Temporary scaffoldings of timber were built from the bluff on either side out to the edge of the water, on a level with the top of the tower. Upon these the short arms of the cantilevers were erected, one end resting on the steel towers and the other upon masonry on the bluff. The shore end was firmly anchored to this masonry, so that it will take an uplifting force of 1,000

Fig. 1. Sept. 13th. American Side.

tons at each end to displace it. This constitutes the counter-weight to balance the unequal loading on the river-arm. As this, under the most unfavourable conditions, can never exceed 3,0 tons, the provision is ample.

There will be none of that wavy motion noticed on a suspension bridge as a train moves over it. Remember-

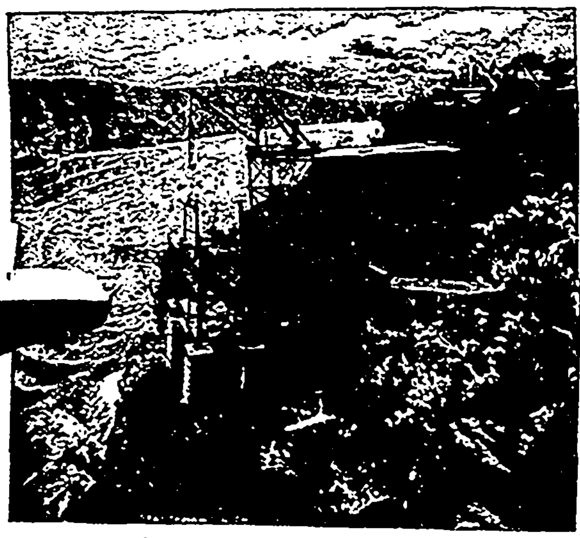

Fig. 2. Sept. 15th.—Canada Side.

ing that it took over three years to build the present suspension bridge for a single track, that this bridge for a double track not only had to be finished within seven and a half months from the execution of the contract, but has been actually completed with eight days to spare, it reflects great credit upon the advancement of American

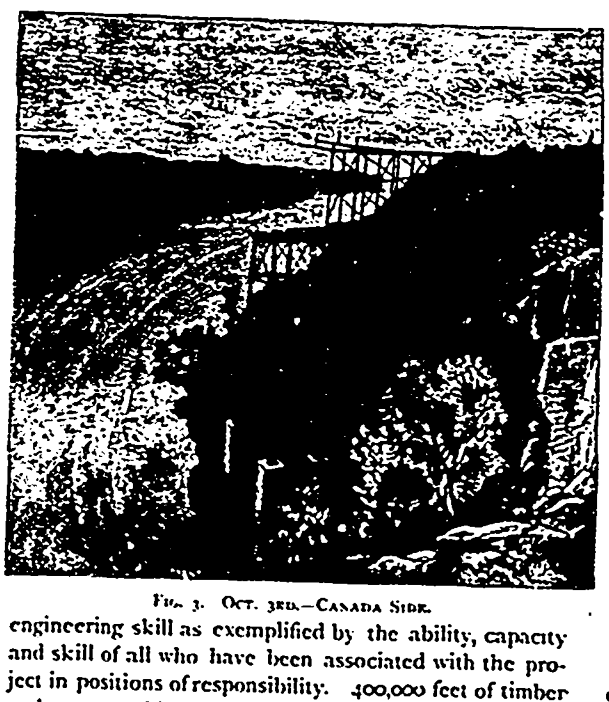

Fig. 3. Oct. 3rd.—Canada Side.

engineering skill as exemplified by the ability, capacity and skill of all who have been associated with the project in positions of responsibility. 400,000 feet of timber and 15 tons of bolts were consumed in the false work. The piers contain 1,100 cubic yards of "beton coignet," and the abutments of the approaches 1,000 yards of masonry. The travelling derricks are the largest yet built. They are calculated to sustain a weight of 32 tons on the overhanging arm, and project 40 feet beyond any support. It is the only bridge of any magnitude completed on this principle. The Firth of Forth bridge in Scotland, with a clear span of 1,600 feet, is to be built upon this plan, and also in this country the Fraser River bridge, 315 feet clear span, on the Canadian Pacific. These are the only examples of this design yet under

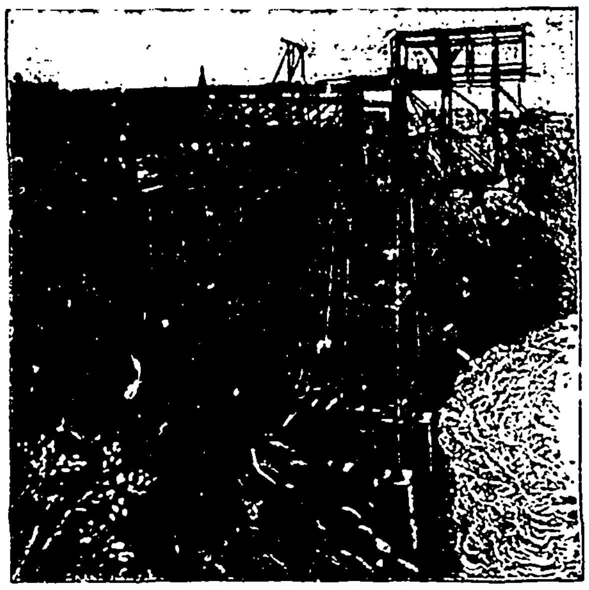

Fig. 4. Nov. 4th.—American Side.

taken, but the principle especially recommends itself to long span bridges that must be erected without false work.

The total weight of the iron and steel entering into the composition of this massive structure is about 3,000 tons. The excavations for the mason work of the towers, upon

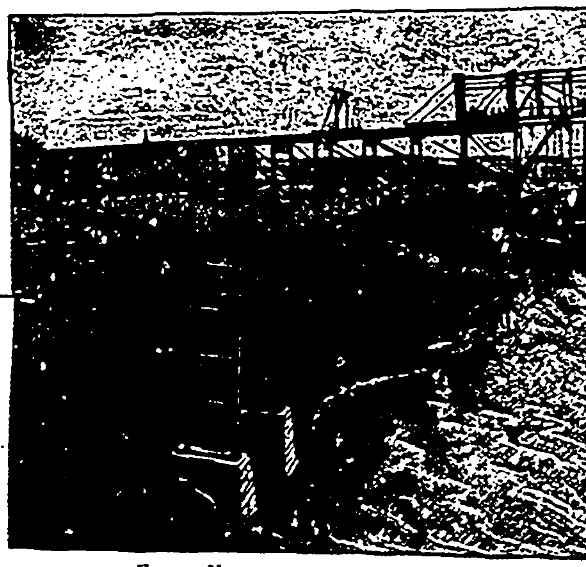

Fig. 5. Nov 14th.—American Side.

which stand the steel towers supporting the cantilevers, were carried down until solid rock was reached. The total weight resting on each of the towers under a maximum condition of strain is in round numbers, 3,200 tons. Each ingot of steel was submitted to a chemical analysis, and samples to a mechanical test. The stan-

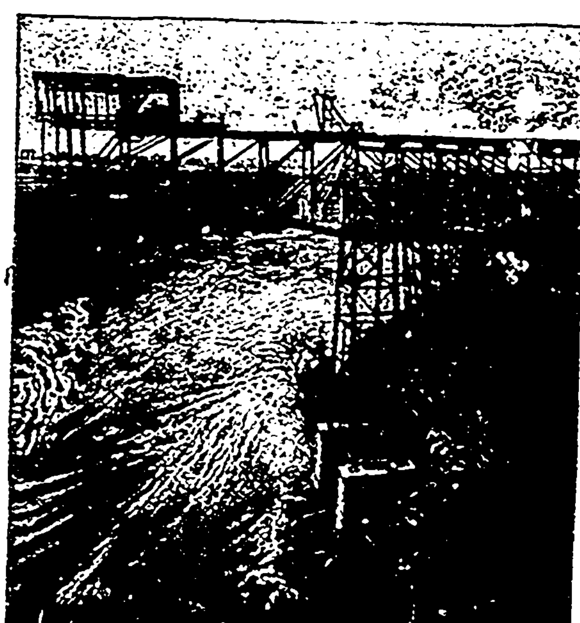

Fig. 6. Nov. 17th.—Canada Side.

dard of excellence adopted was more severe and exacting than usual, and all steel that failed to meet the requirements was rejected.

On the morning of November 21, 1883, the work of putting in the fixed span began, and when the hour of noon had arrived the sections had been connected, and the bridge practically completed. The weather during this performance was very bad, but a large crowd of spectators, which included ladies, railroad officials, and bridge experts, stood patiently in the midst of a heavy rain storm, and interestedly watched the operation.

The total length of the bridge is 910 feet. It has a double track and is built strong enough to carry upon each track at the same time a freight train of the heaviest kind, extending the entire length of the bridge, headed by two "consolidation" engines, and under a side pressure of 30 pounds to the square foot, which pressure is produced by a wind having a velocity of 75 miles per hour, and will even then be strained to only one fifth of its ultimate strength.

The erection of this substantial and elegant structure, over the most dangerous, turbulent and furious rapids in the known world, without a jar, serious accident or loss of life, and in less than 7½ months from the awarding of the contract, ranks as one of the most splendid achievements of engineering skill, bordering the domain of the marvelous. Our large engraving furnishes a splendid view of the completed structure, which presents a new and desirable combination of principles, and as before stated, is the first of any magnitude ever completed upon this plan.

## PATENT LAWS IN EUROPE.

H. Palm, in *Der Oesterreichisch-Ungarische Mueller* writes very sensibly as follows: Within a few years some of the European countries have adopted new laws for the protection of inventors; Germany in 1877, and England in 1878. Whoever compares the history of Germany in 1877, with that of to-day, must be surprised at the immense industrial progress made during these seven years. The hard, but just sentence of Prof. Reulaux, at the Philadelphia Exhibition in 1876, about the exhibits of Germany: "Cheap, but poor," seems to mark the turning point in German industry. In spite of many apparent faults, the German patent laws have aided more than anything else, to bring about a change in the manufacturing systems of Germany. It induced specialization, and with it improved methods, and it is fair to state that all improvements in the industries of the country, are at present protected by patents. German capitalists become more and more disposed to invest in new inventions, and this tendency will, unquestionably, increase as soon as the patent laws cover chemical products as well as others, which is simply a question of time.

England, above all other countries, has enjoyed the benefit of patent laws longest, it can be traced back as far as 1623, and the pre-eminence of English manufacturing interests is due largely to these laws. Strange to say, the new patent laws of 1878 show very little improvement upon the old ones, and restrict the privileges of the inventor, by allowing third persons to make use of such invention, on a payment of a license to be fixed by the board of trade.

In Austria, the necessity for new patent laws becomes more and more apparent, and the tendency there is to increase the privileges of the inventor, and protect his interests to the fullest extent.

All mechanisms of to-day have been invented at some time or other; all are more or less the sum of a varying number of inventions and improvements.

The inventor is the pioneer of industry, the mental path-finder in the realms of industrial progress; therefore let us protect the inventor, for the soundest protection of industry rests with him. This should be understood, for almost everywhere industry and invention are looked upon as two opposing factions. Of course this does not apply to the true, intelligent industry, which strives to accomplish its work economically, quick and good, and is glad to avail itself of all improvements; but it applies to that mongrel-industry which looks upon an inventor as an enemy, and because it lacks the conjunction of an intelligent mental property, does not hesitate to live upon intellectual robbery.

## ZINC FOR PREVENTING BOILER CORROSION.

The use of zinc for preventing boiler corrosion in steam-boilers has formed the subject of several patents, and recently Mr. J. B. Hannay, of Glasgow, has obtained a patent for further improvements on his invention of 1881. According to the present invention, the zinc masses of spherical or spheroidal, or polyhedral, or cubical form, or other form having small difference of thickness in different directions are rendered more durable and efficient by being brought into the condition known as malleable, instead of being used in the condition they have when simply cast. For this purpose the masses are hammered or forcibly pressed or rolled, the operation being by