

in accordance with the established custom on such works, have given offence to influential parties. He finds himself in an isolated position, an Ishmael, his hand against every man, and every man's hand against him.

The young engineer so situated is apt to become discouraged and wearied with well doing. He finds the place too straight for him and becomes somewhat less exacting; his position becomes improved, his merits are recognized, he advances with others, everything moves along smoothly, and the young man's eyes gradually close to many things which, in his early zeal, would have met with condemnation.

"Facilis descensus Averni."

When the young engineer has learnt to look for advancement to the good-will of contractors, or to the favor of interested politicians, his usefulness is gone. What I have just said is not intended as a reflection on either contractors or politicians, individually, but merely that they are the classes of men from which an engineer should accept no favors, for he will, sooner or later, be placed in a position where he will be expected to requite them. The engineer may, however, err in the other direction, and look on the contractor as his natural enemy. Now, this is an altogether mistaken view of the case. The engineer is the arbitrator or judge between the contractor and the parties for whom he is doing the work, and he must be as careful to give justice to one as to the other.

A specification is, I may say, generally gotten up, not solely as a guidance to an honest contractor in his work, but also as an instrument wherewith a dishonest man may be held in check and coerced into doing good work, and, as such, is in many cases of so stringent a character that a literal interpretation of it would ruin a contractor, or cause a work to exceed all reasonable bounds in cost. The engineer must be guided by the spirit of the specification, when dealing with a contractor evidently prepared to carry out his undertaking conscientiously, and is not justified in harassing him with unnecessary conditions, which may be perfectly in accord with the literal meaning of the specification, but which do not, in any way, increase the value or quality of the work and are of no benefit to the employer, but put the contractor to useless expense. It must be remembered that a contractor undertaking a large work assumes a great financial responsibility, and is entitled to every consideration, so that if the supervising engineer can in any way assist him without detriment to the work under his charge, he should in all fairness do so, without any wish for or expectation of reward. Again, the engineer is frequently the custodian of secret information connected with industrial enterprises, or projected works, the possession of which would be of great financial assistance to outside parties. In this position it is not unlikely that he will be approached with a view to the obtaining from him of information intended only for his immediate employers. I need hardly say that any approach in this direction is to be immediately and distinctly repelled. Opportunities of the above kind for crooked dealing are perhaps more numerous in engineering than in most other businesses, but it is not against these manifest digressions from the path of rectitude that I wish to caution you, as here the right and wrong are plain to any man, but against insidious methods employed at first with, perhaps, no sinister motives or on any definite plan, but which eventually, if not withstood and

repelled from the first, will be sure sooner or later to render the person against whom they are employed an engineer in name only, in reality a tool in the hands of the first individual requiring, and able to pay for, subservient service.

The demands on a civil engineer increase with the advance of a nation to a higher degree of civilization, and to meet these demands something more is required than a purely professional knowledge. He must be a good man of business, with a faculty for expressing himself in all matters in a clear and concise manner, and must possess self-reliance and confidence in his own ability, without which he cannot hope to inspire confidence in others. Self-reliance is, in fact, a most essential qualification of the engineer.

Most professions appeal to individual interests. The sick man procures the best medical advice he can obtain. The man involved in legal difficulties retains the best lawyer his means will allow—these matters touch his individual interests; with the engineer the case is different; his services are, comparatively speaking, seldom required in wholly private affairs; he is more often called upon to design or supervise works involving the expenditure of public money or funds of incorporated companies. Here a more or less lavish expenditure does not very keenly affect the individual, and so does not interest him to the same extent as do his private affairs, and the result of this is that the control of works of this kind frequently gets into the hands of parties who hope to benefit thereby, in some way, during their execution. They are anxious to direct matters in such a way as to meet the ends which they have in view, and for this purpose suggest, it may be, alterations in the design or arrangements for carrying out the work to the engineer-in-charge. He will, in this way, receive a mass of gratuitous advice backed up with a considerable amount of pressure. If he is a young man, and perhaps a little diffident as to his infallibility, he may be influenced by the pretended friendly advice of men older than himself, with known experience.

This will invariably lead him into difficulties and teach him, when too late, that there can be only *one* engineer, and that if he does not feel competent to fulfil the duties devolving on the position, his best course is to resign—rather than allow himself to be guided by the advice of interested parties. With a determination to reject, on principle, favors from those with whom he may have business relations, no matter, seemingly, how well intended, and with sufficient self-reliance to dispense with unsolicited advice and rely solely on his own judgment in engineering matters, the engineer will be equipped with at least two attributes essential to the effective discharge of his duties, and whether his career is eventually crowned with financial success, or otherwise, he will, at least, at its termination have the satisfaction of knowing that he has made use of the talents committed to his charge to the best of his ability.

To the young man fresh from college, where apart from the subjects, interesting in themselves, requiring his study and consideration, he has been impelled forward by the rivalry of numerous competitors, and has to some extent worked in the full light of others' observation, when his labors and zeal were manifest, and met with more or less immediate reward, the routine of an engineer's office, and the apparently trivial duties apportioned to him in the first few years of his practice,