



## **The Riddle of the Tay Bridge Disaster**

*The Tay Bridge Investigation*

### **Melissa Berry**

A court of enquiry was set up to investigate and here at David Kirkaldy's Testing Works in Southwark, London, rigorous tests were carried out.

### **Dr Denis Smith**

Material that was sent to this building for testing included things like wrought iron bolts and nuts, wrought iron diagonal bracing, cast iron columns with their lugs and pieces of riveted wrought iron girder.

The object of all the tests really that were being undertaken by Kirkaldy were the ultimate tensile strength of the materials.

### **Melissa Berry**

The enquiry found that the bridge was poorly designed, constructed and maintained.

### **Dr. Denis Smith**

The committee certainly laid a great deal of the blame on the designer Sir Thomas Bouch. As a broken man, he died at the end of the year of the enquiry in 1880. To go back to the report and try to tease out which is the most important factor of the cause of the accident, it's very difficult. That's why, of course, engineers are still fascinated by this particular report and this major accident.

### **Melissa Berry**

All explanations of the disaster revolve around one section of the bridge. The high girders in the centre were raised to give clearance for ships. These were the ones that fell.

### **Bill Dow**

On the night of the disaster there was a very powerful wind from the west of the Tay, sweeping down the Tay, almost at right angles to the bridge. What happened was that the 13 high girders, and only the 13 high girders amongst the girders, landed up on the east side of the bridge. In the process of falling, they took with them 12 of the piers that were supporting them but they left the two end piers.

### **Melissa Berry**

An important and possibly fatal alteration to the design of the piers was made during construction. It was caused by an inadequate survey of the river bed

### **Dr Rob Duck**

We don't really know a lot about the firm that did the site investigation survey for Bouch but certainly they carried out a number of bore holes, a number of drillings across the river and they reported to him that bedrock was at really quite a shallow depth all the way from Wormit to Dundee. And he designed his bridge accordingly to be founded on piers. Unfortunately, what the drillers had done, they had mistaken a very firm gravel layer, sand and gravel layer for bedrock.

Now when the bridge began to be built they started from Wormit and had really relatively few problems with the first fourteen piers because they indeed, were founded on bedrock. But when the came to found the fifteenth there was a problem because bedrock was at a very much greater level and, indeed, in the centre of the river, we know that bedrock's probably as

much as seventy metres below the water surface, because this whole estuary was scoured out by a glacier.

**Melissa Berry**

The change in design had to lighten the load on the piers - the brick piers were scrapped and cast iron columns with wrought iron tie bars were used instead. In what appears to be a crucial mistake, Bouch attached the tie bars to the columns with cast iron lugs that were cast with the columns. His other bridges had used wrought iron straps for this. Cast iron is a very brittle material - not ideal for something to be used in tension - whereas wrought iron is ductile and tough. Nobody is absolutely sure why he did this - some think it was the cheaper and quicker option - but it certainly introduced a fatal weakness.