

"WE WANT GOOD ROADS."

By A. W. Campbell, C. E., Road Commissioner of Ontario.

The Great Need of this Country is Good Roads--How to Build Them Economically Explained by an Expert--Useful Hints and Diagrams to the Road Builders of this Country.

LOCATION OF ROADS.
There are very many instances where, by changing the course of a road slightly, municipalities would save a large sum in construction, and at the same time produce a better road. A slight deviation would frequently avoid swampy or wet ground, or would do away with the necessity of expensive cuts and fills. A bill can sometimes be avoided or the grade very much reduced by altering the location of the road. There is no prejudice against taking the roads from the lines laid down in the original survey, and property owners prefer to have their farms bounded by straight lines. At the same time the value of good roads to the farmer is not to be overlooked, and whenever a change in the road allowance means the change from a bad to a good road, or a change from a steep to a gentle grade, the slight inconvenience created by the alteration of boundary lines will many times be repaid.

CULVERTS.
In no branch of municipal work is so much money wasted as in the construction and maintenance of sluices and culverts. In most townships these are built of timber. Timber is perishable, culverts are subjected to repeated changes of wet and dry weather, the severest test to which timber could be subjected, and a large number of these culverts are renewed at a cost of from \$5 to \$50 each in some townships aggregating from \$500 to \$1,500, and this is an annual outlay. The life of these structures is so short that it is not more than five years before repairs are required and these repairs in a short time amount almost to renewal of the most expensive kind. A broken plank or stringer, a rotten log or any timber replaced with new at different periods makes the maintenance very costly, and this class of structure the most temporary and expensive. No sooner have they all been rebuilt than we must again commence the reconstruction of the first, in this way the expenditure becomes perpetual. And this is a large percentage of our annual tax. If these culverts are in their proper locations, natural watercourses, and other fixed places, they will always be required and their construction in the most durable manner is the best and most economical plan.

For small culverts there is very little difference in the cost of timber and vitrified pipe. If properly laid the latter will withstand the frost and is durable. These pipes may be used up to 18 inches in diameter, and the capacity may be increased by laying two or more rows, but the pipes should have at least one foot of earth or other filling between them. Culverts of 5 or 10 foot span should be cement concrete arches, which is permanent if the concrete is properly made. The concrete should be composed of one part of cement, clean sharp, silicious sand, free from earthy particles and coarse enough to pass through a twenty mesh sieve; clean gravel screened through an inch and a half screen the largest stones to be not more than in place of half-inches in diameter or in place of gravel broken stones that will pass through a two and one half inch ring. These materials should be mixed in the proportion of one cubic foot of cement, two cubic feet of sand and three cubic feet of gravel or broken stones, with just enough water to make the whole into a plastic mass. The sand and cement must first be mixed dry, then a sufficient quantity of water added to make it into a thick paste. It should then be thoroughly mixed again, spread out, the stones or gravel being added whole thoroughly mixed until every stone is coated with the mortar, then put it in place. The walls should extend well below the frost line and have a wing at the ends to protect the embankment from wash.

BRIDGES.
Wooden bridges, except where timber is very plentiful in the immediate locality, are not a good investment in view of the reduced cost of iron and steel, and the increasing cost of timber. Timber decays quickly, and while cheaper than steel in first cost, is more expensive after a term of years since the cost of repairs is very great. Generally speaking the cost of an iron superstructure is more than that of wood. The substructure of stone or concrete is more expensive than pile or crib work, but as in other structures a firm foundation is most desirable and economical. Wooden foundations from decay and other causes settle and the least settlement in the foundation twists the timber causing a disarrangement of the strains and frequently transferring the greatest load to the weakest point. Wherever timbers have a seat or bearing exposed, decay soon commences, and when least expected, collapses under a heavy load. Wherever timber is used in bridges it should be used in members from four to six inches in thickness, the strength of the beam or chord being obtained by building several members together, properly breaking joints, and coating each bearing with lead. A further protection is to cover these built timbers with galvanized iron to protect the numerous joints and bearings from moisture. All caps, corbels, chords, braces and floor beams should be made in this way so that the thickness of no timber will be more than six inches. A wooden bridge should be painted one year after erection; iron bridge at time of erection, and care should be taken to see that all nuts are kept tightened so that each member may carry its fair share of the load.

The cost of renewing a wooden bridge in which a new timber has to be sent to put in a new timber from time to time, will amount to twice the initial cost of the bridge. In this way the ultimate cost of a timber structure becomes very great.

The course pursued by some, indeed most municipalities in erecting iron bridges is likely, however, to result disastrously, and throw iron and steel into disrepute. A council advertises for tenders. The companies specifying supply their own plans and specifications. Thus far the procedure is entirely satisfactory. The difficulty arises when councils accept the lowest tender without obtaining the advice of an experienced builder of iron bridges as to the plans and specifications submitted. This is a matter in which few township engineers and surveyors are qualified to decide, and certainly the wisdom of councillors, entirely without professional training in such matters, is not to be trusted. Cases have occurred in which a difference of five dollars has influenced a council to accept a tender for a bridge which was manifestly, to a man of experience, worth less than the other by several hundred dollars; and which was indeed unsafe offering every likelihood of failure. This is a matter of life and great expense for reconstruction. It is difficult to understand the action of some councillors shrewd in other matters, in the construction of bridges and other public works proceeding with such apparent disregard for the true interests of those whom they represent. A small sum spent in securing reliable advice is as much a matter of economy in public as in private affairs.

RECENT ROAD LEGISLATION.

The State of Massachusetts is one of those which has taken advanced steps in road improvement. On petition of a county, the state road commission may, with the assent of the Legislature, adopt any road within the county as a state highway. Except that the grading and bridging is done by the county, the work thereafter, both construction and maintenance, is under the authority of the state commission. Also on petition of two or more cities or towns, a road between them may be made a state highway. The "state commission" is composed of three commissioners who compile statistics, make investigations, advise regarding road construction and maintenance, and hold public meetings for the discussion of road matters. One-fourth the cost of construction is paid by the county, the remaining three-fourths being paid by the state. In 1894 the state spent \$300,000, in this way; in 1895 \$400,000; and in 1896 \$600,000. It is intended that ultimately about one-tenth of the entire road mileage will be built as state highways.

In Michigan, upon a majority vote of the rate payers in any county, a board of commissioners (five in number, are elected by the people to lay out, and construct certain of the leading roads, to be paid for and thereafter maintained by a county rate.

A bill has just passed the New York legislature which provides for the appointment of a county council, certain roads may be adopted as state roads. The petition is first presented to the State Engineer. If he approves of the location of road thus sought to be improved, he prepares plans, specifications and estimates. These are presented to the legislature and, if approved by that body, 50 per cent. of the cost of construction is paid by the state.

The New Jersey Highway law provides that on the petition of the owners of two-thirds of the land bordering a road, the state Commissioner of Public Roads will cause the road to be improved in accordance with plans and specifications prepared by him, subject to the approval of the Legislature. The owners of the land affected by the improvement pay one-tenth of the cost; the county pays six-tenths; and the state three-tenths.

Connecticut has introduced a plan of highway improvement providing for the appointment of three state commissioners. When a township votes in favor of constructing a road under the provisions of the State Highway Act, the specifications are prepared and submitted to the state commissioners. If the commission approves, the township council lets contracts for the work, to be performed under the supervision of the state commissioner. One-third of the cost is paid by the state, one-third by the county, and one-third by the township. The expenditure by the state in this way is limited to \$75,000 annually.

The State of Rhode Island has appointed a commissioner of highways. When a council represents to the commissioner the need for improving a certain road, an examination is made by him. If he considers the work necessary, he prepares plans, specifications and estimates; and reports to the municipalities affected, also to the state legislature as to the proportion in which the expense should be met by the state and the municipalities benefited. If the state legislature approves the work is performed by contract.

Vermont and California also contribute largely in the form of state aid, while Indiana, Kentucky and other states contribute to a less degree. Only the bare outlines of the systems have been stated, with the object of showing the prominence the question of road improvement has attained of recent years. In adopted within the past five years. In all these systems, safeguards are placed to prevent the expenditure exceeding, for any state or any locality, certain reasonable limits, according to requirements and ability to meet the payments. In most of these states the tax is so levied that the towns and cities pay the greater portion of the cost of state road construction; for example, in the State of New York it is estimated that the people outside of the

towns and cities will pay only 10 per cent of the cost.

IN BRIEF.

Made road "break up" are bad roads. Road improvements in such a way that they will be permanent. Whether by statute labor or other means undertake roadwork systematically. Appoint a supervisor who will have charge of all the roadwork. Make road less a five miles in length. Choose the best men as pathmasters, and keep them in office. Classify the roads according to the nature and extent of traffic over them. Specify the width of grade, amount of crown, plan of drainage, kind, width and depth of material to be used, and see that these specifications are carried out.

Purchase gravel by the pit not by the load. Use clean road material. Strip the clay and earth from over the gravel pit, before the time of performing statute labor. If screening or crushing is necessary, let this be done before the time of statute labor. Do not scatter money in making trifling repairs on temporary structures. Roads, culverts and bridges will always be required, and their construction in the most durable manner, suitable to requirements is most economical.

Statute labor is to be made successful the work must be systematically planned and some definite end kept in view. Have the work properly laid out before the day appointed to commence work. Only call out a sufficient number of men and teams to properly carry out the work in hand and notify them of the implements each will be required to bring. Let no pathmaster return a rate-payer's statute labor as performed, unless it has been done to his satisfaction. In justice to others make the statute-labor returns clearly; show what work has been done. See that the council collects the amount from the delinquent parties and have it expended the next year. The pathmaster should inspect the roads under his charge after every heavy rain-storm. A few minutes' work in freeing drains from obstructions, filling holes, diverting a current of water may save several days' work if neglected.

It is impossible to do satisfactory work on clay roads which are very wet, or which have become baked and hardened by heat and drought. The operator of the grading machine should have instructions to commence work on clay roads as soon as the ground has become sufficiently settled in spring, and not to leave this work until the time of statute labor, usually in June, when the ground is hard and dry.

With the money which can be spent, build permanent culverts, permanent bridges, buy machinery, buy gravel pits, prepare gravel for hauling, construct drains, operate the machinery. Use the statute labor as far as possible in drawing gravel or broken stone. Do not leave the gravel or broken stone just as it drops from the wagon. Spread the metal. Crown the road with a rise of one inch to the foot from side to centre so as to shed water from the roadway to the drains. Give the open drains a good fall to a free outlet. Lay tile underdrains where needed. Drain thoroughly. Keep the road surface dry. Keep the earth underneath the surface dry. Use road machinery. Use graders, stone crushers and road rollers. Improved machinery is as necessary for good and economical work as are self-hinders and steam-threshers. Employ one man to take charge of the machinery. He will become experienced and do better and cheaper work. The same teams should be always employed to operate the graders. They

become accustomed to the work and give better service. Do not cover an old gravel road with sod and earth from the sides of the road. Turn this earth and sod outward and raise the centre with new gravel. Adopt every means to secure a hard, smooth, waterproof surface. Do not let stones roll loosely on the road. Do not let ruts remain. They make travelling difficult, and spoil the road by holding water. Make repairs as soon as the defect appears. Use wide tires. Improve the drainage of the hills. Make the crown of the roadway higher than on level ground. Change the location of the road if a steep hill can be avoided. Do not use wood for culverts. Use concrete, vitrified pipe or stone. Do not build wooden bridges. Use iron stone or concrete. Build good roads.

Mistaken in His Man.—Wallace—And did you make him eat his words? Harveys—No. He turned out to be one of those fellows who would rather fight than eat.

The Burglar and The Public House.

"A fine public house," said Blanco Watson, the humorist. "Yes," I replied, looking at the building we were approaching, "but a strange position—away from the high road, and surrounded by villas." "A very strange position. We will rest in the public-house, and I will tell you how it came to be built in such a strange position."

I smiled, and followed him into the saloon bar. We sat at one of the tables, and were silent for a time, he thinking and I watching him. "The story begins," he said, presently, "with a burglary committed by a certain Bill Jones, one night long ago."

"Bill was a young member of the profession. Hitherto he had not attempted anything very big, but continued success in small things had made him bold. On this night he broke into the house of a well-known actress, in the hope of carrying off her jewels."

"He succeeded in getting the jewels and was leaving with them when he found that the slight noise he had made had attracted attention. A servant girl met him at a turn of the stairway and began to shriek. He rushed by her and to the window through which he had entered. As he passed through it again he heard doors being opened, and knew that the house was fully aroused."

"I understand," I said, "Bill escaped. The actress employed a detective. The detective built this public house in an out-of-the-way place, hoping that Bill, as an out-of-the-way young man, would call in one day for a drink. Curiously enough, Bill did."

Blanco Watson frowned. "This is an intellectual story," he said; "it does not depend on coincidences." "I will continue," Bill avoided the first pursuit by a long run across country, and then walked toward his home, not daring to use the railway. He kept to the by-roads as much as possible, and at the close of the next day had reached the neighborhood of London.

A spade lying inside a field gate suggested to him the advisability of hiding the jewels until he had arranged for their sale. After making sure that he was not observed, he entered the field and picked up the spade. A tree of peculiar growth stood just beyond him. In the manner of fiction he counted twenty steps due north from the tree, and then dug a deep hole, placed the jewels in it, and filled it up again.

"He arrived home safely that night but was arrested in the morning. The servant girl had given an accurate description of him to the police, and they had recognized it."

"In due course he was tried. The evidence against him was very strong. The servant girl swore that he was the man she met on the stairs; some of the villagers swore that they had seen him near the house previously to the burglary. He was found guilty and sentenced to seven years' penal servitude."

"Bill behaved very well in prison, and at the end of five years was released on a ticket-of-leave. He decided to wait until the ticket had expired, and then get the jewels and leave the country. But a day or two after his release he walked out to look at the field."

"There was no field. During the five years he had been in prison the estate of which the field was part had been built upon. He wandered about the houses in despair. But, as he turned a corner, he saw something which suggested hope. Behind some railings was a tree of curious growth."

"It was the tree twenty steps due north of which he had buried the jewels. He recognized it immediately, and ran toward it. Again he was in despair. A yard or two north of the tree was a chapel, and the jewels were under the chapel. He leaned against the railings, covering his face with his hands."

"It happened presently that the head deacon of the chapel, a kindly old man, came down the road. He saw Bill standing like one in trouble, and stopped and asked what was the matter and whether he could help."

"For a few moments Bill did not know what to reply, but then he spoke up. He said that he had been a burglar, but that he had learned in prison that burglary is wrong; that now he was trying to live an honest life, but that, as he had no friends, it was not easy."

"The old man was touched. He had found Bill leaning against the chapel railings, and Bill had said that he had no friends. Was it not his duty as head deacon of the chapel to be a friend to Bill? Clearly it was."

"He took Bill home with him; he was a bachelor, and there was no one to restrain his benevolence. They had supper and talked together. The deacon found Bill intelligent and fairly well educated, and offered him employment. He was a builder in the neighborhood, he explained, and had a vacancy in the works. Bill gratefully accepted the offer, and began his new career on the following Monday."

"Months passed, Bill had changed wonderfully. He had forgotten his old habits and learned new ones. The deacon was delighted. Not only was Bill the best of his workmen, but he was the most regular attendant at the chapel. "Bill longed for the jewels, and he worked hard because he knew that money would help him to get the jewels, and he had taken very good care of them. He had dug down through the floor one night, but the chances of detection

were great and he had given up the idea."

"Years passed. The deacon had become an invalid, and Bill practically managed his business. He was an important man at the chapel, too, and was often entrusted with a collection-box. One day the deacon died. Soon afterward it was known that, having no near relatives, he had left his property to his friend William Jones."

"I see!" I exclaimed. "Bill—" "Blanco Watson shook his head. "Bill was Bill no longer," he said. "He had become a man of wealth. At the next election of deacons he was one of the successful candidates. In future we must refer to him as Mr. Jones, and not as Bill."

"Mr. Jones was a most energetic deacon. He introduced new members and persuaded old ones to attend more regularly. He started a young men's literary society and a series of Saturday entertainments. He made the chapel the most popular in the district, and then, at a New Year's business meeting, he struck boldly for the jewels."

"The chapel was too small, he said in the course of an eloquent speech. They must erect another on a larger site. There was but one such site in the neighborhood. He himself would undertake the building operations, charging only what they cost him. He would also purchase the old chapel. The net expenditure need not be very great."

"The proposal was well received and a committee, with Mr. Jones as chairman, was appointed to consider the details. Their report was very favorable, and at another business meeting it was decided to carry out the proposal."

"The necessary funds were subscribed and guaranteed. Contracts were made with Mr. Jones. In the spring of that year the building operations were commenced, and by the autumn they were finished. The congregation removed to the new chapel. Mr. Jones purchased the old one at a high price and entered into possession."

"And then," I said, "I suppose he got the jewels?" "Blanco Watson laughed. "No," he said, "he did not. He broke up the floor himself, counted the steps due north from the tree again, and dug. He did not find the jewels. He counted the steps again and dug deeper. He did not find them. Then he tried other places, but, although he kept on until he had tried everywhere beneath the floor, he never found the jewels."

"Why, what had become of them?" "I cannot say. It is possible that when the foundation was being laid a workman had discovered and appropriated them. Again, it is possible that there were two trees of similarly curious growth, and that the one outside the chapel was not the one Mr. Jones first saw. Again—"

"And what has the story to do with the public-house? But I can guess." "Of course you can, Mr. Jones was very angry with the chapel members. He considered that by false pretenses, they had led him into buying the old chapel dearly and building the new one cheaply. He resigned his deaconship, and then sought a way to be revenged on them. He found one. On the old chapel he built a public-house—this public-house in which we have sat so long."

HOW NELSON HUNTED FLEETS.

Two Years Forcing a Trafalgar and Three Months Catching Bonaparte. Lord Nelson was the greatest and most successful admiral the world produced, down to the days of steam power, yet on more than one occasion he let his enemy slip past and lead him a heart-rending chase for months before a blow could be struck.

Bonaparte's expedition for the conquest of Egypt and the Orient had been organizing for many months at Toulon. On May 9, 1798, Nelson sailed with a flying squadron from Gibraltar to scout off the French port and ascertain the mission of the French fleet. But the enemy eluded him completely, left Toulon with Bonaparte's army and disappeared at sea with Nelson none the wiser for having appeared in the Gulf of Lyons.

Reinforced by ten ships of the line Nelson started in pursuit. But he kept missing the French fleet. He called at Alexandria in Egypt, but no French ship was there. Then he chased off to Syracuse, but still no enemy. Finally after about three months of vain pursuit he appeared on August 1 off Alexandria again and there he beheld the object of his search anchored in Aboukir Bay. The army of Bonaparte had been safely landed. The complete destruction of the French fleet followed, however, and the ultimate ruin of the Egyptian campaign was assured.

The campaign of Trafalgar, perhaps the most memorable in naval history, was infinitely more trying to the patience of both Nelson and the English people than any before it. The British admiral blockaded Toulon, where the French fleet was fitting for sea, a full year and a half, and in all that time not once did he touch foot on the land. And how were his perseverance and vigilance rewarded? On January 18, 1805 the enemy broke away and swept off to sea. It effected a junction with the Spanish fleet at Cadiz, which Nelson had determined to prevent. Then the allied force sailed to the West Indies with Nelson in pursuit. The chase continued back to Europe again, without success, and Nelson thereupon left his ship and returned temporarily to England. It was not until October 5, 1805, over eight months after the French force had escaped from Toulon harbor that Nelson finally met it and the Spanish allies in battle off Cape Trafalgar.

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Neighbor—I hear your husband has had his life insured for a large amount. Mrs. Sourface—He has, but I just like him. Come gone and insured himself for a fortune, and he hasn't insured me for a penny.

THE QUEEN'S HINDOO ATTENDANTS

In the days of Roman Empire the Caesars brought captive to the Eternal City, Princes and potentates of their conquered outposts. The lot of the captives are not always a happy



MUMTAZ HUSAIN, The Queen's Indian Chef.

or contented one, though some of them, it is recorded, established relations in Rome, which advanced them to high positions of honor about the Caesars. Some such idea or a development would appear to apply to the Hindoo attendants of the Empress of India, and our Gracious Queen. She has at the present time three Indian attendants, who look to her personal comfort, and a chef over the Eastern kitchen, which is called into use when distinguished visitors from India go to London. The Oriental department of



MUNSHI ABDUL KARIM, The Queen's Indian Secretary.

the Royal household is in charge of her private Indian secretary, Hafiz Habbal Karim, who belongs to a good family at Agra, and has been in Her Majesty's service since the jubilee year, 1877, discharging his duties faithfully and well. The Queen speaks and reads Hindustani with considerable proficiency, and she also shows devotion to Indian art. Nothing gave the Indian cavalry officers who formed a guard of honor to the Queen in the diamond jubilee procession last year more pleasure than the fact that they received their jubilee medals from her own hands.

AN INTELLIGENT SHEEP DOG.

Would Steal Sheep for His Master and Drive Them to a Secluded Place.

The Collie is a wonderful dog, the most intelligent and faithful of the race. I will tell you an anecdote illustrating the sagacity of this friend of the shepherd and his flock—thoroughly authentic, but marvelous beyond belief. It was long the custom in the Scottish Highlands, says Sheep Breeder, to mark the sheep by impressing with a hot iron a certain letter upon their faces. The shepherds of Tweeddale had for a long time been missing a few of the choicest of their flocks, and one day a black-faced ewe returned to her lamb from beyond the river, with the letter O branded over the T that was her owner's brand. A farmer living in a wild and secluded glen, shut in by crag and mountain, where the mist came down like darkness and the eagle screamed above the cataract, was known to use the letter O as his "mark."

The glen was searched and 600 stolen sheep recovered. He confessed his crimes and was executed in the city of Edinburgh in 1773. Upon the pretense of buying he would visit the flocks in the vale of Tweed, accompanied by his Collie Yarrow, and point out those sheep that he wished him to drive home. Then he would ride off to his own glen, passing through every hamlet and calling at every inn on the way. Yarrow, concealed on some hillside among the heather, would wait for the darkness to come and hide his evil deeds from the light of the sun; then he would select every sheep that his master had pointed out to him and drive them rapidly by unfrequented paths over mountain and moor to his own dark glen, before the weather gleam of the eastern hills began to be tinged with the brightening dawn.

There the "bira" was concealed by the letter O in an enclosure in the hollow of a hill, Yarrow keeping faithful guard outside, and never failing to notify his master of the approach of strangers.

Whether the suggestion of a dog, but I don't not be-twin-sparkable mystery. Resemblance come across cases of resemblance knew a case of were twins, and their own part

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