removal will be a perennial source of expense to Canadian roads, and its accumulation should be prevented by location if possible. It is customary to elevate the grade two or more feet above fields and flats, in order that the rail may be always windswept. In cuts ample width should be provided, and the rail raised well above the bottom of the cut wherever the wind directions are such that serious drifts will be formed. In bush location the change of snow movement that will be caused by clearing should not be overlooked.

That satisfactory track is largely a question of thorough drainage has long been acknowledged, but the fact that the necessity for drainage is a matter of natural soil has not been as clearly recognized by the railway engineer as by the common road builder. Cases occur where an inexpensive shift of the line would throw it upon a dry and open sub-soil, and alter the drainage conditions completely.

Every effort should be made to avoid road and railway crossings, swing bridges and lines along public streets, not only because of construction cost, but to secure freedom of traffic movement. The power to locate such crossings of other lines of transportation has to be obtained from the Railway Committee of the Privy Council. This is rather unfortunate, as that body has a decidedly political complexion, and a railway, no matter how carefully built, may have its line ruined by a level crossing forced upon it by Government authority. It is difficult to suggest an improvement upon our present method, unless it be by the creation of a non-political commission; and for the present it would seem that the road which has consistently avoided the building of level crossings itself is in the strongest position to fight any applications for permission to cross its lines.

The necessity of securing a good foundation for the roadbed is a point that should not be overlooked, as that detail affects both construction and operation. Every soft spot should be thoroughly tested before the location is finally laid down, and if any great depth of weak material is discovered, the line should be changed so as to avoid it. Bad foundation is not only a construction danger, but will be found to be the cause of a wave motion, when under traffic, that materially increases the tractive effort required, and renders it extremely difficult to maintain the track in good condition.

It would appear superfluous to remark on the necessity of always considering construction during location, were it not that many locations are made which require material alteration before the line can be built. It may be said that no engineer who has not had previous experience in location, construction and operation is capable of making a first-class location. There is unfortunately no line of work in which the best workmanship is more likely to escape general observation, an appreciation of which fact is perhaps the reason that so many capable railway engineers have taken up other branches of their profession. . . .

Lastly, it is to be remembered that all Canadian railways must be built under the provisions of the Railway Act, and of such Provincial Acts as may be in force. The engineer should therefore know the requirements of the act, for although railway managements may take most vigorous action to influence Government opinion upon great questions, they are perfectly prepared to accept all lega' requirements as to matters of detail.

WONDERFUL ENGINEERING.

An unparalleled engineering feat, says Collier's Weekly, has recently been achieved in Australia of immense value to the gold fields. The Coolgardie water scheme is to Australia what the famous Assouan dam is to Egypt. The remarkable feat of pumping 6,000,000 gallons of water a day for a distance of 350 miles, from the Helena river to Kalgoorlie, has been accomplished by English engineers by means of a great dam, called the Mundaring weir, ninety feet high, constructed across the Helena river twenty miles from Perth. The reserve capacity is about 5,000,000,000 gallons. There are a number of auxiliary reservoirs and pumping stations along the thirty-inch steel water main which runs along the railway line to the gold fields, the richest square mile of earth on the globe, near Kalgoorlie. The only foreign enterprise of equal importance is the Simplon tunnel, which will make Switzerland and Italy next-door neighbors. In a short time Pullman trains will pass through the Simplon Alps in a few minutes, 7,000 feet under the snow-covered diligence road which Napoleon Bonaparte built 100 years ago, and which takes about ten hours to traverse in favorable weather. This tremendous rat hole, which passes under Lake Avino, will cost the Jura-Simplon Railway over $15,000,000.

LEAKAGE OF KEROSENE OIL.

While it is undoubtedly true that kerosene oil is of a very penetrating nature and that it will leak through a very narrow crack, it is also the case that water is nearly, if not quite, as penetrating. One reason that leakage of water through a narrow crack is not so apparent as that of kerosene oil is that it evaporates and leaves little or no trace of the leak. Again, if there is any sediment or suspended mineral matter carried by the water, the evaporation soon leaves a deposit that effectually seals the crack and prevents further leakage. In the case of kerosene oil the leakage does not evaporate, or does so very slowly, and spreads over the outside of the vessel, making its presence very apparent, whereas the total leakage may be quite small. With the oil there is no tendency for a leak to seal itself, but on the contrary kerosene oil is of a highly solvent nature, and tends to remove all deposits clogging the crack.—Machinery.

SUIT RE TESLA'S PATENTS.

An important decision was lately given by the United States Circuit Court of Massachusetts, in the case of the Westinghouse Electric and Mfg. Co., against the Stanley Instrument Co. for alleged infringement of certain patents of Nikola Tesla. A similar suit was brought against the Catskill Illuminating and Power Co., and resulted in the Circuit Court of Appeals giving judgment, as in the first mentioned case, in favor of the defendants. The point involved was as to the priority of invention.

The claims of the first patent, which came up for consideration, cover a certain method, and of the second certain means of operating electrical motors by means of alternating currents from a single original source. This system is known as the "split phase" system.

Nikola Tesla was the inventor of what is known as the polyphase system of transmission of power and had covered by his earlier patents said system when operated by means of currents of varying phase from independent lines or circuits. By the methods and means therein described Tesla dispensed with one of the line circuits and was able to run the motor by means of alternating currents from a single original source. This was accomplished by means which so retarded the phases of the current in all circuits or so varied the relative resistance of the motor circuits as to maintain the necessary difference of phase in the circuits. Such utilization of a single original source by thus splitting a single current into two currents was an improvement of great practical value. But on April 22, 1888, there had been published at Milan, in an Italian Journal, a report of a lecture by Professor Galileo Ferraris in which the systems covered by the patents in suit was fully described. This printed publication is such a disclosure of the subject matter of the patents that if prior thereto it would constitute an anticipation.

After reviewing the evidence the court found that the claims of Tesla had been anticipated and that there was therefore no infringement of his patents.

The outlay on the improvement of St. Andrew's Rapids, Red River, will be $469,000, with $47,000 more for the land and engineering expenses. Delay has been caused by high water the first season, and also by proposed changes in the contract by which stone will be substituted for concrete, as being better adapted to the climate.