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Address before the Society for the Promotion
of Engineering Education, Ithaca, New York,
June 21, 1923.

THE ENGINEER AS A LEADER IN PUBLIC SERVICE°

The general recognition of an existing condition is frequently long deferred because of the lag in public thought which seems to be almost universal. The most difficult obstacles to progress are the fixed habits of the mind, whether of the individual, the community, or of the whole nation. The most time-consuming task is the endeavor to break down or to widen an opening through traditional thought. The ordinary associations, environment, and customs of the individual establish habits of mind and perpetuate traditions not only for himself, but collectively for a whole community. Not the traditions founded upon history and glorious deeds. Than these we have no finer heritage. We have no foundation for our institutions so secure. The traditions which obstruct progress -- real permanent progress -- have no such heroic birth. It may be a ludicrous sight to see a full grown, able-bodied man visibly startled by a black cat crossing his path. But the added thought that this man is an American citizen with the same right to exercise his discretion in the choice of governing officials as any other citizen is not so laugh provoking. There are people of intelligence

who refuse to sit at a table if there happens to be thirteen and a haunted house which the boy passed at night with his hair raising his hat from his head remains still a haunted house to the man when he has passed the tradition along to his own son.

Characterize these manifestations as superficial, as of no real significance, if you wish. Yet a great grandmother of one of our foremost engineers of today was burned at the stake as a witch in our own New England.

As a matter of fact, these indications are not superficial. They are too deadly real. The danger to navigation and safe passage lies not in the portion of the iceberg above the water, but in the vastly greater bulk below. So, too, it appears to me after nearly two decades in a branch of the public service which is relatively new, that the greatest difficulty to progress has been this great mass of backward looking, traditional ideas and ideals which persist in the face of existing conditions. Thus, to obtain any measure of the leadership of the engineer in public service it is necessary to seek those places where there has been a pushing forward, a breaking away from the conditions as they had persisted, and to measure the influence of the engineer where these breaches have occurred. Successfully to evaluate the engineer it is necessary to have a radically different conception of many things than the legendary or traditional viewpoint. Someone has well said recently that industry has ceased to be regarded as a means for creating wealth for the individual, and to be looked upon as a method for sustaining human life.

So, too, the highest perfection of our ideals of government is to establish more firmly and to perpetuate the constitutional exposition of the right of the individual to life liberty and the pursuit of happiness.

A recent writer*says:

"The civilized man has vastly more security, power, opportunity, comfort, leisure, than has the barbarian or the savage; he has amassed a wealth of instruments, possessions, and ideas infinitely transcending the paltry hoards of earlier days; he lives in a 'man-made' environment astoundingly different from the 'state of nature'. This is especially true of modern Western civilization. Our civilization may be inferior to others in some respects. It may lack the beauty of the Greek, the durability of the Chinese, the spirituality of the Mediaeval. But in dynamic energy, in mastery over the forces of nature, and in all-round efficiency it far transcends anything the world has ever seen.

In fact, within the past century we have broken the age-old tempo of material progress and have leaped clear over into a new self-made world. Down to a trifle over a century ago man's material progress had been a gradual -- a very gradual -- evolution. His tools, though more numerous, were mainly elaborations of those discovered by his remote ancestors. A few instruments like the printing-press and the mariner's compass were about the only notable innovations. Man's control over natural resources had likewise not greatly expanded. With the exception of gun-powder, he had tapped no new sources of material energy

*Lothrop Stoddard

since very ancient times. His chief source of power was muscle, animal and human (do we not still reckon in 'horse-power?'), and, for the rest, he filled his sails with the breeze and turned clumsy water-wheels by using brooks and streams. But the ancients had done all these things. As for methods of communication, they had, if anything, deteriorated. In the year 1800, there was no system of highways which equalled the Roman roads, no posting-service as quick as Caesar's, no method of signalling which could compare with the semaphore 'telegraphy' of the Persians, and probably no ship which could not have been overhauled by a Phoenician galley in a moderate sea.

Suddenly, astoundingly, all was changed. The hidden forces of nature yielded themselves whole-sale, as though at the wave of a magician's wand. Steam, electricity, petrol, and a whole series of mysterious 'rays' and 'waves' gave man powers of which he had not even dreamed. These powers were promptly harnessed to innumerable machines which soon transformed every phase of human existence. Production and transportation were alike revolutionized, distance was well-nigh abolished, and the very planet shrunk to the measure of human hands. In other words, man suddenly entered a new material world, differing not merely in degree but in kind from that of his grandfathers".

These accomplishments led naturally to a different conception of government and gave opportunity for the extension and elaboration of public service which may be roughly divided into two classes:

1. Those services which the public permits to be rendered itself by groups of individuals, corporations, for a profit, but which it regulates both as to the service and as to the charges which shall be imposed.

2. Those services which the public undertakes to do for itself without profit.

Perhaps the most notable illustration of the first class is the railway system of this country, and now a most important activity of the latter class is the building of systems of modern highways. It would be a simple task to point out the achievements of the engineer in each of these, but it seems to be of greater moment to establish if possible the degree of authority with which the public has vested the engineer and thus to establish the measure of his leadership. Mark in each of these two great classes of activities how the public, in seeking to secure efficient service for itself, has broken away from long established customs in which the inevitable conflicts of human relationships were adjudicated and determined largely by the courts, if determined at all, and has established new processes in which rapidity and continuity of necessary adjustments and performance are the characteristic requirements.

Note the difference in the attitude of the public toward the public service of today, typified in the status of the public highway, with that expressed by Jusserand in his "English Wayfaring Life of the XIVth Century"? He says: "The keeping of roads and bridges in repair

the latter included in the 'trinoda necessitas', was not considered as worldly, but rather as pious and meritorious work before God, of the same sort as visiting the sick or caring for the poor; men saw in them a true charity for a certain category of sufferers, namely, travellers; this is why the clergy submitted to it.

Further: "A" religious order with this end in view had been founded in the twelfth century, that of the Pontiff brothers, or makers of bridges, which spread into several countries of the continent.

The great London Bridge was commenced in 1176 by Peter Colechurch, "priest and chaplain" And when, through lack of repair London Bridge was about to fall down, a more or less continuous condition, there resulted the appeal from the throne to the clergy throughout the country to collect "with pious exhortations" from their followers subsidies to repair the structure.

Today we have established as a most important part of our civil government the broad activities for human welfare which we call public service. In this modern development is found the greatest recognition of the engineer and his leadership. Consider the operations of the modern public utilities corporations. These are practically all now administered by commissions. Since the organization of such commissions by the States the scope of the engineer as a leader in public service has been widened to a degree not heretofore approached. And this development has taken place within the past twenty years. Since that time most of the States have organized utility commissions to regulate public utilities and the railroads and industrial commissions to regulate and

supervise the conditions and operating methods of industrial enterprises and to care for the whole matter of protection and compensation paid to workmen in case of accidents. Prior to this time the engineer was very seldom consulted by state governments. In cases where the public had undertaken construction or building projects the engineer was employed, but he seldom had an opportunity to exercise executive functions and powers based upon his engineering training and experience.

The organization of these regulatory bodies at once demanded men for the public service with broad engineering experience, and men who had a conception of the ideals of public service. To the legislative branch of our government alone is given the police power. Before the days of commissions it was necessary for the legislature through statutory enactment to specify in great details the means and methods to be followed throughout the public service. This included the details of the protection of dangerous machinery in factories, the practices to be followed in industrial enterprises that the work of employees might be safe and healthful. It was necessary for the legislatures to fix rates by definite statutes, and to specify conditions under which service was to be rendered by public service corporations to the various classes of consumers. The multitudinous questions which necessarily arose regarding the enforcement and violations of such enactments were subjects for court procedure. The lawyers and judges as a matter of fact were called upon to enforce the provisions as laid down by the legislatures. In the enactment of the commission legislation, the legislatures adopted an entirely new plan. Specific

provisions regarding the rates charged and service furnished by public service corporations were largely done away with, leaving perhaps only the maximum. So, too, were omitted the details for the protection of machinery in factories, and the conditions of employment. There was substituted for these definite and specific provisions broad general pronouncements. Instead of specifying the many details of factory inspection, the manner and method in which saws and belts should be protected, the legislature condensed them in one paragraph requiring the employer to protect the life, safety, health, and welfare of employees, and authorizes a commission or board to draw up rules and orders specifying the details as to the manner in which these things should be accomplished.

So, too, specific provisions relating to the regulation of railroads and public utilities were repealed or modified, and commissions were established whose duties were to determine that reasonable and not discriminatory rates were charged for service and that the services rendered were adequate and satisfactory.

These regulatory commissions are in reality a fourth branch of government. They may be said to be legislatures continually in session, yet the power of the legislature is not delegated. The legislature has said that rates shall be reasonable and that conditions of employment shall be safe and sanitary. It is the function of these commissions to determine after investigation what are reasonable rates and what conditions are safe and satisfactory with which to surround men, women and children employed in industrial establishments.

The real distinction which entitles these commissions to a position as a fourth branch of government is not so much their administration as their investigation and research. These investigations are, however, not the academic research of laboratory and study, but the constructive investigation of the administrator. In these fields of investigation and administration the work of the engineer has become all-important. These commissions by force of their activities really constitute standing referees of the court directed by the legislature to report all the facts that must be given weight in determining what is reasonable. The courts have a place because under our constitutional system the acts and orders of these administrative boards are always subject to court review upon appeal by interested parties. Instead of having a referee appointed by the court, usually a lawyer with the lawyer's limitations as to the relative value of different facts, these commissions are composed of men who are compelled by their duties to give weight to the social, economic and technical facts that otherwise would not get before the court. In proceedings before the commissions man-made limitations, legal formalities and precedents are of little significance, and facts and real conditions stand forth simplified to the degree possible. In making their investigations it is necessary that commissions call to their aid men trained in the science of engineering. The industrial commission must ascertain where danger lies and where health, life and safety are menaced. It must discover

devices, processes and management that will avoid these dangers, and must ascertain whether they are practicable. In railroad and public utilities regulations and in rate determination a fundamental requirement is a physical valuation of the property. The present structural value is the value that has to be ascertained. True, other elements must be considered, but until the physical value of the property is determined, the public and the courts have no way of appraising the value to be allowed for these other factors. The making of such a valuation is wholly an engineering task requiring an inventory of the property, an examination into its condition, and an application of proper unit prices. Further, if operating methods and practices of the public service corporations are investigated, the testimony and reports of competent engineers form a basis for commission action and order.

As these commissions were being organized by the different States, there came a new demand for men of engineering training and experience. Each one of these regulatory commissions has a staff of engineers trained for their specific duties. The very nature of the work requires that they be specialists. Thus we have valuation engineer, water power engineers, gas engineers, electrical engineers, telephone engineers, safety engineers, sanitary engineers, lighting engineers, and so on through the whole category. The regulatory work of such bodies could not be carried on with any degree of success without the investigations and research activities of a staff of competent engineers. It is the logical development that

since a large part of the work of these bodies consists of engineering investigations and the weighing of engineering facts the chief executives of the states in selecting men for such commissions have realized that men with engineering training make most excellent commissioners. It is a fact that many of these state commissioners have as members men who are competent engineers. Thus in the strides which the nation has made in providing for itself service through others the regulatory powers and leadership which relatively few years ago were lodged almost solely in the hands of the courts and the legal profession, have by weight of requirements gravitated to a very large extent to men who are trained and experienced engineers. This development is an outstanding triumph for the engineers, illustrating as it does the leadership attained through a determination of the facts by research and investigation and their application to our modern conditions unhampered by the limitations and mystifying and inaccurate traditions.

In the class of public service which the public undertakes to do for itself the establishment of highway departments has been the most outstanding of recent developments, both as to the breadth of the authority reposed in them and as to the funds provided for their expenditure. In the past 30 years, but largely in the past 10 years, each State has established such a department. Almost without exception the executive officer of these is a trained engineer and the administrative head, whether it be a single

commissioner or a board, is largely called from the engineering profession. The duties, excepting only those of clerical and accounting nature, are almost entirely performed through an engineering personnel. In addition to the duties of these departments of a technical character, comprising principally the construction and maintenance of highways, as highway transportation has developed so phenomenally there has developed necessity for the broadest understanding through research and investigation of the economics of transportation, public finance and highway operation. There are involved in highway administration the most difficult of human relations touching the desires, hopes and aspirations of the communities, large and small, and of the more widely separated and individualistic agricultural population.

In the State highway departments, the engineer is predominant, but not in either of these two fields alone are found the limits of this movement of the engineer into leadership. There are other fields, the Public Health Service, city management, forest control and conservation, food distribution and conservation, transportation and traffic control, city planning, conservation of labor through labor-saving machines and development of efficient methods, power development, and agriculture. This latter field is worthy of note. Considering the typical American farm either as a home for a family or as a production plant, the tremendous advances which have been made in establishing better homes and more efficient utilization of farm labor, the work of the engineer has been outstandingly the greatest influence.

Generally speaking, these activities are represented in each State by state organizations having intimate association with the various phases which are of state-wide concern and for many there exists in the Federal Government organizations formed along somewhat parallel lines to represent and administer the national interests. In these, as well as in the State organizations, the engineer has a dominant position.

All of these developments taken in the aggregate present convincing evidence of the position that has been reached and accorded the engineer as a leader in public service activities. Yet this leadership does not exist by reason of autocratic authority or the divine right to rule. Neither does it detract from the sphere of the economist, the financier, the physician or the lawyer. The very organization and plan of operation of the organizations to administer and conduct these public service activities are based upon a mutual acceptance and respect each for the other of these professions. Perhaps the outstanding characteristic of successful operations of public service is the degree of cooperation which exists, cooperation between Federal and State organizations, cooperation between the regulatory bodies and the public service corporations, cooperation between the different professions which are necessarily brought together in a single organization. In the discussions, therefore, in this meeting of the training of the engineer for leadership, the outstanding thought which such an analysis as this reveals, is the necessity for the training of

the engineer, not alone in the pure science of engineering, but in the broad humanities, in economics, in finance, and in the ideas, methods, and ideals of government. The position of the engineer today, and the recognition accorded him were achieved through service -- service for a long term of years in subordinate capacities, finally maturing in the recognition of his administrative and executive possibilities as the public has learned to secure better service and direct action for itself. The position of today will be held and enhanced only as long as the ideals of public service are truly maintained by him. This is perhaps the greatest privilege as well as the heaviest responsibility resting upon the engineering educator.