

ation. Primarily, the object in view in leaving openings through the spandrels was to lighten the dead load over the haunches and thus extend the field of application of the masonry arch. No sooner was this done, however, than it was noticed that the new type was superior in appearance to the old from the relief of the large blank spaces in the spandrels. Fig. 23, showing the magnificent Walnut Lane arch at Philadelphia, and Fig. 22, already mentioned, are representative examples.

While the limits of this paper makes it possible to indicate the coincidence of aesthetics and mathematical science at only a few points, the author believes that many other points of agreement might be discovered. For this reason it would be profitable for the engineer to carefully examine the economic properties of designs which recommend themselves primarily to the aesthetic taste. An instance of the kind is afforded in the recent adoption by the Pennsylvania Railroad of masonry arches for short-span bridges. Since this policy was inaugurated chiefly on economic grounds, the incident is most significant.

#### (6) TRUTH AS TO MATERIAL AND STRUCTURAL PRINCIPLES.

Not alone in the realm of ethics is deliberate deception and falsehood to be condemned, but also quite as promptly in art. Any structure in which the real nature of the material or the structural principles employed are purposely disguised is a sham, and, therefore, a failure aesthetically.

Attempts at veiling the real character of the material used are very common, but quite frequently they are far from successful. Fig. 24 is an illustration of a whole class of structures which are rendered aesthetically defective by the effort to make monolithic concrete look like masonry by employing joint lines. In the case of this particular bridge the lines of the structure at once give the lie to the surface treatment from the fact that the arch is much flatter than would be constructed of masonry. In many other cases rock-faced or cut-stone masonry has been employed for facing concrete arches in order to produce a pleasing surface finish where the rise is small enough to render the deception readily apparent.

What is to be said, however, of cases where the lines of the structure are consistent with stone masonry, but where the facing only is of this material, the load-bearing element being of steel or reinforced concrete? Is the deception any less objectionable because it is successful, or is it only to be deprecated where the designer has left the deceit open to detection by some inconsistency of the structural lines with the material? In answer to this it may be said that no deception is intended in the majority of cases, the sole object