designs differ principally in excessive depth and in pin connections. If 
Mr. Waddell will read the remainder of Dr. Levy’s work, he will see the 
grave objections to pin joints.

One thing I would like to point out, is the entirely wrong use that is 
made of what Baker said about English railway companies strengthening 
their bridges. Our bridges in England and more especially in Scotland, 
we admit, have a lavish amount of iron put upon them. It was fortunate 
that it was so, for, when the traffic increased in weight, and more especially 
in swiftness, they were still quite substantial. Baker has struck a new 
key-note, really a physical one; namely, that frequency of transit, an 
increase from a 15 minute to a 5 minute service, demoralises even those 
substantial bridges which writers in Germany, where they design on the 
same principles but carry out the most extreme economy, have flouted 
as far too strong. The future engineering of bridges to carry heavy 
swift, incessant traffic, is only going to begin; Mr. Waddell’s pamph-
let on undue economy is not in the new direction, but an over refinement 
of the old. Designing which gives prominence to extreme economy of 
dollars with only sufficient strength, in putting stiffness in a second place 
and resilience (the resistance to shocks and directly proportion to the 
weight), in the third place, puts resistance to this new kind of fatigue, that 
Baker has brought to light, in the fourth. It is easily handled, however; 
any lad fresh from college can make it show well, and it appeals to the 
purse. The economy is, however, false, and all the excessive complicating 
of the design till it is like a spider’s web is only the afterthought to remedy 
in some measure defective stiffness, short livedness, and inefficiency except 
for loads “that crawl between heaven and earth.” It will likely prove that, 
for heavy, swift, incessant traffic the heavy riveted plate girders, riveted as 
they are on the Clyde, if not the tubular bridges, will be the truest economy 
after all.

I read the other day in a scientific paper everyone must have seen, that 
“soundness” was to the scientific man what “respectability” was to the 
business man; without it he could not get even a hearing. I submit that 
Mr. Waddell’s preface and discussion and manner of settling everything his 
own way by quotation from his former letters or his books or their reviews 
or what he said at some society, his wholesale condemnation of both prac-
tical engineers and mathematicians, his recourse to public newspapers 
posing as a martyr, obscure his real work, and render the whole “unsound,” 
that is, not scientifically respectable.

I also read that the future stiffened suspension bridge, the Albert Bridge 
being pioneer, is to include the despised Bollman system, the chain being 
only to hold up the weight of the rods and keep them from sagging.

One thing I had nearly forgotten, the dictum that no boom should act 
as a beam, although only a few lines above it exception is taken to a piece 
which bends under its own weight. I reverse the dictum: every boom acts 
as a beam for its own weight, and this alone soon fixes an inferior limit to 
the number of bays in a bridge. Further, something must carry the rolling 
loads over the gap from cross-bearer to cross bearer. If it is done by inde-
pendent strings they soon develop into bridges themselves if the gaps 
inordinately increase. Further, there is no objection whatever to the lower