

## WHAT IS AN ENGINEER-CONSTRUCTOR?\*

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One prominent element of modern industrial life is **bigness**. We have large business corporations, combined railway systems, extensive manufacturing concerns and comprehensive enterprises in all lines of commercial activity.

Another dominant element is **efficiency**, which may be taken as the key word of modern business life and engineering practice. The constant aim is not cheapness in construction or equipment, but effectiveness, the greatest return for the outlay.

These two elements chiefly have brought about a condition in which we have the necessity for a technical organization ready to produce large results in an effective way. Between the desire for bigness and efficiency and its fulfillment, is the field of operation for the creative and constructive abilities of the Engineer-Constructor.

An Engineer-Constructor is an organization, and not an individual. It makes possible the most effective combination of technical theory with practical experience, and provides for the use of "team work" in connection with the designing and building of properties. Its aim is to attain the greatest economy in effort, time and money,—its province is to "do" things in the most effective way.

In its broadest development such an organization need not be confined to any one class of enterprise. Here is something to be built which requires for its completion a combination of conception, technical knowledge, construction experience, and executive ability. Whatever it is, the Engineer-Constructor should be prepared to carry the proposition through from beginning to end without technical assistance from outside the organization. To be most effective, such an organization should have at its command the technical knowledge and experience of the past; the ability to analyze situations, and discover the truth from conflicting testimony; the imagination to conceive unprecedented results and courage to overcome obstacles; the ambition to improve existing systems, and the honesty to spend money without favor or graft; and finally loyalty to itself and to its client, which will protect in every way the interests of all concerned.

An Engineer-Constructor, therefore, is nothing less than an ideal employee who has the best possible preparation, the widest experience and the natural aptitude to do in a large way the big things which the development of this country is constantly requiring. Such an organization substitutes for the isolated efforts of one or more individuals an effective combination of the aggregate abilities of a number of experts and adds the enthusiasm and inspiration which comes from the contact of fellow-workers.

The expression that "the team plays as one man" suggests the comparison of our ideal Engineer-Constructor organization to a modern football team, and, as this idea grows upon us, we can find considerable instruction and inspiration in the analogy.

If this talk was upon the development of a team for football instead of a technical organization, we would very probably divide our dissertation into such headings as "Individual Requirements," "Training," "Team Play," "Formations," "Generalship."

Our football vocabulary would contain such words as "Purpose," "Perseverance," "Quickness," "Accuracy," "Mental bravery," "Discretion," "Obedience," "Aggressiveness," "Confidence," "Self-control," "Judgment," "Tenacity," "Versatility," "Discipline," "Loyalty," and "Enthusiasm."

A discussion on the principles of developing a team would contain the phrases,—*"Fundamentals of the game," "Every man should master details," "Get into the game," "Start together and play together," "Whole heart in every play,"*

*"Perfection of team play," "Unified purpose," "Combined efforts," "Theory wins games only when put into practice," "Play hard," and "Hurry up."*

All the things that might be said in regard to getting together, and developing a winning football team could be applied equally well to the building up of an organization to do the work of an Engineer-Constructor. To carry the illustration further, let us line up the candidates for this new kind of team,—the more material to select from the better,—we will always have use for substitutes.

We need a,—

Civil Engineer,  
Electrical Engineer,  
Mechanical Engineer,  
Structural Engineer,  
Sanitary Engineer,  
Chemical Engineer,  
Gas Engineer,  
Fire Protection Engineer,  
Hydraulic Engineer,  
Mining Engineer,  
Architect,  
Industrial Expert,  
Statistician  
Purchasing Agent,  
Construction Superintendent,  
Operating Engineer,  
Accountant.

An Engineer-Constructor is an organization in which a number of these candidates are fitted together as a mechanic would build a machine, and the efficiency of such an organization for the purpose for which it is created depends upon, first,—the perfection of its individual parts; second,—upon the skill with which these parts have been brought together; and, third,—upon the absence of any unnecessary friction during operation.

Such an organization should not be the maker or manufacturer of any equipment, nor be connected with the exploitation of any system of apparatus, nor interested in the introduction of any patented devices. In its highest stage of development it will not be connected except in a technical way with the financial interests which control the enterprise.

Carrying our analogy even farther, let us look at some of the plays with which the candidates will become familiar in some of the big games which they must be prepared to play.

The carrying out of every big enterprise will entail nearly all of the following duties:—

Investigations and Reconnaissance,  
Preparation of Preliminary Reports,  
Estimates of Costs,  
Estimates of Probable Earnings and Operating Expenses,  
Surveys,  
Preparation of Plans and Specifications,  
Getting Proposals and Purchasing,  
Letting Contracts,  
Field Engineering,  
Construction and Erection.  
Inspection,  
Preparation of Progress Reports,  
Record of Costs,  
Tests,  
Operation,  
Final Reports and Statistics,  
Accounting.

It is important to gain as much ground as possible on every play. In playing an entire game from start to finish, different men will have the ball in nearly every play, but the precision of the team work should be so perfected that every man will be in every play. To assist is fully as important as actually carrying the ball. Look over the various situa-

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