER CITY	3.3
	2.7 YANDELL	0.6
	0.6 CALUMET JCT.	
	CARS HANDLED	

LAURIUM BRANCH (North Bound / South Bound)

Wednesday Jan 2nd 1963

7am 29.3 20 above Calm cloudy

Noon 29.3 20 ✓

5pm 29.2 32 ✓

Telegraph Calls	Station	Distance
✓	LAURIUM	.0
✓	1.6 CALUMET JCT.	1.6
	CARS HANDLED	

LAKE SHORE BRANCH

NORTH BOUND	Telegraph Calls	Station	Distance	SOUTH BOUND
Labby Laurn		ENGINEMAN / CONDUCTOR		Labby Laurn
X		TRAIN		X
100		ENGINE		100
pm 0/26	NA	MILL MINE	.0	pm 405 26/0
–		2.8 OBENHOFF	2.8	–
–		2.6 SALMON TROUT	5.4	–
– 0/26		2.2 REDRIDGE JCT.	7.6	26/0
515 pm	BH	2.4 BEACON HILL	10.0	402 pm
0/26		CARS HANDLED		26/0

26 Rock
24 #3
2 #4

SENTER BRANCH (North Bound / South Bound)

Station	Distance
SENTER	.0
4.0 ATLAS	4.0
CARS HANDLED	

INSTRUCTIONS

1. Weather conditions and temperatures shall be reported at least once in six hours by and recorded for at least one station on each dispatching district and shall be recorded for such other stations as report weather conditions.
2. Each train dispatcher shall sign his name and record the time of going on and off duty in the space provided.
3. The A.M. or P.M., as the case may be, shall be shown at the initial and final time of each movement.
4. The number of cars in each train shall be shown at least at one station and at such other stations as the carrier may determine.
5. Time of trains passing reporting stations shall be recorded; where trains stop at reporting stations, both arriving and departing time shall be recorded.

WEATHER, HOUGHTON, MICH.

29.2 7 A.M. 30° Calm cloudy
29.2 NOON 33° North Wind cloudy
29.2 5 P.M. 33°
MIDNIGHT

TRAIN DISPATCHER 730 A M. TO 430 P M. [illegible signature]
TRAIN DISPATCHER ____ M. TO ____ M.

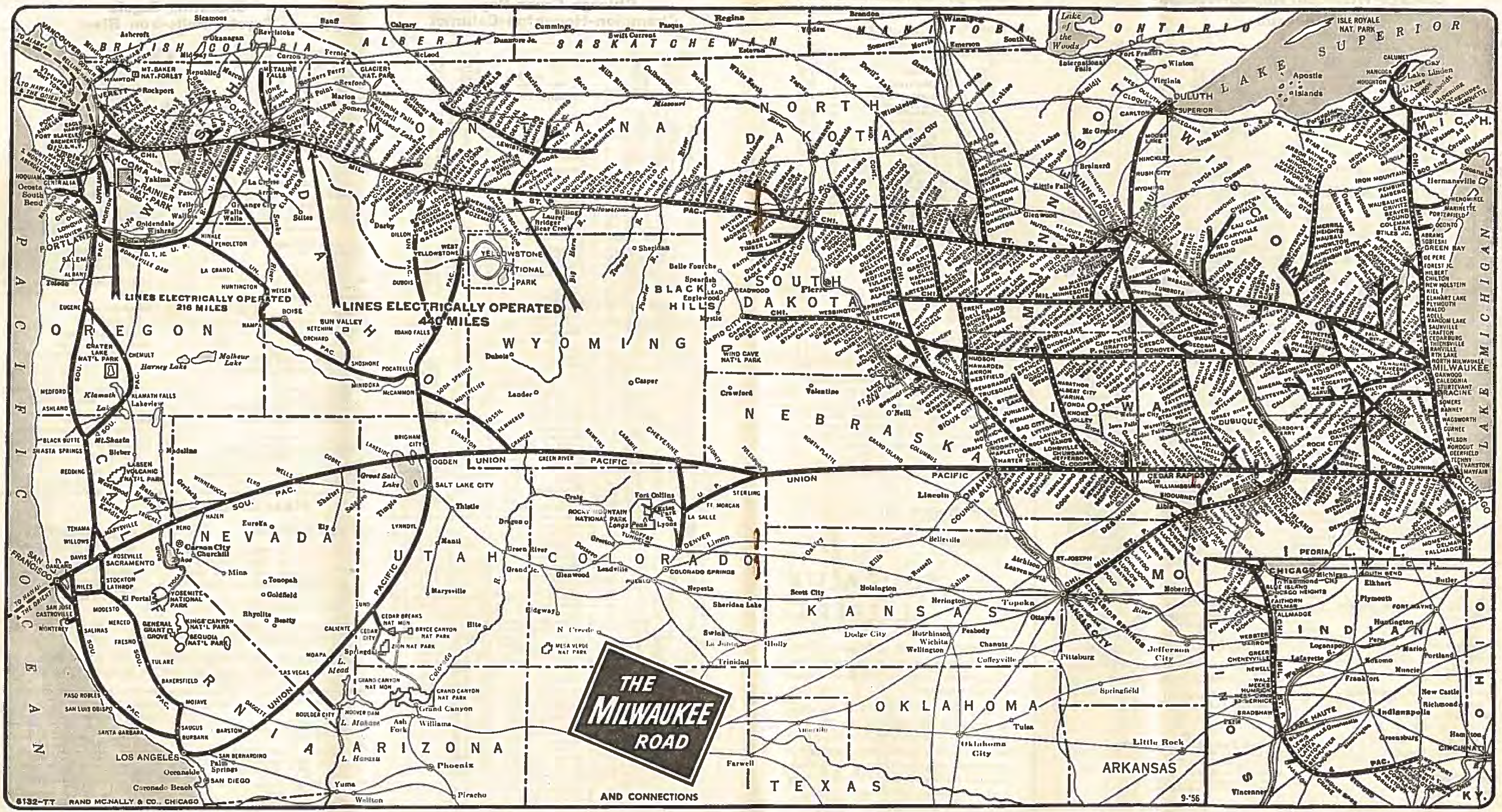
Train Miles.
Freight, ordinary 144
Freight, light
Freight, total 144

Work Service 0

Locomotive Miles.
Freight, principal 144
Freight, helper
Freight, light
Freight, total 144

Locomotive Miles.
Train switching, fr't 30
Yard switching, fr't 16
Yard switching, pas'gr
Yard switching, total 16
Total transportation service 190
Total work service 0

COPPER RANGE RAILROAD
THE COPPER COUNTRY ROUTE
LAKE SUPERIOR
LAKE MICHIGAN
MICHIGAN
WISCONSIN
ILLINOIS
IOWA
IND.
Copper Harbor
Mandan
Delaware
Central
Phoenix
Eagle River
Cliff
Mohawk
Ahmeek
Calumet
Laurium
Lake Linden
Gregory
Hubbell
Mason
South Lake Linden
Lac La Belle
Gay
Redridge
Freda Park
Coles Creek
Hancock
Houghton
Dollar Bay
Senter
Mill Mine Jc.
Atlantic
Obenhoff
Salmon Trout
South Range
Trimountain
Painesdale
Riverdale
Toivola
Stonington
Elm River
Twin Lakes
Copper Range
Winona
Winona Mine
Adventure
Greenland
Seager
Lake Mine
Mine
McKeever
Mass
Rockland
Ontonagon
Green
Big Bay
L'Anse
Herman
Marquette
Negaunee
Ishpeming
Champion
Republic
Sidnaw
Kenton
Frost Jc.
Lake Gogebic
Gogebic Lake
Bessemer
Hurley
Mellen
Saxon
Radford
Watersmeet
Atkinson
Crystal Falls
Channing
Henderson
Ward
Northland
Watson
Kingsley
Chandler
Escanaba
Manistique
Iron River
Iron Mountain
Norway
Bagola
Randville
Metropolitan
Merriman
Gladstone
Princeton
Little Lake
Lawson
Eben Jc.
Ladoga
Winde
Clsco Lake
Fosterville
Buswell
Star Lake
Mercer
Manitowish
Conover
Hackley
Minocqua
Fifield
Gagen
Monico
Laona Jc.
Crandon
Prentice
Hazelhurst Jc.
Tomahawk
Spirit Falls
Harrison
Parrish
Pratt Jc.
Drexel
Merrill
Antigo
Athens
Abbotsford
Wausau
Ringle
Elland
Lakewood
Walton
Pembine Jc.
Everett
Powers
Amberg
Wausaukee
Girard Jc.
Ellis Jc.
Menominee
Marinette
Pound
Coleman
Lena
Oconto
Sturgeon Bay
Shawano
Rosholt
Marshfield
Romadka
Arpin
Junction City
Stevens Point
Clintonville
Pulaski
Green Bay
Algoma
Kewaunee
Frankfort
Grand Rapids
Plover
Amherst Jc.
New London
Waupaca
Babcock
Bancroft
Appleton
Neenah
Depere
Greenleaf
Manitowoc
Ludington
Merrillan
Dexterville
Red Granite
La Crosse
Sparta
Tomah
New Lisbon
Packwaukee Jc.
Montello
Princeton
Berlin
Winneconne
Oshkosh
Ripon
Fond du Lac
Chilton
New Holstein
Kiel
Elkhart Lake
Sheboygan
Plymouth
Markesan
Elroy
La Farge
Portage
Cambria
Randolph
Iron Ridge
Horicon
Random Lake
Fredonia
Richland Center
Prairie du Sac
Prairie du Chien
Columbus
North Lake
Lone Rock
Madison
Mazomanie
Waterloo
Watertown
Oconomowoc
Brookfield
Milwaukee
Muskegon
Grand Haven
Dodgeville
Mineral Point
New Glarus
Palmyra
Eagle
Waukesha
Oakwood
Racine
Platteville
Milton Jc.
Delavan
Elkhorn
Burlington
Genova
Brodhead
Janesville
Bardwell
Gratiot
Shullsburg
Dyersville
Dubuque
Galena
Warren
Beloit
Harvard
Fox Lake
Kenosha
Freeport
Rockford
Benton Harbor
St. Joseph
Maquoketa
Delmar
Savanna
Kittredge
Forreston
Davis Jc.
Genoa
Elgin
Chicago
Glenview
Mayfair
4562


THE MILWAUKEE ROAD
AND CONNECTIONS
LINES ELECTRICALLY OPERATED 440 MILES
LINES ELECTRICALLY OPERATED 216 MILES
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MANITOBA
ONTARIO
LAKE SUPERIOR
LAKE MICHIGAN
PACIFIC OCEAN
WASHINGTON
OREGON
CALIFORNIA
NEVADA
IDAHO
MONTANA
WYOMING
UTAH
COLORADO
ARIZONA
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
KANSAS
OKLAHOMA
TEXAS
ARKANSAS
MINNESOTA
IOWA
WISCONSIN
MICHIGAN
ILLINOIS
INDIANA
OHIO
KY.
MO.
SEATTLE
TACOMA
SPOKANE
PORTLAND
SAN FRANCISCO
LOS ANGELES
SALT LAKE CITY
DENVER
OMAHA
KANSAS CITY
MINNEAPOLIS
ST. PAUL
DULUTH
MILWAUKEE
CHICAGO
UNION PACIFIC
YELLOWSTONE NATIONAL PARK
6132-TT RAND McNALLY & CO., CHICAGO
9-'56

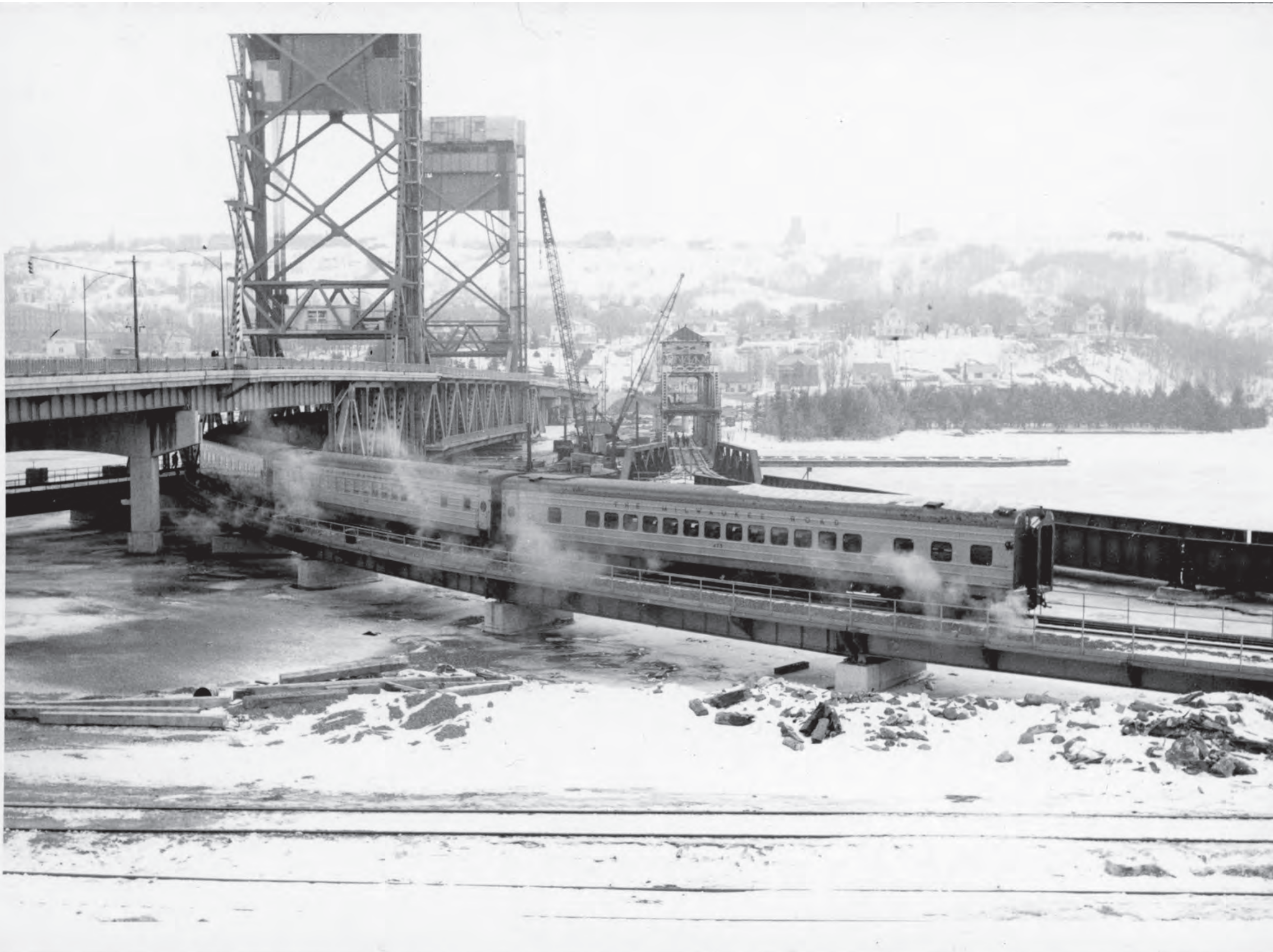
Additional Photographs:

[8-1] Photograph No: Neg 2008-01-16-07, “First Train Across Portage Lake Lift Bridge.” Date unknown., Copper Country Photo File: Bridges- Portage Lake. MTA & CCHC.

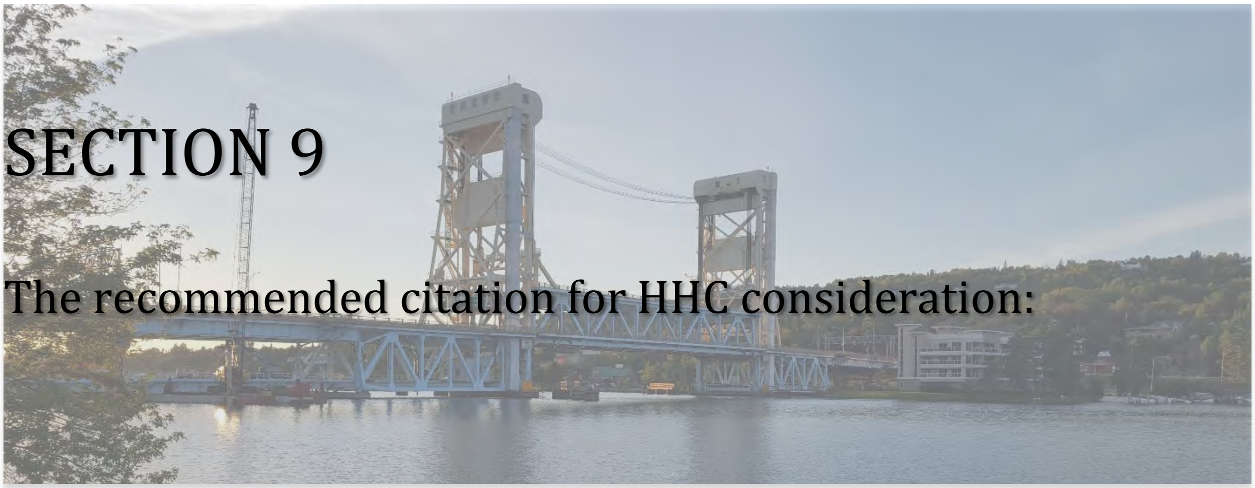
[8-2] “Portage Lake Bridge- Winter,” (Mar 8, 2019). Photograph courtesy of Michael Prast (Apr 2019).

[8-3] “Intermediate Position,” (Apr 19, 2019). Photograph courtesy of Michael Prast (Apr 2019).

[8-4] “Intermediate Profile,” (Apr 19, 2019). Photograph courtesy of Michael Prast (Apr 2019).


THE MILWAUKEE ROAD


HOUGHTON



SECTION 9

The recommended citation for HHC consideration:

“Completed in 1959, the Portage Lake Bridge used a revolutionary intermediate lift position to provide a flexible and efficient crossing for many types of transportation. Construction took two years, working through the Keweenaw’s harsh winters and culminating in a lift span that weighed 4,584,000 lbs - the heaviest lift span in the world at the time. Through the intermediate position and its double-deck vertical lift design, the bridge connected the communities of Houghton and Hancock, playing a key role in connecting the Keweenaw’s copper mining, logging, and other industries to the nation.”

SECTION 10

A statement of the owner’s support of the nomination:

Attached is the statement of support from Bradley Wagner, MDOT Bridge Design Supervising Engineer, representing the Michigan Department of Transporation.

GRETCHEN WHITMER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF TRANSPORTATION
LANSING

PAUL C. AJEGBA
DIRECTOR

February 15, 2019

History & Heritage Committee
Jennifer Lawrence
1801 Alexander Bell Drive
Reston, VA 20191-4400

MDOT is honored to submit this letter in support of the nomination of the Portage Lake Lift Bridge for recognition as an ASCE National Historic Civil Engineering Landmark. The Portage Lake Lift Bridge is a unique structure and currently serves as the only connection of US-41 to Michigan's Keweenaw Peninsula and is a vital connection for the residents, businesses, and tourists in Michigan's Copper Country.

The Portage Lake Lift Bridge was an engineering marvel at the time of its original construction in 1959, and to this day remains one of the biggest and heaviest lift structures in the United States. From the mid-1800s to the 1960s copper mining was the defining industry of the area, with several active copper mines on the Keweenaw Peninsula. By the 1950s, the previous structure, a steel swing bridge, was nearing the end of its usable life. There was a need for a structure that could carry residential and commercial vehicle traffic as well as rail traffic while still allowing for the passage of freight under the bridge via the Portage Lake Canal. The resulting structure, the Portage Lake Lift Bridge, was able to accommodate all modes of traffic while reducing the impacts to traffic on the Portage Lake Canal.

MDOT currently invests significant capital in the preservation of this structure due to its importance and the significant cost of replacing the structure should it deteriorate beyond the reach of reasonable repair options. Most recently, in 2015, a significant project was undertaken that replaced the lift cables, operator house and several mechanical aspects of the structure to ensure reliable service for years to come. The historical significance, vital traffic connection, and prominent impact to the Houghton and Hancock skyline truly make this structure worth of recognition as an ASCE Historic Civil Engineering Landmark.

Respectfully,

Bradley M Wagner

Bradley M. Wagner
Feb 15 2019 1:40 PM
cosign

Bradley M. Wagner, PE
Bridge Design Supervising Engineer
Bureau of Bridges and Structures
Michigan Department of Transportation