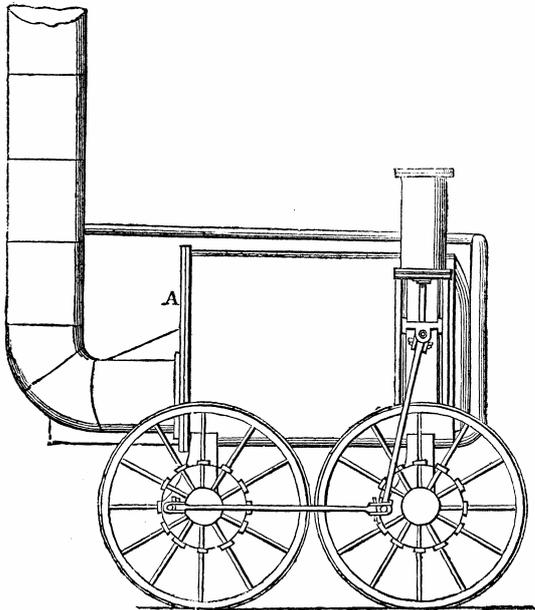


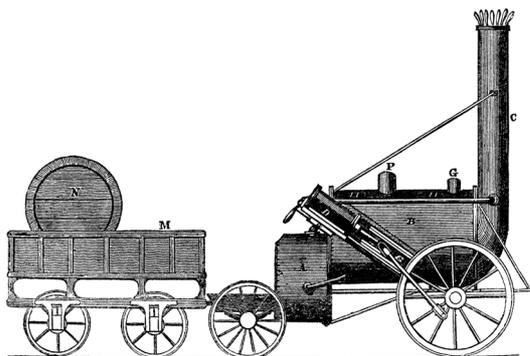
On 31<sup>st</sup> August 1829 the Directors decided that the place of the contest would be at the level space between the two inclined planes at Rainhill and the date was set for 1<sup>st</sup> October. The judges were to be J. Kennedy, J.U. Rastrick and N. Wood.



The board of Directors of the Stockton and Darlington Railroad allowed Timothy Hackworth to build an engine at his own cost at the Shildon works. This was to become the Sans Pareil, exactly along the lines of other Hackworth engines, four wheels coupled with a return flue boiler, vertical cylinders above the trailing wheels. He used his standard blasting exhaust arrangement, but could not use springs due to the vertical cylinders. He must have given this some thought, because the Sans Pareil is reported to have had very large clearance spaces in the cylinders<sup>73</sup>.

Figure 2.9 Sans Pareil by Hackworth<sup>93</sup>

Robert Stephenson's way of thinking was different. In general he was satisfied with the mechanical part of the Lancashire Witch and her successors. However, he had noticed that the wrought iron wheel tyres of the coupled engines wore down very quickly, probably due to the fact that the two wheels of the driving wheelset could not be turned to the same diameter within close tolerances in 1828/29. The different wheel diameters led to much slipping, aggravating the problem.



He decided that, based on the demands of the railroad, the experimental engine could do with single driving wheels. Another problem he was facing was the perpetually insufficient steam-raising capabilities of the present boiler type. However, Henry Booth suggested that he might try a boiler where the single flue was replaced by a large number of smaller ones. The multitubular execution of the new boiler was the great step forward that locomotive design had been waiting for.

Figure 2.10 Rocket by R. Stephenson [Mech.Mag.]

Multitubular boilers for stationary engines had been in use in Cornwall since 1780, and a Dutch patent for boilers with tubes had already been granted to William Blakey in 1776<sup>74</sup>.