

and it looks as if our business men now propose to make a business of seeing to it that they are properly represented in the business of government. Engineers should arouse themselves and participate in this great movement.

While up to the present no better or more practical means has been discovered than our great political organizations for giving effect to the wishes of our citizens, it is becoming increasingly evident to thinking men that no permanent advance can be made by simply turning out one political party and substituting representatives of another as our rulers. An intelligent and continuous effort should be made to improve the composition of our legislative bodies. We are essentially a nation of manufacturers, traders and farmers. We are all part of an organization with a mechanism which is so delicate, extensive and complicated that it must be controlled and managed with the greatest wisdom and intelligence if we wish to continue to progress in prosperity and lead happy and useful lives. It seems to me that in the future it will be the duty as well as the privilege of the engineer, who so largely contributed to the production of this complicated mechanism, to assist in its management in order to assure its preservation.

ADDRESS OF E. M. HERR

THIS TOPIC is now so wide that there is no difficulty in discussing it from one's own particular point of view and in line with any individual interest and experience. The danger lies in dealing with so broad a subject from too limited and narrow a point of observation. It is doubtless from a full realization of this danger that those responsible for the program tonight have brought men together in this discussion from so many different positions and varied experiences in life.

Having announced my apprehension regarding the narrow view of this broad question, I feel at perfect liberty to proceed to take such view, if only to make good my prediction.

My experience for the past eighteen years has been with the engineer in manufacturing business and the last ten years in a business so highly technical in its character and developing so rapidly, largely through the efforts of these very engineers, whose status we are here to discuss, that it was often a question

whether we were engaged in engineering our manufacturing or manufacturing our engineering. As fast as the factory learned how to make a machine or device of any kind, the engineers would bring out an improved design and the shop had to begin all over again and learn anew the lesson which had cost so much in time, effort and material. At such a time one sympathizes with the self-made railroad superintendent of my acquaintance in Chicago, who, after receiving notice from the chief engineer of the railroad that such and such changes must be made or limitations put upon speed of trains or weights of engines, would frequently say: "If we could gather up all the engineers and drop them in the middle of the lake, we could make some money for our stockholders." And so he might have done for a time, but from this remark it is evident this superintendent was desirous of standing still as to progress and improvements. Here we have one answer to the question under discussion, viz.: The engineer stands for progress and improvements. Progress and improvements! What a fine status for any profession. If the engineer always stands for genuine progress and real improvements can much more be desired? Let me therefore counsel our young engineers to adopt this as their slogan, and always be sure, in their engineering reports and recommendations, that they stand for progress and improvements that are both genuine and real.

The engineer is not restricted in his sphere to dealing with inanimate things, broad as is the field of improvement and development of the materials, processes and products of a business.

It was an engineer who first developed the principles of scientific management, and the men who have brought the greatest contributions to the wonderful advance in the handling of workmen, resulting in materially increasing their efficiency without adding to but often lessening the drudgery of their work, have all been engineers.

Engineering, originally the art of managing engines, was later defined as "The art and science by which the mechanical properties of matter are made useful to man in structures and machines." This definition is now far too restrictive and must hereafter include men as well as materials; animate as well as inanimate matter.

In the management of men, the engineer as usually trained, has his severest test. Many engineers, remarkable for their judgment, skill and intelligence, fail dismally in handling men.

The very nature of the training of the engineer tends to unfit him in directing and controlling the rank and file of the workmen. The exact and uncompromising methods so necessary in engineering training cannot be applied in dealing with men. Fairness and justice are the cardinal principles to be used always, but in addition, in dealing with people one must know how to bring the human element into all such relations. When this is properly done, the workman is inspired, stimulated and led into obedience and loyalty to which no severity or rigid rules could drive him.

It might be thought that training and directing workmen is not part of an engineer's work. Formerly this was true, but with the rapid growth in the technical requirements of many kinds of manufacturing, and the development of improved methods of management of shop work, the latter devised and developed by engineers on engineering principles, the old rule of thumb methods of shop management are fast becoming obsolete and either the old men must learn the new methods or our young men with engineering training must learn how to handle men skilfully and fairly.

Another field rapidly opening to trained engineers is the commercial one. The product of many of our factories is so technical, from an engineering standpoint, that only an engineer trained in that specialty can properly present it to prospective customers.

It is, therefore, seen that not only does engineering include, besides the designing and constructing field, the managerial and executive work which also demands this trained intelligence, but even the salesman, who is popularly supposed to be born, not made, is leaning heavily upon the engineering profession. This can only point to one conclusion: In the manufacturing business, the engineer, formerly useful for designs and specifications, is becoming necessary in practically all branches.

The daily increase in the complexity of our civilization inevitably increases our industrial development, and as we have seen, consequently extends and broadens the field of engineering work. Can we wonder then at the enormous increase in the attendance at schools of engineering and the rapid strides made by our engineering departments in the University as compared with those of the academic departments?

It is naturally rather stimulating to our pride as engineers to contemplate the rapidly widening field which the profession is occupying, but we must not forget that with this broader field

comes greater responsibility and the necessity for more careful and thorough training than in the older times of simpler conditions.

But, it will be said, while our activities and responsibilities are greater, so also are our resources; and does not the multitude of improved processes, labor saving devices and space and time savers, such as the many kinds of rapid transit, the telephone, telegraph, etc., more than make up for the difference?

In some parts of engineering doubtless this is true, but in what I will call the newest branch, viz., the engineering which deals largely with men and not with machines, the managerial and executive work to which the profession is being called with rapidly increasing urgency, but little help is found in new inventions. In this new field (if such it can be called) the ability to analyze accurately and draw correct conclusions from clearly perceived premises, so essential in general engineering, is just as important.

The difficulty which most engineers find comes from the analysis of cause and effect in the management of and dealing with men and women instead of machines or structures. The former is more difficult as a problem and was formerly only solved by those thought to be specially gifted in their ability to handle men. Like many other so-called "gifts," this one can be learned, not by inflexibility and severity, nor, on the other hand, by weakness and vacillation, but by even-handed justice tempered with humanity.

No fair man wants more than justice and I maintain that very nearly all men are fair or want to be. The difficulty comes in knowing how to deal justly and humanely in every case, and in the pressure and urgency under which business must now be done. He is both patient and wise to a remarkable degree, who can attain unto it.

Is not, however, the man with an engineering training far better equipped for weighing correctly the elements which must enter into such a decision? He is, with but one exception. This exception is his training and tendency to analyze mathematically. The very training in mathematical analysis, so largely a part of an engineer's education, to a considerable extent unfits him for a correct weighing of what I have called the "human element."

As an illustration, there is a great difference in the effect upon an employee of the way an order or decision is given. You

all have probably at some time dealt with those in authority, from whom you would rather receive a refusal than an acquiescence from another. An adverse decision would be received from the former superior and carried out with a feeling of loyalty and willingness, but with an unavoidable feeling of grudging obedience and almost revolt from the latter. The different effect upon the employee was caused by the employer's knowledge of and due regard for one phase of the human element in dealing with the employee.

Many other conditions, largely personal in their character, must also be considered and given due weight in an analysis embracing the actions of men and women.

This is the element to which I wish especially to direct the attention of the young men of the profession. That it can be learned, I know from my own experience, which also has taught me its value.

Keep steadily in mind the Golden Rule—Do to others as you would have others do to you—and your judgment, with this in mind, while not susceptible of mathematical proof, will not fail of at least some part of the human element and ring true to the requirements.

Do not misunderstand me to advocate a departure from engineering principles in this matter of dealing with men. On the contrary, they must be dealt with logically and correctly, and a proper application of the principles of good engineering can bring only this result. No correct result can be obtained in any engineering or other problem if any of the elements are left out in its analysis. The human element is a factor and must be included or your result is not true. Therefore, I repeat that the engineer is needed in the shop and other places where men, and women too, must be managed and controlled. In this work his status is broadened and his influence greatly increased, but more important still, the engineer himself is made a more liberal, broader, better and more useful member of society.

Such an engineer will have a broad perspective, because he is accustomed to observe tendencies in both men and affairs and to draw correct conclusions from them. He can lay plans far ahead and, seeing clearly the ultimate result, is able to take full advantage of the tendencies in both his own field and that of allied lines of engineering, not only foreseeing demands but so shaping his activities as to create them.