The three sheaves at the top of each tower are 8 ft. in diameter and weigh about 2½ tons each. The rims and hubs are of cast steel and were machined before the sheaves were assembled. The rims are in four sections bolted together. The spokes are built up of steel plates and angles rivetted together and bolted to the rims and hubs. The shafts are 5″ in diameter of medium open-hearth steel. After the sheaves were assembled the hubs were shrunk on the shafts. The sheave bearings are of cast steel bushed with bronze. Lubrication is provided by means of wicks.

Insulators

The insulators which we proposed using in the steel lines consist of a large ring-girder and two spiders. The ring-girder is 8 ft. in diameter and made up of two 9″ channels 12″ apart with ⅜″ cover plates. The spiders are built up of plates and angles with a heavy steel casting in the centre. The upper spider is connected to the ring-girder by means of three 2½″ bolts 10 ft. long, one at the end of each spider arm. The centre spider is supported on the ring-girder by six porcelain insulators of eight skirts each, two insulators at the end of each spider arm. The clear distance between the spiders is about 36″.

The porcelain insulators used are special compression insulators having a tested breaking strength of 60 tons each,—this is about 4 times the estimated maximum load. Electrical tests showed a dry flash-over of 302,000 volts and a wet flash-over of 262,000 volts. The completed insulator has a net weight of about six tons.

Cables

The cables are 1⅜″ in diameter, of galvanized plough steel made up of six strands of 19 wires each and a stranded steel core of 30 wires, with a small hemp centre. Tests made at McGill University showed that the individual wires had an average yield point of 221,000 lbs. per square inch, and an average breaking strength of 258,000 lbs. per square inch.

The completed cable was tested, the yield point being found to be 158,500 lbs. and the ultimate strength 186,400

Concrete Bucket, With Cover

lbs. or 193,000 lbs. per square inch and 227,000 lbs. per square inch respectively.

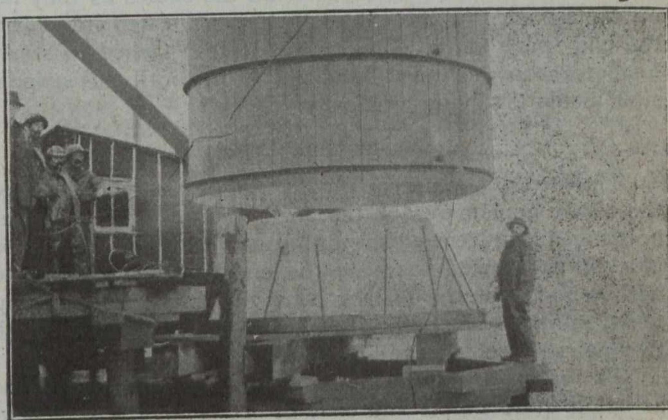
The test of the completed cable indicated a modulus of elasticity of 7,250,000 lbs., or 8,800,000 lbs. per square inch. We are in doubt as to the correctness of our test in this regard on account of the fact that the usually accepted value for the modulus of elasticity for stranded steel cables is about 21,000,000 lbs. per square inch. However, the behavior of the cable during erection bore out the results of the test.

No electrical tests were made on these cables, but their sectional area would indicate a conductivity equivalent to that of a 100,000 c.m. copper cable.

The bridge sockets used for connecting the cables were machined out of solid blocks of steel. Those attached to the centre span cables are 15 inches long, taper in width from 5½″ at the front to 8″ at the back and are 9″ thick, providing a grip of this length on the cable. The sockets attached to the anchor span cables are slightly smaller.

A conical hole, tapering in diameter from 1 9/16″ to 5″ is bored through the centre of the block from front to back and on each side of this hole a 2⅝″ diameter hole is provided for the connecting bolts.

The cable was passed through the tapered hole in the centre of the bridge socket and broomed out on the end



Setting First Caisson Form

for a length of 15 to 18 inches. The wires were then cleaned with gasoline and held in place by means of a templet made of ⅛″ steel plate which fitted over the back of the bridge socket. The bridge socket was then suspended with the back up and heated by gasoline torches for about half an hour when spelter was poured into the conical hole through a 1 inch diameter hole in the centre of the templet. After the bridge socket had cooled, the ends of the wires projecting from the templet were cut and the templet was removed.

Before adopting this form of connection, tests were run under our direction at McGill University to determine the depth of socket required. We found that if the spelter was heated to just the right temperature, i.e., just hot enough to ignite a sliver of wood thrust into it, that the full breaking strength of the wire was in the majority of cases developed in a length to six inches.

Shortly after the bridge sockets were poured, we found it necessary to shorten two of the cables and the speltered end was cut off. We had one of these cones of spelter cut in the machine shop and found that the spelter adhered so firmly to the wires that the section could be machined without lifting the wires out.

Erecting Cables

Owing to constant succession of delays that occurred in the construction of the foundations and in the erection of the towers, we had to abandon our original plan of stringing the cables in the fall of 1917 before the ice formed in the river, and so decided to do this part of the work after the ice had become thick enough to support the weight of the heavy reels of cable.

Throughout the heavy snows of January and February, we managed by constant rolling and scraping to keep a road open between the two towers. Early in March the centre span cables were laid out along this