Making for the two sides of the truss......... 35
Adding the amount of metal in the tension member be-
fore given.......................... 86

The total of metal in tension was thus found to be.... 121

But to this should be added the ties G k, which, although
not called into action, when an uniform load was on the
girder, would have to bear a strain if the load were a
passing one. They might then be required to support a
single unit of load. Under similar circumstances two
ties on each side might require to be strengthened, so as
to bear a further half unit each; then 4 ties 1 unit x
the 1½....................................................... = 5

Giving as the total of iron in tension, as already stated. 126

He would not occupy any further time, by entering into
the details of the calculation of the quantity of metal in the
Bollman Truss; but would simply refer to the figures already
given, by which it would be seen, that while it was more
economical than the Fink Truss, in the proportion of 37 to
39.6, it was less economical than the ordinary diagonal truss,
in the proportion of 37 to 26:2.

The cause of the waste of metal in the Fink and in the
Bollman trusses appeared to him, on a little consideration,
to be sufficiently obvious. The strains which related to the
centre part only of a truss, and which might be got
rid of in a comparatively short distance near that centre,
were, in the Fink and in the Bollman trusses, carried to the
very ends of the compression member, so that the whole
length of that member sustained a pressure that need only
be borne near the centre. Further, to carry out this bad
arrangement, the tie-rod were, of necessity, placed at most
unfavorable angles, by which not only was an unnecessary
amount of metal consumed, but the already useless strain on
the compression member was aggravated.

It was unnecessary to investigate the construction of the
Murphy-Whipple truss, as the drawing showed that truss to
be free from the radical error, of carrying the whole of the
compression to the very ends of the top member. It was,
however, clear, that the use of struts in a vertical position
was not so economic as the use of struts in a diagonal posi-
tion, inasmuch as the struts when placed vertically did not
assist in the progression (if such a term might be allowed)