Under Cover Items of Interest in the Information Center for Ropeway Studies Collection

Sid Roslund
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Sid has been involved with the ropeway industry for over 35 years. He started at the Steamboat Resort in Colorado and then worked for three years in Indonesia at the Freeport Mine that used VonRoll Tramways to haul the ore down from the mine to the mill. Sid then was involved with the opening of VonRoll Tramways offices in the USA as the head of Service and After Sales Engineering. Sid is now the Director of Technical Services for NSAA (National Ski Areas Association) and started working for the association when USIA was formed in 1990. He left USIA when the original organizations (SIA and NSAA) separated and moved NSAA to its current offices in Denver. The administration of the ASC B77 Committee and the ANSI B77.1 Standard for Passenger Ropeways are one of his major responsibilities. Being a Denver native he is now back home.

Under Cover Items of Interest in the Information Center for Ropeway Studies Collection

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Presently the Information Center for Ropeway Studies Collection has over 800 books on different aspects of ropeways systems. There are the usual books such as the CF&I Roebling Wire Rope Handbook or Aerial Tramways and Funicular Railways by Z Schneigert. One collection of books from Casper D Meals is a unique compendium of varied materials (papers, journal articles, manufacturer catalogues, etc.) that were bound into books during the first decades of the 20th Century. The binding of the printed materials into books captured a "snapshot" of the wire rope industry for a short time period in each book. This paper will look at several of the information threads that weave through these books and several other book series in the Collection.

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Under Cover Items of Interest in the Information Center for Ropeway Studies Collection

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The collection of materials continues to grow at the Information Center for Ropeways Studies at the Colorado School of Mines, Arthur Lakes Library. It now has over 800 books, 8 file drawers of manufacturers catalogues, 7 journals (i.e. NSAA Journal, ISR, etc.) along with pictures and videos. Anyone can access the database working from the School of Mines web site www.mines.edu. Pick the Library tab and then click on a library link. On the library page chose "About the Library, choose collections, scroll down to Information Center for Ropeways Studies or you can enter http://library.mines.edu/ropeway/. You can go directly to the search engine at http://ropeway.coalliance.org/. The related Image Database at http://csmphotos.coalliance.org/ is having pictures added as time and funding allows for the scanning, and preparation of the originals for inclusion into the database. As often happens with pictures, information and captions aren't always correct but are adjusted as viewers relay additional information to the library to correct the picture caption.

When you go the search engine, it is easy to pick a topic and view the results. The problem is that the abstract writers have to try and get the essence of the item conveyed in a few words and then pick out the key-words. You don't always get the nuances of what is written or what is displayed or available in the pictures drawings or ancillary materials. You just have to sit down and page through the material.

One of the unique sets that was given to the Ropeway Center was compiled by Casper D. Meals, a Professional Engineer from Nutley, New Jersey. In the 1920's he started to compile professional journal articles, manufacturers catalogues and any other information into bound books, most of which dealt with wire rope. These bound books seem to be generally assembled by year and thus allow the browsers to see manufacturing changes based on the emphasis of their catalogs and more uniquely, the 2-8 page information tracks that were placed in the back of the catalogues to fill the blank pages.

Wire Rope Book 1A[2] has a series of reports that were compiled to figure out the cycle life of wire rope through a snatch block. This is a result of the high money and material loss from ship cargo being dropped, when a wire rope would break on a cargo derrick, prior to and during WWI. Due to the war effort, the Wire Rope Testing Committee in England would have to devise and arrange testing quickly to reproduce practical conditions for the wire rope to determine a service life. The *First Report* is essentially a review of existing written material on the subject.

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[2] Arthur Lakes Library, TS 1787.M32

When existing papers on wire rope were consulted "The amount of reliable information obtained is disappointing when considered in relation to the number of papers written on the subject"[3] You do not realize how far we have come until you read some of the quotes under "THE ROPE" stating "all the wires in the same rope should be as closely alike as possible"[4] There are discussion between Lang Lay and Hawser Lay. A very interesting comment under "When a rope should be scrapped" was made by McCunn and Colson – "Determine the changes of sectional area of a rope by the alteration of its self-induction". They used a solenoid over the rope."[5] The report continues through a discussion of all aspects and finishes with a bibliography containing 88 references.

The *Second Report* of the Wire Rope Research Committee in 1919, finds the committee resuming their activities. They determined that they would test 1-inch circumference wire rope of the same grade wires but different constructions under different tensions around pulleys. The tests were limited to 1 million cycles on the testing machines for time constraints but they found most wires would exceed this testing limit without failure. When the different wire ropes were tested, the results and conclusion were what we take for granted today. "Larger pulley diameters, lower tensions, groves that match the rope diameter, and 6 x 19 Lang Lay construction gave the better results".

When you get through all the testing and results of the *Third Report*, a conclusion is made that there is a wide range of failure cycles from the wire ropes supplied from the different manufactures for the tests. But it was noted that some manufacturers' wire ropes consistently out preformed other manufacturers' ropes. It was thought that the quality of the individual wire materials and the manufacturing process can greatly influence the results of the testing. The final recommendations are for "Routine inspections of the wire ropes on derricks for broken wires and the prompt replacement of wire ropes when broken wires are visible. This would give the best results based on the variety of testing results obtained."

Wire Rope II – Mines and Lift Bridges[6] has a series of varied reports. ASME in 1918 worked to access the stresses in wires in a wire rope. Pages of formulas and their applications as applied to wire rope as it passes around a sheave are laid out. Of interest is the "fast line losses" table for internal friction loss using multiple parts of reeving. The numbers are similar to those used today.

1921 saw a great deal of interest in small cables used in aircraft controls which was for new high performance airplanes. Again, *A Study of the Elastic Properties of Small-Size Wire Cable* has discussions of pulley sizes and the effect on wire rope life due to catastrophic control failures. This was the original "Fly by Wire."

In the 1919 *Safe Practice In Using Wire Ropes in Mines* notes that for attachment to a car on a slope is states "when the rope is permanently attached to the car, it is safer to pass the rope

[3] The I.Mech.E. Page 835, Wire Rope Research, Wire Ropes for Use Over Pulleys(See Footnote #2)
[4] Et All Page 841
[5] Et all Page 846
[6] Colorado School of Mines, Arthur Lakes Library, Wire Rope II, TS 1787.M32 V-2

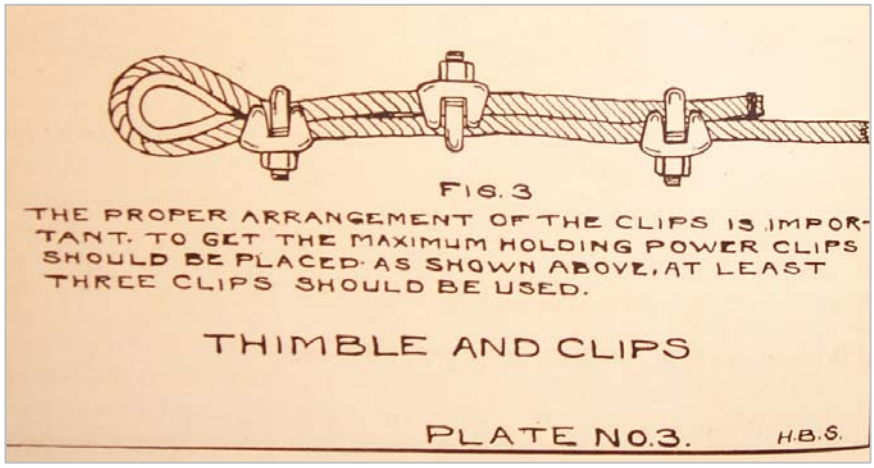
entirely around the car, clamping it to the car at various places". A chart for using Crosby clips was also included.

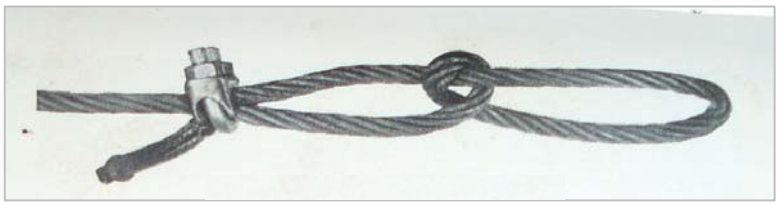
Number of Crosby-type rope clips required to develop 80 per cent of strength of 6–19 plow-steel rope.

Diameter of rope.	Number of clips.	Length of wrench to tighten bolts.	Efficiency.
Inches.		*Inches.*	*Per cent.*
⅜	5	18	77.39
½	5	18	79.13
1	5	24	77.89
1¼	5	24	80.00
1¼	6	24	82.15

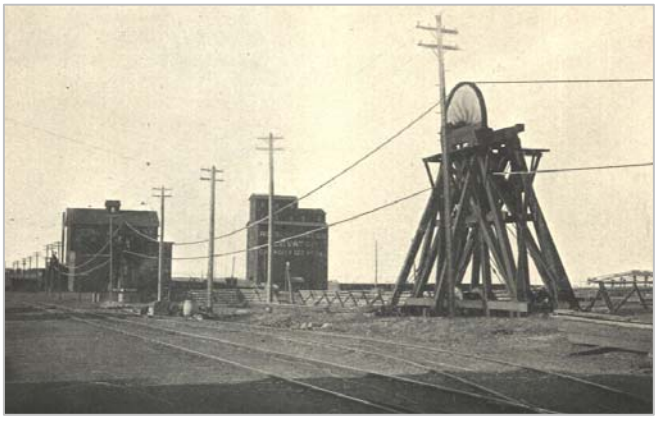
A British document *Wire Rope For Mines* in 1928, talks about the different methods of attaching end connections or "capping" a rope end. One unique method is the use of two halves of an end connection that are placed over the rope end and then rivets are passed through the rope to fasten the two halves together "often damaging the wire rope". This is also an interesting piece to read, as it describes wire rope making from preparing the steel, drawing the wires to laying up the rope.

Practical Wire Rope Information – H.B. Sauerman – This 40-page 1916 pamphlet cost $0.20 and covers the topics of a basic Wire Rope Handbook riggers use today. What is of interest is what was thought to be correct or innovative installation of a clip.





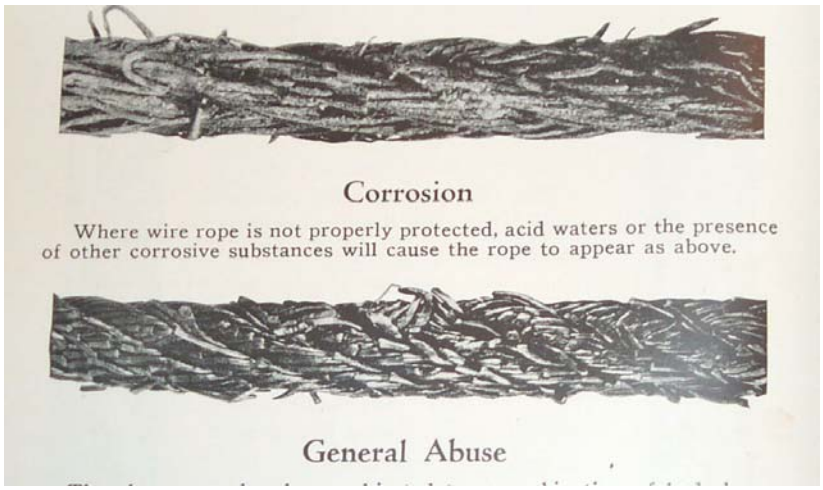
A unique use for wire rope that you hardly think about is The Transmission of Power by Wire Rope. A John A Roebling's Sons Co. pamphlet outlines the whole process. The rope speeds to transmit relatively low horsepower by today's standards were surprisingly high. How about wire rope traveling at 7500 ft/min for the transmission of 200, HP and built to the general rule that the sag of the static rope between support sheaves should be about 1-36th of the span length and the power should be transmitted on the lower loop..



The Royal Milling Company
Great Falls, Montana
Sheaves – 200 RPM's
250 Horsepower transmitted
A wire rope loop is installed between each support sheave. Sheaves have two grooves.

As stated before, many of the books are compilations of catalogues. Wire Rope 23^7 is one such book compiled in 1942. What is interesting is to follow a topic through the years in the back of the catalogues. Once you have a manufacturer of interest, the database allows you to pick out various years and trace the topic through the years and watch the changes in techniques and terminology in different versions of catalogues. Some topics disappear, surprisingly some are the same today, and some have changed over the years. Splicing is one of the topics you can follow.

As you are looking at the catalogues, look at the descriptions of damage and the images. It is a little more than we see today in our industry.



There is one more thing from an historical standpoint to look for in the catalogues. Companies often used the opening pages to introduce the company and give a brief history or infomercial of the company.

Broderick and Bascom Rope Company Seattle Factory – 1907

This is just a brief description of just 3 of the Meals books in the collection. They all have a unique historical take. You need to take a couple of hours one afternoon and come to the center and browse. Five hours later you will discover you didn't have enough time. "It's like a candy shop for ropeway oriented people" stated John Mauch from Breckenridge. "Everything you open has a unique flavor to the history of Ropeways and you want to see what the next item offers."

[7] Colorado School of Mines, Arthur Lakes Library, Wire Rope 23 - TS 1787.M32.V23