

ENGINEERING IN RELATION TO LAW.

In dealing with this question it must be understood that I am using the term "law" in the sense of jurisprudence or in the sense of the machinery for administering justice, and the conception of it which I have in my mind is the one applicable to the English system of law which does not take into account, as is done in some European countries, any natural laws. In other words, law as applicable to English jurisprudence consists of a number of rules made by man. One interpretation is the general code of rules for action as habitually enforced by the authority of the State. They are not the invariable operations of nature, but they are the activities of man which are capable of being modified by the forces of legal enactment and opinion. The force which lies back of and secures obedience to the law is called sanction of the law, and the immediate objects of the law is the creation and protection of legal rights.

The conception of the origin of law which has prevailed according to one school, is that law was a command imposed by a higher authority; hence the idea of the divine right of kings to impose their will, which was reflecting the inspiration of the Deity, upon their subjects. On the other hand, the other conception, and the one which is really the more modern and logical conception and more in keeping with the temper and outlook of British peoples, is a set of rules to which the peoples have submitted themselves for their own benefit and protection—firstly, from the wild brutes at the very inception of society, and secondly from other human beings of organized society. As society was organized and banded together for such protection, it became necessary for provision to be made for the preservation of the health of the community, and later when society so developed that intercommunication became necessary, the means of intercommunication had also to be provided. The lawyer, therefore, has been called upon to make rules and to carry out those rules for not only the organizing of society but for the carrying on of all the activities which go to make society not only exist but prosper.

Engineering, on the other hand, is as the word implies, a "carrying out." The word "engineering" is commonly used to express the idea of carrying some conception into effect. The function of the engineer, therefore, is to develop and to put into practice the rules

for society which the lawyer has formulated and propounded; hence the natural and inevitable connection for the benefit of society between law and engineering.

I am advised that originally in the earliest stages of the development of the science of engineering, the term was made to apply only for war purposes. That is, the military engineer was the only engineer who was known to society, and naturally his function was to protect the community by fortifications and other military works. As incident to military operations, the engineer was required to make roads and subsequently the making of roads and other such works was a function for which he was employed after his services began to be utilized outside of actual military works and operations. The engineer who subsequently did that work, when not for military purposes, became known as a civil engineer as distinguished from a military engineer. To-day, however, as you are aware, the civil engineer is distinguished from the mechanical engineer, the mining engineer, the marine engineer, the gas engineer, and the chemical and electrical engineer. It will be seen, therefore, that from the humble origin of the military engineer, the engineering world has produced a long line of specialists—the electrical engineer also including telephone, telegraph, electro-chemistry, electric railroading, power generation, transmission, lighting, etc., the common basic idea being the control of electrical energy for human service with the highest efficiency compatible with economic investment. In a general way, engineering might be said to be the art of directing great sources of power in nature for the use and convenience of man, of the means of production, and of traffic both for external and internal trade, and for the drainage of cities and towns and other purposes relating to the health, welfare and comfort of the community.

Civil engineering is said to be chiefly: (1) securing the land against natural forces by retaining walls, drainage ditches, flood protection works, sea walls, breakwaters, shore revetments and pavements; (2) making ways of communication by roads, railroads, canals and dredged channels, lighthouses, tunnels and bridges; (3) water supply to towns by wells, dams, reservoirs, aqueducts, piping networks, filters; (4) drainage and refuse disposal of towns by sewage pipe systems, sewage filters and purifying tanks, garbage furnaces and digesters; and (5) constructing buildings, platforms, docks, walls, and land measurement by surveying—and arising out of these there are certain specialists, such as bridge designing, railway location, water supply, etc.

In connection with electrical engineering, there are three kinds of effort—inventive service, development effort, and operating effort. Under the head of inventive effort the engineer requires a knowledge of physics, chemistry and the art of design. It is significant that in a practically new society and a modern country, such as the United States, the military engineering corps is the main public works department of the Federal Government, and as part of the duties of that corps there are certain civil functions which it performs, such as the care of rivers and harbours, including supervision of navigation conditions, planning and executing improvements, such as dredging channels, clearing rivers, and building breakwaters, jetties, locks and dams, and lake surveying for mapping and gauging the great lakes. They are in control of the mining in California; the Panama Canal construction is headed and largely officered by members of the engineering corps. They attend to the lighthouse service, and they supervise the construction of roads in Washington and Alaska. They are in charge of irrigation projects of the reclamation service. The engineering officers are recruited from West Point and certain civilian assistant engineers are appointed. We are informed that prior to the nineteenth century, the construction of bridges, buildings, sewers, roads and aqueducts was carried on by architects, ordinary craftsmen, and army engineers. As you know, in the carrying out of this kind of work, the civil engineer has superseded the architect and the army engineer.

In England, in a statute dealing with railway construction, the definition of engineering work is given as "the construction, alteration or repair of railroad, harbour, dock, canal or sewer," the idea being that the engineer is a man who provides the facilities for transportation by land and water and makes arrangements for the disposal of sewage, and therefore provision for the health of the community. An engineering work has been held to be not necessarily confined to the machinery or plant on which an engine is operated. For instance, in the case of a tramway, engineering work was held to be co-extensive with the whole area of the tramway.

Society seems to have passed from status to contract; that is, from combined effort to individual effort, with a slight tendency recently back towards status. The engineer filled a very prominent position under the status regime, and under the contract system is now more and more becoming recognized as one of the chief factors in society. In other words, he must be engaged to carry out all the regulations by which society is held together and by which social

and commercial intercourse between people is rendered possible. In my position of legal adviser and the one who is assisting in directing the machinery for enabling this municipal community to function, I come into daily contact with the engineering problems which arise, and I know how closely interwoven law and engineering are. In all contracts made by the City under which anything is to be done which will protect the citizens from the forces of nature and provide for the health and comfort of the citizens, the City Engineer's opinion has to be obtained and his certificate relied upon as to how the work is to be done, when it has been done, and that it has been done properly. The legal department prepares the contract and sees to it that the scheme which is to be carried out is in keeping with the law—that is, the general rules made by the higher authority—the State—or in this case, the province; but the carrying out of these plans, so that in the application of these rules the members of the community will reap protection and benefit, must be left to the engineer. It has now become so necessary that the engineer and the lawyer co-operate so as to work harmoniously for the good of the community, that in England special attention has been given to framing what are known as engineering contracts giving the legal aspect of the contract definite engineering significance, so that when the contract is to be interpreted by the Court and the Court has to be assisted by engineering ability, there will be no difference of opinion as to what the meaning is. It is always necessary so as to enable the affairs of society to progress to provide for some finality, and the method adopted by society is what is known as the judicial system; that is to say, in the administration of justice so as to carry out the law of a state, the judiciary is created so that its final decision either originally or upon appeal will be accepted by the community without resorting, as in the past, to force between the disputants. The scheme of judicial action includes two theories—the theory of a judge who is an expert and, owing to his special training, is qualified and owing to his high office is respected, so that his opinion and integrity render his decision final and acceptable by the rest of the community; and the other aspect is the jury, which is taken from among the people and represents the mass of the community and its decision on fact to be accepted as final and conclusive. That theory is sometimes crystallized and concentrated in creating an engineer to be the sole judge of a problem and making him the expert judge and the individual member of society who is to decide between the parties to a dispute. In the standard engineering contract it is usually provided that every

part of the work must be done to the satisfaction of the engineer whose directions are to be followed in every respect and whose opinion on all questions relating to the quality of materials and workmanship is to be conclusive and final. The decisions of the Court on such contracts have been uniformly to the effect that until the engineer has given his decision in the matter and the amount due according to the decision of the engineer ascertained, the contractor has no cause of action for the contract price of the work. This interpretation of the contract has existed in England for a number of years, and has been followed uniformly in Canada.

The City had a case in 1913 arising out of a contract to instal some electrical pumping machinery, which went to the Court of Appeal, and in which a final decision was arrived at unholding the engineer's status under such a contract. As you are aware, according to the British system of jurisprudence there are three sources of law—the common law, which is the custom of the country accepted by the community for years; the statute law, which is the written law created by the Parliament from time to time for reinforcing, enlarging, modifying, or abrogating the common law; and a third which is not supposed to be substantive law but which is nevertheless so—judgments of a court or judge-made law, said to be interpretation of the common and statute law. These decisions as to the effect of the decision of the engineer in building and similar contracts are undoubtedly "judge-made law," and the fact that they have existed for a long time within the British Empire without any statutory interference is to be taken as an expression of the feeling of the communities having the right to alter the decision by legislation of an acceptance of that position and of their confidence in the ability and the integrity of the engineering profession as a whole to decide such matters. In England there has been a slight alteration brought about by the sentiment, to some extent, of the engineering profession, in that there is now usually provided an appeal from the decision of the individual engineer to the Engineering Institute. This seems to have been a concession to the contractor, who has felt for some time that he may be in the position of having his complaints decided by a man against whom he is making the complaint. I look to the day when a similar modification will be made in the contracts in Canada. Indeed the matter has been mooted in the City of Winnipeg. This is evidence of how sensitive organized society is to complaints affecting the justice of the situation.

It is a truism to say that the social and economic life of a community is governed by its geographical situation and physical conditions resulting therefrom. That being so, the rules of society or the law of the place will be influenced by the geography of the place and the interdependence between the engineer and the lawyer will be materially affected by such laws. Canada is the place which we know best and the geography of which brings this home to us most strongly. In the early stages of all societies, the problems are not so intricate and necessarily the laws are simpler. As society develops, of course, new problems arise which have to be met. The great St. Lawrence deep waterway project, involving the scheme for hydro electric development and including considerations of navigation, as well as the plans for transportation of the staple products out of the country and also of the freight coming in to supply the needs of the people who will fill up the great open spaces of the west, all of which are intensely interesting engineering problems, have brought in their wake most intricate legal questions. These questions are now being argued by the leading counsel of Canada, and will soon be discussed by the judiciary not only of Canada but of the centre of the Empire—that is to say, the Privy Council in London. The status of the matter is governed by the great legal document which is the written constitution of Canada, known as “The British North America Act.” That Act is the Act under which, of course, the Province of Manitoba and the City of Winnipeg are incidentally governed, and the laws made for the government of which get their origin and foundation in that Act. Different phases of the problem of regulating and controlling the forces of nature by means of water running into and through the Province of Manitoba, not unlike that confronting the people of Canada in the St. Lawrence project, have arisen from time to time and have been forced upon the consideration of the City of Winnipeg. The City of Winnipeg, owing to its geographical situation, has been regarded as and is the connecting link in the rounding out of the scheme of confederation. The basis of this was the railway problem which found its pivot in Winnipeg and in the stormy times resulting from the agreement with the Canadian Pacific Railway for the construction of a trans-continental railway connecting the east with the west, which would have had the effect of giving the Canadian Pacific Railway a monopoly of all traffic going through the country. The City of Winnipeg opposed this so as to get a competitive rate by means of having communication with the railways south of the international boundary. This involved a question of abrogating a contract solemnly formed by the Dominion Government and also involved the ques-

tion of the right of the Dominion to disallow a statute of the Provincial Government authorizing the railway to be constructed to the south in violation of the contract made by the Dominion Government. The whole of this difficult legal problem hinged upon and was dependent upon the engineering difficulty of constructing a railway around the northern shores of the Great Lakes through what is known as "dead territory," which could not supply it with any traffic, and gave rise to the difficult economic problem as to whether the cost of construction and maintenance of that section of the railway should be charged to the east or to the west; that is, whether it was a benefit to the east because it was taking the manufacturing products to the western market, or whether it was a benefit to the west because it was taking into the west the much needed supplies and taking out from the west to its world market the products on which it depended for its development. That problem has never been solved either by the engineer, the economist or the lawyer, and still remains a very debatable subject.

Winnipeg, owing to its central position and due to the fact that the progress of engineering has made it a great electrical city, has had more than one legal problem arising out of the question of the regulation and control of the waters of the Winnipeg River on which its hydro electric plant is situate. This question has given rise to the international problem of the construction of a treaty creating an International Commission to deal with the control of international waters, the Lake of the Woods being the natural storage basin for the Winnipeg River and engineering science having demonstrated that the best use of the water of the Winnipeg River for hydro electric development could be obtained only by controlling the levels of the Lake of the Woods. This engineering problem of control involved at one time the acquisition of a dam at the outlet of the Lake, and gave rise to a very delicate and intricate legal situation as to who had the right to acquire, control or regulate that dam. Certain interests in Winnipeg insisted on the public owning the dam and the land on which it was situate, and the theory was propounded that the proper authority through which this ownership should be attained would be the Dominion Government, the argument being that the Dominion Government in its control over navigation and fisheries, as well as owing to its international obligations arising out of the treaty with the United States of America, was the proper authority to acquire the dam. On the other hand, the Province of Ontario, in which the Lake is situate, and which, under the British North America Act, owns and has power to legislate for the control of water power sites contained within its bound-

aries, contended that no other government than that of the Province of Ontario could acquire the dam. The Dominion Government, however, on the other hand, on the advice of its lawyers, tried to circumvent the contention of Ontario by passing legislation declaring all structures on the waters to be for the general advantage of Canada, which it was contended would give it such control over the dam at the outlet of the Lake of the Woods that it would be practically the owners of it. The Ontario Government protested against this legislation but never tested its validity. The matter reached a very strained situation until, after a succession of conferences between the representatives of the different interests, a contract was prepared between the Provinces of Ontario and Manitoba and the Dominion Government, settling the matter by way of compromise. This was only possible because the engineers took a practical view of the situation and induced their political representatives to sink their nice questions of construction of the British North America Act for the time being, and pointed out what would be in the best interests from an engineering and *economic* viewpoint of all the parties concerned; and when they had the situation developed from that point of view, then was introduced the lawyer who prepared in conference with the engineer, a comprehensive agreement under which a satisfactory *modus vivendi* has been reached. The same thing has been accomplished in connection with the storage of water in Lac Seul in the Province of Ontario.

The City of Winnipeg is also confronted with the problem arising out of the control of the Roseau River and the Red River, both rising in the State of Minnesota in the U.S.A. and flowing into the province and through the City of Winnipeg. These rivers and the Assiniboine River which joins the Red at Winnipeg, were at one time means of communication between the City of Winnipeg and points both west and south, and also at one time before the City was built up were of great benefit to the City and to-day are a great advantage to the community, but are a source of danger if not properly controlled in that they threaten the destruction at any time of a considerable amount of very valuable municipal property—that is, sewage systems, etc.,—as well as private residential and public and private industrial and commercial buildings. The control of the waters of these rivers is now a question which is exercising the minds of not only the City of Winnipeg but the Province of Manitoba and the Dominion Government in its international aspect. It is to be hoped that soon the lawyer and the engineer will get together and solve the problem.

The City of Winnipeg in its inter-municipal relations also has to solve problems of the control of flood waters and securing and distribution of drinking water and the disposal of sewage, as well as the providing of means of inter-communication by means of roads, bridges and street railway facilities with the municipal organizations adjacent and contiguous to the City. Nice legal questions also arise in connection with the providing of such things as park and recreation facilities, such as golf courses, etc., the benefit of which accrues not only to the citizens of Winnipeg but also to those of the adjacent municipalities. All these problems involve engineering questions in which the lawyer has to take part, none of which can be properly disposed of without a proper understanding by the lawyer of the engineering features and a proper understanding by the engineer of the legal aspects of the situation. The legal aspects keep changing and shifting from time to time as new conditions arise and new services are demanded by the members of the community.

In its local administration the City of Winnipeg is also confronted with problems arising between the corporation as such and its own citizens. Owing to the physical conditions in and around Winnipeg, the questions of the proper defining of natural water courses, the legal obligations resulting from the blocking of original water courses, and the disposal of the surface and flood waters by means of artificially constructed drains and sewers, often arise. The question of the disposal of water directed by an adjacent municipality into existing channels into the City and the avoidance of damage to property of the citizens of Winnipeg by necessary action to be taken by the City as a governmental institution, has to be decided by co-operation between the Law Department and the Engineering Department. All these problems indicate very clearly that as the lawyer has to be alive to the situation (it being his duty to provide a solution for every problem arising from day to day as a result of the physical and other conditions which he finds in his City), so the engineer must be available to assist him to carry out his plans and the rules which are made as a result of the lawyer's judgment. More and more it is being brought home to men who are in contact with these problems that the lawyer and the engineer must continue to work in close co-operation and to co-ordinate their efforts, if society is to continue to enjoy the fruits of the developments in science and the individual citizen and his property are not to be destroyed by the very forces which have been utilized for his benefit.

Winnipeg.

J. PREUDHOMME.