



Bridge of the Month No20 August 2012 Balcombe



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Balcombe Viaduct on the London-Brighton line is a magnificent structure, so much so that it shows clearly on the Google satellite photographs at <http://goo.gl/maps/QoHRY> and in streetview (<http://goo.gl/maps/S7ljj>).



That it is magnificent is enough to make it worth consideration, but there is room for a little more thought about what has been done here both in an engineering and an architectural sense.

There are very obvious architectural inputs. The pavilions at the end which are (surely) pure decoration and the provision of an open parapet of pale coloured stone adds hugely to the air of lightness

What is perhaps less obvious, but is clear when you look at this photo, is that perforating the piers is not a simple economic decision. To the right of the picture above, the structure appears slender and open. The left hand third, though, would appear as a solid wall from this angle were it not for the piercing of the piers. This is a direct application of an issue I have heard Jorg Schlaich talk about.

So, who did it? John Rastrick (1780-1856) was the engineer (http://en.wikipedia.org/wiki/John_Urpeth_Rastrick) and David Mocatta (1806-1882) (http://en.wikipedia.org/wiki/David_Mocatta) the architect.

The bridge was opened (with the railway) in 1841. Built of 11million Dutch bricks brought up the Ouse via Newhaven. It cost £38000. (Isn't wikipedia wonderful).

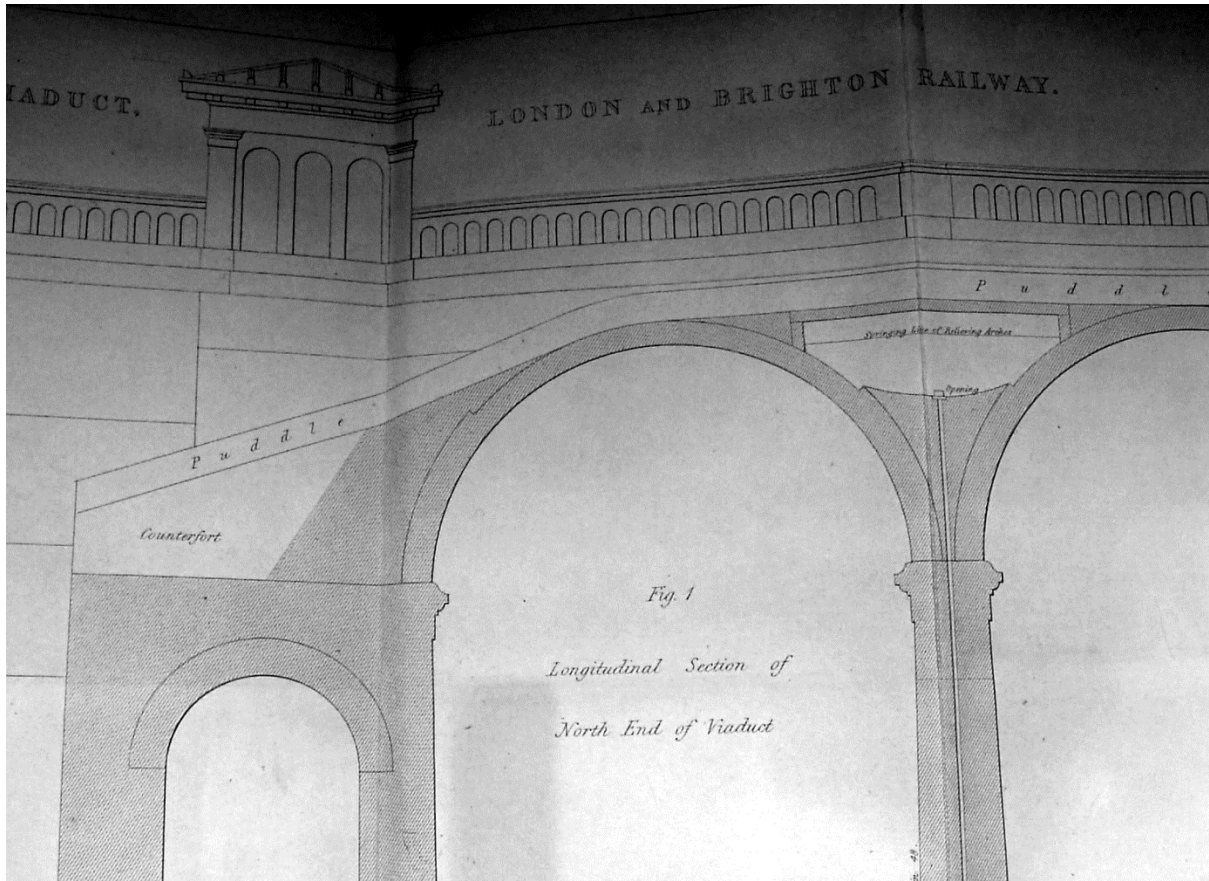
This is a monumental structure, though there are more like it, for example the London Road Viaduct in Brighton on the Brighton to Lewes line of the same railway. What lifts it, in my mind, is the hand of the architect reducing the mass and adding just that hint of decoration. In that sense, the pavilions at the corners of the abutments may be seen as mere extravagance. They certainly don't provide enough shelter for the linesmen.



This view shows how the pavilions act as finials on the substantial buttresses of the abutments. The moulding and buttresses are almost certainly intended to relieve the massive appearance that would otherwise dominate.

Also clear here is just how little of the piers is removed by the perforations. Presumably a compromise between engineer who wanted to loose none and architect who might have preferred to remove most.

There are considerable areas of pointing and patching visible here. What I cannot find, though, is any sign of drains.

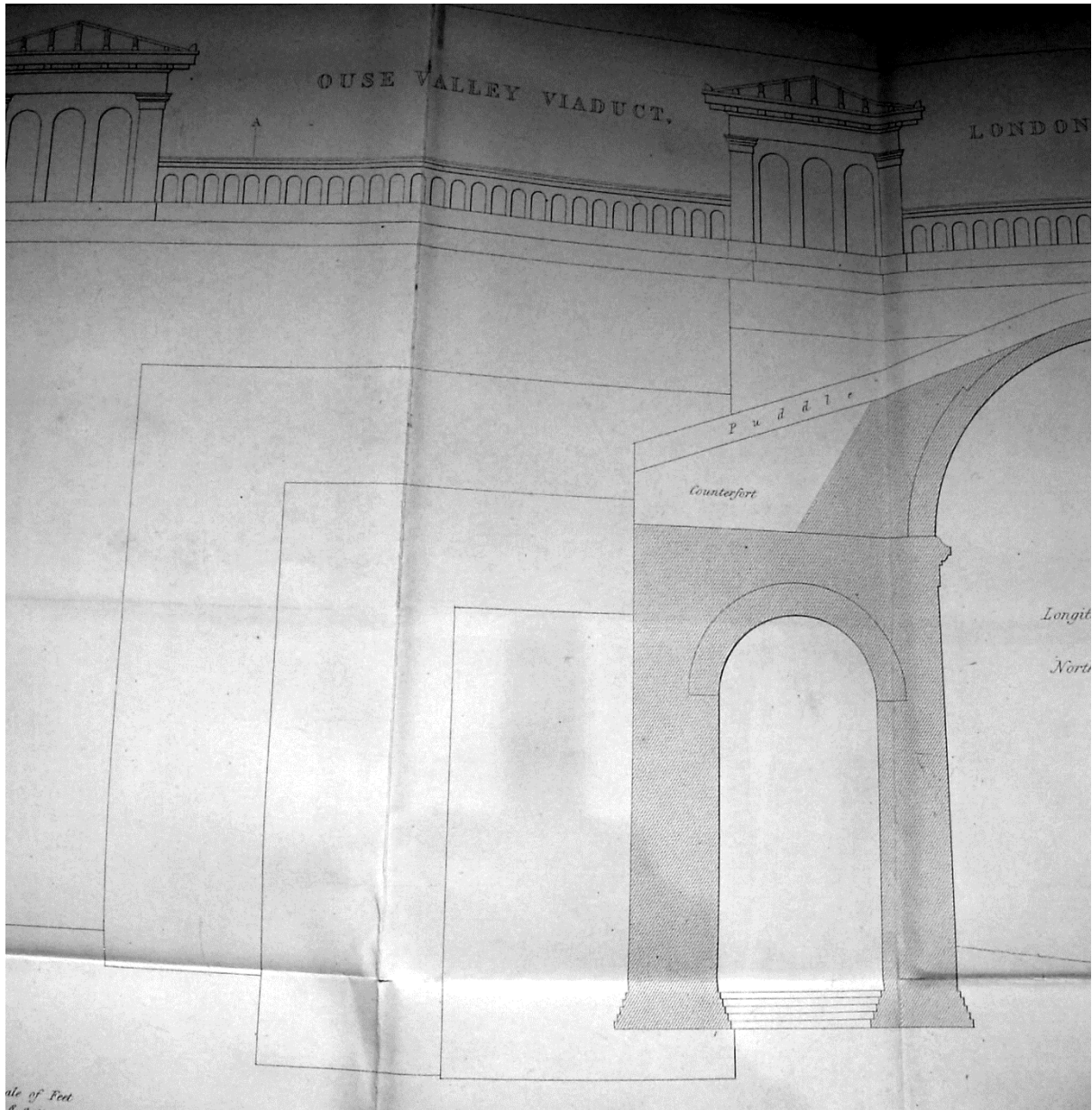


In the mid 19thC there was a considerable demand for books of drawings of the grand Civil and Mechanical Engineering works in progress. The ICE library has a collection and the drawings shown here come from that. The facility to copy large drawings adequately with a relatively cheap digital camera is really rather special.

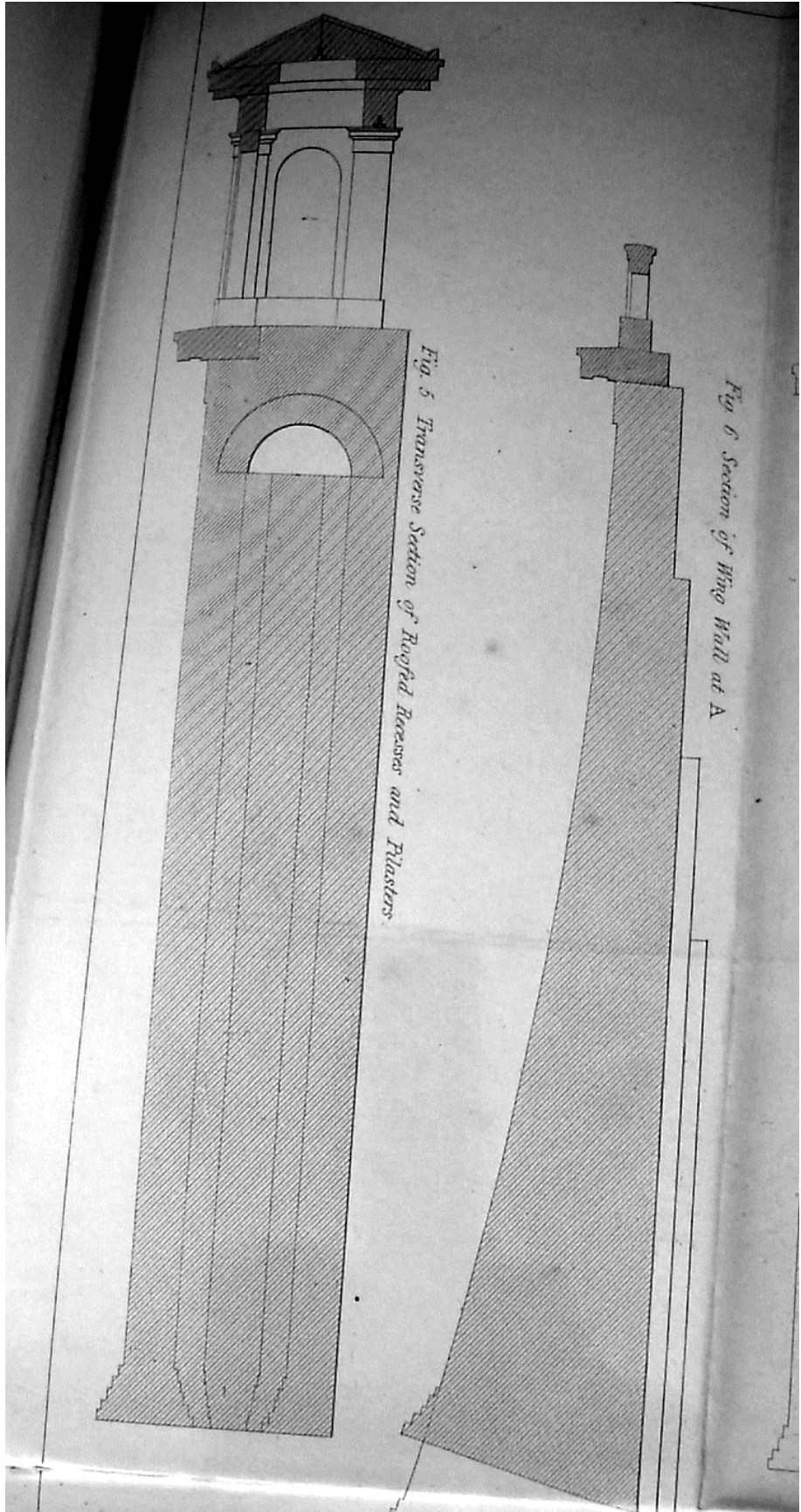
The drainage is quite clear in this picture. The backing over the centre of the pier has a dished top and there is a drain taken down from the low point through the leg of the pier. Notice how there are also internal spandrel walls with jack arches in this area, with the voids closed off at the ends.

Over the abutment, the backing is replaced with an inclined top counterfort. The abutment is also made hollow with an internal arch which cannot be seen from the outside. Over the top of the whole structure is a layer of clay puddle which is shown here as being thicker than the arch itself.

Notice, though, that only one pavilion appears in this section. To see both it is necessary to expand the view somewhat.

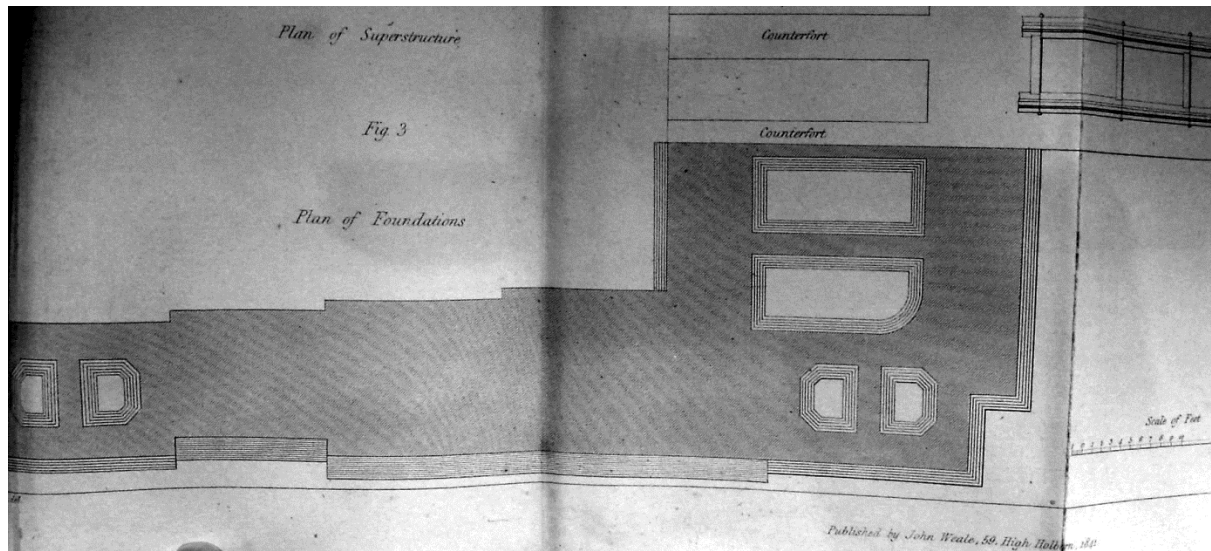


Now we can see that the abutment extends a long way back beyond the solid. The wing walls might normally not be regarded as parts of the structure but here they clearly are. Note the lines indicating thicker parts and that the foundations appear to extend below those of the more solid elements.

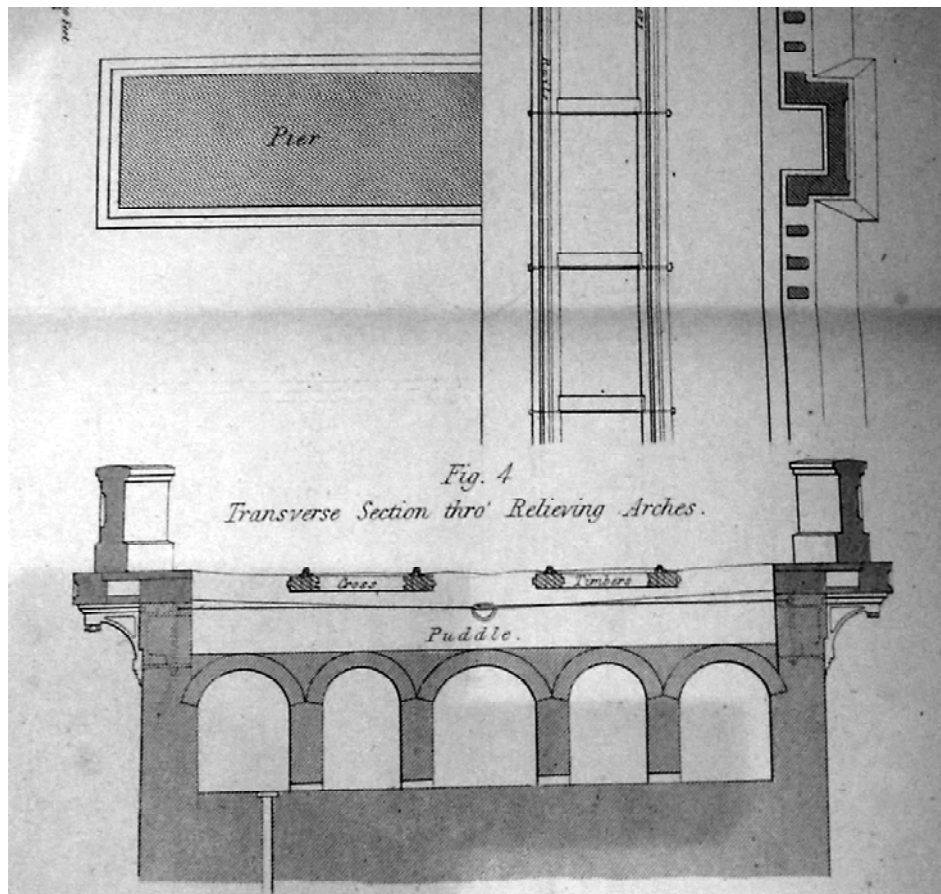


The outer face of the wall sweeps down and out in a majestic curve, while the inner face steps in the opposite direction until the whole is many metres thick.

There can be little doubt that this is part of the structure. Indeed, since the foundations go so low we can safely assume that they were built before the embankment. That means they were probably designed to resist the thrust of an arch without the benefit of the embankment fill behind them.



This plan of the abutment is slightly distorted as a result of the folds in the age but it is clear how it all fits together. Interesting to note that Rastrick used Brunel's style of track with longitudinal timbers, spacers and tie bolts and Vignoles (flat bottom) rail.



Perhaps more interesting is the fact that the abutment hollows and counterforts line up with each other but not with the hollows in the arch. The latter are shown below.

The internal spandrel walls are carefully positioned under the rails but the counterforts on the abutment are apparently in line with the voids in the arches. This section is, of course, at the pier centre line.



This view down the length of the viaduct shows how the bottoms of the openings in the piers run down through steps rather than in a smooth line.

News and Events

Bill's Sutherland History Lecture from 16th Feb is now available to watch on the web at

<http://www.istructe.org/resources-centre/webinars>

After a long struggle with the new protection software we think that the Demo, available from <http://www.obvis.com> is now stable and can be properly activated when paid for. It will work in standalone or network mode. If you are ready for an update or thinking of buying please download this version and then contact us for activation.

We are now ready to embark on the next phase of proper development.

Moire TellTales now available from www.moiretelltale.com

Engagements

UIC Arches meeting: Dublin 3/4th September

IALCCE Conference Vienna 3-6th Oct

The Heritage Society of Engineers Ireland: Lecture 15th October 2012

Followed by a day seminar at the Mespil Hotel. Email Philip@obvis.com for details

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