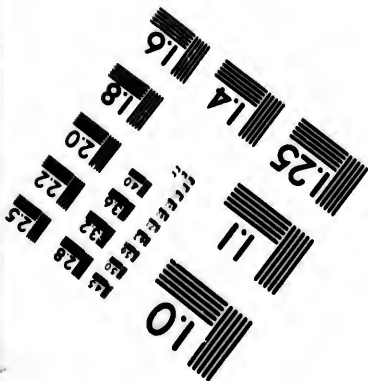
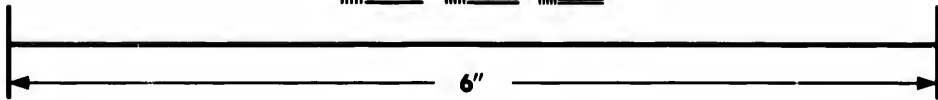
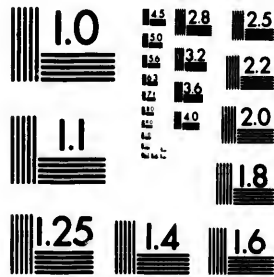


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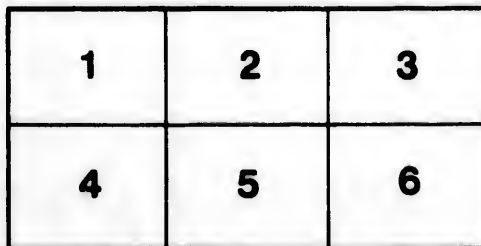
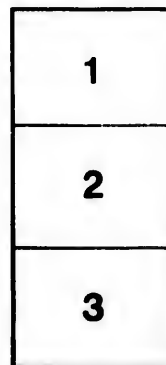
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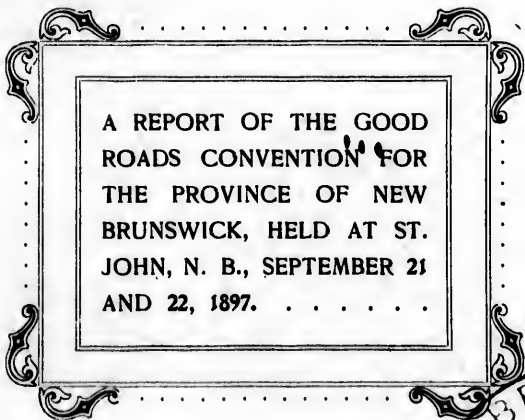
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REPORT
OF THE
GOOD ROADS CONVENTION
FOR THE
PROVINCE OF NEW BRUNSWICK

HELD AT ST. JOHN, N. B.
SEPTEMBER 21ST AND 22ND, 1897.



PUBLISHED BY THE DEPARTMENT OF PUBLIC WORKS,
PROVINCE OF NEW BRUNSWICK.



REPORT

OF THE

GOOD ROADS CONVENTION

FOR THE PROVINCE OF NEW BRUNSWICK.

HELD AT SAINT JOHN, N. B.
SEPTEMBER 21ST AND 22ND, 1897.

THE CONVENTION called by the Good Roads Association for the City and County of Saint John met in Amusement Hall, on the Exhibition Grounds, on Tuesday, 21st September, at 10 a.m.

On the platform were HON. H. R. EMMERSON, Chief Commissioner of Public Works; HON. L. J. TWEEDIE, Provincial Secretary; HON. A. T. DUNN, Surveyor General; HON. C. H. LABILLOIS, Commissioner for Agriculture; PROFESSOR A. W. CAMPBELL, Provincial Instructor in Road Making for the Province of Ontario, and MR. W. F. BURDITT.

Among those present were HON. GEORGE F. HILL, M.P.P.; T. B. WINSLOW, Secretary of Public Works; Deputy Mayor ROBINSON; Alderman CHRISTIE, Chairman of the Board of Public Works; Street Superintendent MARTIN, W. A. TRUEMAN, JOSEPH HORN BROOK, T. S. PETERS, and others.

In the absence of the President of the Saint John City and County Good Roads Association, DR. BERRYMAN, the chair was taken by Mr. W. F. BURDITT, who spoke as follows :

I may explain that a short time ago a number of people in Saint John, who felt interested in the improvement of our highways, got together and formed a local association called the Saint John City and County Good Roads Association. It was suggested at that meeting by a number present, and especially by the Hon. Chief Commissioner of Public Works, that a Good Roads Association for the Province should be organized; but we felt at that meeting, being only a local

one and representing only people from the County, that it would not be proper to undertake to organize a Provincial Association without having present gentlemen representing the different sections of the Province. That matter was therefore deferred, and the Saint John Association subsequently decided that it would be a good opportunity during the Exhibition to call together a convention from all parts of the Province to discuss the question of Road Making—what methods could be adopted for the improvement of the highways—whether any suggestions could be made as to improvements or modifications in the law, besides practical suggestions in regard to road making, operating of road machines, etc. Therefore it is the object of this meeting to discuss practical questions, to receive suggestions from gentlemen who are well posted in the matter of road making, and also with regard to the character of roads best adapted to our needs. It is not the desire of the Saint John Association or the prospective Provincial Association to advocate a large expenditure on very costly roads. There are doubtless a few of the main highways of the Province that it would be economy to build in a very thorough manner—that is, make thoroughly built macadamized roads of them; but for the most part all that is required is the ordinary earth and gravel road built in the best possible manner. We feel—a good many of us who have looked into the matter—that the system of working on the roads is perhaps not the best; that is to say, the custom of calling out the statute labor at a certain season of the year and doing certain work whether it requires to be done or not. It calls to mind the gentleman who said he took a bath once a year whether he needed it or not. Once a year the statute labor is called out, and if there is a piece of road naturally good, that is, provided with good drainage, nevertheless the statute labor has to be performed, and probably a lot of surface material is scraped or dug out of the gutters and placed on the road, and it is made worse by the labor performed than it was before. Then there is another feature, that those who are directing the labor have very little practical or technical knowledge with regard to road building. There is no continuity of purpose—each section is acting for itself and independently of the others: there are a great many men engaged in overseeing the work and expending the money, and, generally, the results are, perhaps, not as good as if there was a better system of directing the labor and expending the funds. I for one am not

prepared to say anything against statute labor. I think that it will probably be a long while before we in this Province will be prepared to do away with statute labor, because I know from my own familiarity with the agricultural community that in many districts it is a great deal easier for farmers to put in so many days labor upon the roads than it would be to pay a money tax, and the probability is that we get more labor performed by statute labor than we could by assessing a money tax in many districts. At the same time the day is approaching when, to a large extent, statute labor will be done away with and money assessment voluntarily adopted in the different counties. The introduction of road machines does away, to a large extent, with the necessity for statute labor, and I think the more progressive parishes and counties will gradually see the advantage of at least assessing a part of the tax in money instead of work. It has been suggested that it would be a good idea to allow the poll tax to be served in labor, and cash assessments for the balance. That would probably be going too far at the present time, at all events. But the object of this meeting is to call forth an expression of opinion from men from different parts of the Province, and hear their suggestions and receive their opinions as to the advantages of forming an Association and the best methods of disseminating knowledge. Almost every roadmaster in the Province has some practical knowledge, but back of all that there is the experience of men, engineers and others who have given thought and attention to this question for hundreds of years, and this experience has been gathered together and records kept of it, and if we can obtain information in this way, by the results of the work of the past, I think we should by all means do so. We have here to-day for distribution a pamphlet issued by the League of American Wheelmen of the United States. It conveys some very useful information and suggestions, which I think anyone who is interested in road making will find profit in reading. And it is in this way that this Association can do a great deal of good, in disseminating knowledge among the people generally as to the best methods of constructing roads. I think that one of the weak points in our system of road making is that not sufficient attention is paid to the matter of drainage. A certain attempt is made at surface drainage, but even that is not adequately provided for. Of course there are certain cases where the soil is naturally of a porous

structure, and there is very little need of drainage, but in other localities the soil is retentive, subject to soakage and of a spongy nature, and there under-drainage would be very beneficial. Under-drainage dries the subsoil and makes a firm foundation. It is not generally realized that the action of frost would have but very little damaging effect if it were not for the soil being previously saturated with water. It is not the soil that freezes, but the water between the particles of soil. Where the soil is naturally drained there is no heaving of frost and no trouble in the spring time; and it is possible to make any soil similar to that by a system of under draining. Tiles are cheap, and there is no doubt that in many localities there could be no more profitable investment made than in a tile drain, put down four feet below the surface, independent entirely of the surface ditches. Thus, by taking away the saturation underneath, you have a firm and good foundation for any material that is placed upon the surface.

We have with us to-day MR. CAMPBELL, Provincial Road Instructor for Ontario, who visits the different sections of that Province, giving instruction in road making and advising with the County and Town Councillors and others as to the best methods of road construction. We also have with us the Hon. Chief Commissioner of Public Works, and many other gentlemen who know much more about roads than I do, and as you would no doubt like to hear the Government's position in regard to this matter, I will now call upon the HON. H. R. EMMERSON, Chief Commissioner of Public Works for this Province.

HON. MR. EMMERSON.

I am sure I would be taking advantage of my position if I were to at any length discuss the objects of this meeting. We are all glad to have the opportunity of listening to a gentleman of the reputation of MR. CAMPBELL, and while this meeting is not a large one, that is no indication that there is not a desire throughout the Province to have better roads. Now, there is some suspicion, I fancy, throughout the Province with reference to the object in view by the Association recently formed in the City of Saint John, and in reference to the object in view in the formation, as is proposed, of a New Brunswick Good Roads Association. It would be, perhaps,

just and proper that we should remove any such misapprehension. In the first place I think I can fairly say on behalf of those who have the object of this Association at heart, that it is not the intention to propose anything whereby the burdens of the people will be added to; whereby there shall be any increased taxation, or anything of that nature. The desire, as I understand it, of those who have moved in this matter is to so take hold of the present means at our disposal that we shall accomplish what is so much to be desired—better roads through the country, by the promulgation of information as to the best methods of road making and in some way protecting and guarding the present expenditure, so that we can get greater and better results. I venture this assertion, that if the moneys expended by the grant of the Legislature each year upon the roads were expended under better circumstances and with more information, that money, together with the statute labor, would make the roads of this Province equal to, if not better, than the roads of any of the Provinces. I have travelled in Prince Edward Island, Nova Scotia, Quebec, and somewhat in the great Province of Ontario, and while we have much to complain of, and while we think that our roads are very bad, yet I find roads in all these Provinces that would not compare with some of the highways of this Province. But we have not obtained the proper results; we have not got value for the money expended, for the labor put forth on these roads. Now the question is, how best to administer grants and the statute labor, that the best results may be attained. What we should seek is the best methods—the best way to expend—and then we should have a knowledge with reference to the mode of expending. I would like to say a word with reference to the Highways Act, and now do not understand me as in any way attempting to entrench upon politics, because, as I understand it, this movement is without regard to party politics—it is without regard to Government or Opposition. Every man, whether he favors the Government or is opposed to it, must be desirous of having good roads, and if I introduce the subject of the Highways Act do not understand me as wishing to defend the action of the Legislature or Government. It is simply to call your attention to a principle that is involved in the Highways Act, and as to whether it is a wise one or not I leave it for you to judge. You must remember that the Highways Act is the result of the combined efforts of every member of the Legislature. It is true that the

Department of Public Works had to shoulder the introduction of that Act, but every member of the Legislature discussed it and every member's views, whether Government or Opposition, were respected, and many of the provisions were introduced without regard to whether the gentlemen proposing them were supporters or opponents of the Government. The principle sought to be introduced in the Highways Act of 1896 was to place the responsibility in certain districts upon some one man. Of course in changing the procedure in any direction that affects the public, there is necessarily a certain amount of friction, and where you have a class of officials who, by a certain Act of the Legislature are removed and become nonexistent, you must necessarily expect that in the change from that condition to some other there will be a certain amount of friction and opposition. Now under the old system we had what were called surveyors. Each surveyor had a certain district and the responsibility in that district was upon him, without regard to the adjoining district. In one district the surveyor might wisely expend the money at his disposal, while in the adjoining district a far different condition of things might exist. Each surveyor was lord of all he surveyed in his own district. Under the Highways Act of 1896, the Counties were divided into divisions, and each division was placed under the control of one man, called a Commissioner. The object of this was that the responsibility should be placed upon some one man for a larger area, so that there would be more uniformity in the expenditure of money and in the character of the work done, and so that there might be better results attained through out the Counties. That was the principle that was recognized, and I think it is a principle which will commend itself to all of us. I do not believe too much in centralization, but I do believe that if you have public work to be done you should have the responsibility placed upon some one man, and the greater the area, with reference to road matters especially, the better, in my judgment. In the main there is not so very much difference between the present law and the old one. They are the same in principle with this exception. Some people say: "You have roadmasters who are answerable to the Commissioners, and you do not require that those roadmasters should be sworn." Well, now, under the law they are required to give a certificate; they are required to make certain representations. If they make false representations they are subject to a penalty, and

they can be made answerable for their misdeeds in that respect, and I contend that the man who would make false representations and give a false certificate would make a false oath, and it does not seem to me you could improve the matter by substituting the oath for a signed certificate. But that is a matter of detail. The point that should be had in view by this Association when it is formed, is to take into consideration all such matters.

I would think that we should not have County Associations. They would be unwieldy. I should say rather have Parish Associations affiliated with this Association. I should suggest that in every Parish it should be made the duty of some member of this Association to see that there should be established in that Parish a Parish Association for the attainment of the very object which we have in view — the dissemination of information and the watching closely the expenditure of public moneys. It is very easy to make complaints against people, but I have had a suspicion sometimes, as I have travelled over the Province, that the people were more interested in getting money grants than they were in having good roads. I remember once, travelling through one of the Counties of this Province with a representative of that County, and he complained that the apportionment of by-road money for his County was not sufficiently large, because there was so many bye-roads, and I found that about every half mile there was a road running from the main highway back. I inquired where those roads went to, and his reply was: "Oh, they go to the back lots." Then I asked where they ended. "Oh," said he, "the wood lots are back there." I found that there were roads where the farms were long and narrow which extended, perhaps, three or four miles back to some wood lots, and perhaps some two or three farmers would be interested in that road. They were not public roads in any sense of the word, and there was each year hundreds upon hundreds of dollars expended upon just such roads — no I will not say expended, but divided among the parties interested in those roads. Well, there was a provision put in the Highways Act to this effect, that there cannot be a dollar of public money legally expended upon any road in the Province that is not laid down upon the commissioners' returns to the Public Works' Department, all of which roads must be recorded and recognized public roads and not private ways. In the county to which I have referred those roads were struck off, and the money

which for the last forty years had been practically lost was expended upon the proper bye-roads of the county, and I am sure that the results are to be seen in that county to-day — in fact, I know it from personal observation and experience. Now the Parish Associations would serve this purpose, to my mind. If they were largely attended, as I think they would be, they would excite an interest in every man as to the desirability of good roads, and when once they become awakened to the desirability of good roads they will watch closely every man who has to do with the expenditure of the public moneys or the statute labor. They will take an interest in the work, and in a short time will have every man in that parish interested in having the best results from the expenditure of the money and the appropriation of the statute labor.

I shall not take up any more of your time. I think I can speak for the Government — I can certainly speak for my own department — when I say that we shall be at all times only too happy to aid in the furtherance of the object of this Association, and in saying that I want to say that I do it from a selfish motive — that is, selfish in the interest of the Department of Public Works. I would like, and always do like, to see the best possible results obtained from the expenditure of public moneys. It reflects credit upon whoever happens to be the head of the department if the results are creditable, and more than that, it is economy. There will not be such a demand upon the department if the moneys are properly expended. I can take you to districts in this Province to-day where, if the moneys sent out this spring had been properly expended, they would not be making application to-day for assistance for this little work or that little work. So it is in the interest of the Department of Public Works that this movement should go forward, and not merely in the centres of the respective counties, but in every hole and corner in every county.

Now, Mr. Chairman and gentlemen, I can only say that so far as the Department of Public Works is concerned we will be happy to second all your efforts and do the best in our power to advance the movement for the benefit of good roads throughout the Province.

DR. JOHN BERRYMAN.

As President of the Good Roads Association for the City and County of Saint John, it is a matter of great congratulation to me to see such an audience as is here present, and I believe that if the gentlemen here carry away good impressions, and disseminate those impressions, it will have a broad, wide and good effect. Our Association was not formed to complain, or to carp, or to criticize. We felt that improvements might be made in our roads without any additional expense or taxation to the people. This is an age of improvement and increased knowledge. So far as I can see, however, our roads are as they have been, with very little improvement, for the last fifty years. Since the introduction of better styles of carriages and bicycles we have all felt that improvements in our roads would be of great benefit to us, and if the people in the country would unite and make good roads, people making summer excursions would go where the best roads were to be found. So it is in the interest of every one to try and stimulate this work, and the information that will be received to-day, and that will be got by the dissemination of pamphlets, books and writings will show that the improvement of roads, though it, of course, will cost money, will, in the end, by saving of wagons, carriages, bicycles, etc., compensate us for the outlay.

HON. MR. TWEEDIE.

Mr. Chairman and Gentlemen:—When I came into the hall this morning I was rather impressed with the small number present here, and it struck me that perhaps it was due to the fact that the Government of this country had been so mindful of its duty and had performed its work so well that the roads, after all, were in good order, and the people took no interest in the matter except in a few sections of the country—in fact, that all this talk about the roads being in bad condition had not been entirely correct. However, perhaps it is not fair to infer that, but to infer that the audience is small on account of the weather.

It is a fact that our roads are not in the condition that they should be with the expenditure of money that has been made upon them for years. It is perfectly true that a large portion of the

money appropriated by the Government for bye-roads and great roads, especially bye-roads, has not reached proper channels; that, in other words, members have been in the habit of using this bye-road money for political purposes and gave it to their friends, whether they had roads to repair or not. I remember once canvassing against a gentleman, a member of the government at that time. I said to a certain man in a county which I will not name: "Vote against this man; give our ticket a vote." His reply was: "What, vote against Tom? Why, he is good for two barrels of flour every year." This man got ten dollars a year on a bye-road that began nowhere and ended nowhere. I think, however, that the section in the Highways Act which has been spoken of by the Chief Commissioner has, to a great extent, prevented that. It should be the object of this Association to find out what roads are deserving of money, what roads are required for public purposes, and it is upon these roads that the money should be expended to enable people to get to the centres. All the roads not in the benefit of the public should be stricken off, and to a great extent they have been under that section. Then again, in some districts it is difficult to make roads, while it is very much easier in other districts. In Restigouche, for instance, you can make a road very much better than you can in Queen's County, and at a less cost. In Gloucester it is the same way. In Northumberland we have a good deal of difficulty in some sections, while in other places the statute labor will make the roads in good condition. What I would like to hear from the gentleman who will address us is as to what he would suggest for a rough-and-tumble country, where there are no facilities, no gravel pits, what he would suggest for making roads in a country of that kind. There is a good deal of difficulty in finding out what portions of the Province require more money than others. We apportion a certain amount to each county, and some counties do not require it as much as other counties, because they have the facilities for making good roads. I think there should be no such thing as bye-road money at all; that it should all be appropriated by the Chief Commissioner, and that there should be a Deputy Chief Commissioner for each county, who would get a salary sufficient to live on, and who would devote his whole attention to the roads in his county. It is all very well to talk about getting a man to attend to the work without paying him for it, but it cannot be done. My

idea is that there should be one man for each county, under salary, and if he does not do his duty, then discharge him. That is practical to my mind, and we will never have good roads until we pay a salary to men to look after the expenditure of the public money, and be responsible for that expenditure.

I am afraid that the idea of forming Parish Associations cannot be worked out. You may form a Good Roads Association for the Province, but no association is any good unless it is alive, and unless an interest is taken in every portion of the Province the Association will not bring forth the results that it should, and the desired benefits will not accrue. However, I am fully in accord with the formation of a Good Roads Association, and will endeavor as a member of the Government to assist in every way in my power.

A. W. CAMPBELL, C.E.

Mr. Chairman and Gentlemen: I am sure I was very much pleased indeed to receive an invitation from the Good Roads Association for the City and County of Saint John to come here and talk to you for a little while to-day on the question of road and street improvements. You must remember that I am not here in the same capacity as if before an audience in the Province of Ontario, where I am paid for addressing that audience, and to them giving instruction and, as it were, dictating. I did not come down here with the intention of finding any particular fault with your system of road and street making or of dictating to you as to how these roads and streets should be made, but simply to assist you in getting together and forming an Association, and to discuss with you the principles of road construction and generally to create an interest, getting you to take hold of the question and solve it for yourselves. In commencing a discussion along this line, especially in the rural districts, we are met with a good deal of opposition. I remember well, shortly after I was appointed to the position which I now occupy in Ontario, attending a meeting in the Eastern part of the Province. I was a little late in arriving at the hall, which was pretty well crowded. As soon as I was introduced by the Chairman and rose to address the audience, one old gentleman, who had been a road maker in that district, jumped up and said: "Tut,

I thought you were an old man. Young man, I built roads in this country before you were born, and I am damned sure I am not going to sit here and listen to you talk about how to make roads." That was somewhat discouraging to me, just starting out on a campaign of such importance. I was completely overcome and for some minutes did not know whether I was discussing a question of good roads or bad roads.

In 1894 an agitation was created in the Province of Ontario, the object being the improvement of country roads and the streets in towns and cities. This agitation led to an invitation being extended by a few interested parties to Municipal Councillors, Farmers' Institutes, Dairymen's Associations and representative men from all parts of the Province to meet in the City of Toronto. About one hundred of these representative men assembled in the month of February of that year, and they formed an Association, the object being to lay down a proper system for the construction of the roads in the rural districts and the streets in the cities and towns; to create an interest among the people in road improvement generally, and in the necessity for improved roads, endeavoring as far as possible to unite all efforts, that is, the statute labor in the rural districts and the concentrated expenditure of the public moneys, of uniting these efforts of labor and money expenditure towards the betterment of our roads. At the formation of that Association an attempt was made to form local Associations in the various counties. This did not meet with very much success. As the HON. MR. TWEEDIE has stated, it was found that unless the Associations could be made alive and kept alive, it was better to have no such branch Associations at all. But the Provincial Association, composed of representative men from every part of the Province, kept up a lively campaign. This question was discussed by the members of that Association at every meeting of Farmers' Institutes, Dairymen's Associations and kindred meetings, and in fact on every public occasion where possible a member of the Association was sent to discuss the question of improved roads. In this way a very lively interest was created; the attention of the Government was attracted by this agitation and an appropriation of \$500 per year was made to defray the expenses of the Association, for sending speakers around to these various meetings, and for meetings of the different delegates when it was found necessary to consult and prepare literature, etc.

In 1896 the Government thought it wise, in order to assist the Association, to select some one man who had had some experience in road building, whose duty it would be to go into the various municipalities of the Province, examine the condition of the roads and streets, examine the system of public expenditure and the principles upon which these roads and streets were being made, advise with the municipal councils as to the best plans to be followed, consult with the street commissioners and with the path-masters in the rural districts, and in every way give advice and instruction in order to bring about the best possible results with the money and labor expended. I happened to be chosen for that position. For some six years I had charge of all the roads in the Counties of Elgin and Middlesex, which were public roads, and for five years following that I was City Engineer of the City of Saint Thomas, during which time nearly three-quarters of the streets in the city were macadamized. For ten years I had given my time almost exclusively to the construction of roads in the rural districts and streets in the city. The Government, of course, imagined that on account of my long experience, although a young man, I must have some knowledge of the true principles of road construction; they carefully examined these roads and streets and were satisfied that the results produced were amongst the best, and that is why the position which I hold was created, and those are the duties which I have to perform. In order to carry out the work of this Association successfully I am satisfied that some such course should be taken here. In the Province of Quebec a plan was laid down similar to that of Ontario, and MR. CAMBAUD, who is a very practical man indeed, goes about, as I do in Ontario, discussing the question with the local and municipal authorities and advising and getting them to follow improved plans. We are very apt to think that when we know a little about any particular work, even that of road making, and we are placed in a position of responsibility and trust, we must naturally pretend to know all about that particular work. Now this is the greatest mistake that we can possibly make. We may for a time fool the people; we cannot fool ourselves. I believe I know as much about road making and street building as any man in this audience, yet I am not beyond learning something about these subjects, and probably before I leave this city — and I hope that such will be the case — and before I leave this meeting, or series of meetings, I will receive

some advice and instruction from those present that will be of great service to me in performing my duties in the Province of Ontario. But it is a mistake for us to presume to know what we do not know, and it is impossible for any one of us to know too much about any particular subject. We are all apt to make mistakes. Road builders make mistakes; engineers make mistakes—serious mistakes; they make blunders—serious blunders, but the engineer who makes a mistake and profits by that mistake is the better for having made the mistake in a great many cases. And it is so with us all. I have made mistakes that have cost me money, but they have been the best instructor and educator to me that I have ever had or received. Now, if while I am here I can give you some instruction, I believe you are men who are going to accept that advice and profit by it, and I hope to get advice and suggestions that will be of benefit to me. I have had the privilege of driving over some of the streets in the vicinity of Saint John, and I do not consider that they are types of first-class roads by any means, but I do consider that some of them are very fair. We have some better roads in the Province of Ontario, and we have some vastly worse roads in that Province. I have not seen your worst roads, and, I presume, I have not seen your best roads. I have only passed over a small section of your Province, and I observe that you have a great many difficulties to contend with. I have not, however, passed over that portion of this Province in which the greatest difficulties, I believe, are met, but let me tell you that the greater the difficulties the more carefully you will have to prepare to contend with those difficulties, and that is what you have been doing here all the time. You have had difficulties to contend with in the City of Saint John and in this immediate neighborhood, but from the permanent manner in which your improvements of a corporate and public character have been made, it looks to me as if the great difficulties only stimulated you to get the greater amount of information in order to solve those difficulties. Now, if in certain sections you have no gravel and no stone, you only equal certain sections in the Province of Ontario, where to-day we are freighting by rail crushed stone and gravel a distance of one hundred miles to make our roads. I might also mention that all the roads which I constructed during the three years previous to accepting my present position the material was brought fifty miles by freight. The people recognized the import-

ance and necessity of good roads, and have striven in every possible way, and are striving to-day to solve the difficulties by meeting them.

Now there are a few principles in connection with road making which must be followed. These principles are simple, but they are just as important as the principles of cheese making in the manufacture of cheese, or as the principles which must be observed in other enterprises. What are these principles, and how must they be observed in the construction of country roads? The celebrated MACADAM one time was asked what the principles of road making were. He said: "Well, gentlemen, they are just three in number. First, drainage; second, drainage; third, drainage." Drain the foundation. It is just as necessary to provide a dry and unyielding foundation for a road as it is for any other structure. You cannot bridge over mud and water by piling on stone and gravel. Crown the road so as to lead the surface water into the gutter, and thus drain the surface of the road. Construct ditches along the side with a free and uniform fall to a certain outlet; see that the outlet is clear to provide drainage for this surface water. Those are the principles of road making. There are details, of course, in connection with this which must be observed. Now, how are you following these principles here? I do not know exactly, only from looking over a certain small section, but in the majority of municipalities in the Province of Ontario they were following the principles of road making after this fashion: Don't drain the foundation; build ditches along the side of the highway; use the earth from those ditches for raising a grade on the surface of the road, but do not construct any outlets from those ditches; keep the water in the foundation of the road. In this way it will swallow up all the gravel and stone we can put on, and each year certain of us will receive so much money for piling on more stone and gravel; do not crown the surface of the road, but keep it flat, because the flat surface will retain the water when it falls; this water will penetrate the surface of the road, and after twelve hours rain the surface will become soft, the wheels will rut the road and drive the stones into the mud, make receptacles for the water, and the road will more readily become destroyed. Then the next point which they observed: Use dirty material in the construction of roads; that is, provide gravel which will contain about fifty per cent. of sand and earthy matter, and put that on the

road. It will compact readily, and in the dry season under the traffic of wheels will make a smooth, nice surface, like the surface of some of the streets in St. John — they are covered now with mud. This makes a nice surface in the dry season, but when the wet season comes on, this sand and mud will attract the moisture, the rain will enter into the soft roadway, will break the bond between the stones, the traffic will then drive the small stones down into the surface of the road, the sand and mud will churn to the surface, and each spring we will find the surface covered with four or five inches of mud, and in this way we will be paid for carrying away an amount of mud equal to the gravel placed on the previous year. Now I do not suppose you are following any such foolish rule in this Province. I presume that you have profited by the experience of others, and that instead of laying down a specification for bad roads, and spending your money in building bad roads, you are working along another line, and that your specification embodies different principles; that you are providing for the construction of good roads; that you are seeing to it that every dollar of money expended upon your roads is producing the very best results. If so, your specification will embody these principles: first, drain the foundation of the road. Do this by constructing drains on each side of the grade, and see that a proper outlet is made to a creek or some ravine. (*Fig. 1.*) A better plan than to construct sharp, open and deep ditches along the side of the road is to use common field tiles; place one row of these tiles, from four to six inches in diameter, on each side of the grade and below the frost line. See that these tiles have a uniform fall and a proper grade, and see that they are carried to a proper outlet—some creek or ravine. Then grade the road and give the crown a drop of one inch to each foot from the centre of the road out to the gutter; that is, where the grade is twenty-four feet wide between the ditches, the centre of that road should be twelve inches higher than the side at the edge of the ditch, the ditch, of course, being beneath this. See that the crown is made regular and uniform, so as to shed the water as quickly as possible from the centre of the road to the side ditches. Then provide ditches along the side, preferably shallow gutters. Deep, open ditches are dangerous, and they are unsightly along a road, beside being expensive to construct, and very expensive to keep up. Shallow gutters along the road surface to carry the water freely

while it is raining, to certain fixed outlets at regular intervals into the tile drain below, or into the water courses leading from the road, is the best known plan of road construction. It is more expensive in the first place, but is vastly cheaper to maintain. These tiles cut off dangerous water which is rising in various instances from below towards the surface. That water line is constantly fluctuating. In dry seasons the water line may be four or five feet below the surface of the road; in wet seasons it rises towards the surface, and may rise to within a foot or six inches and then be frozen. The frost acts upon the water, raises the whole surface of the road imperceptibly, and in the spring of the year, when the frost leaves, the foundation will be soft, spongy, and honeycombed. When traffic comes on the surface of that road the wheels readily form ruts and depressions. The question of drainage is one which is very little followed in this Province, as I understand; but, gentlemen, you are spending now in this Province about a quarter of a million dollars in money and its equivalent upon your roads. You have been spending that for the last quarter of a century, and you have little or nothing to show for it. You are going to continue to expend that quarter of a million dollars of money and its equivalent for the next ten years, and are you going to see to it that at the end of that time you have something to show for this enormous expenditure. Unless you take hold of this question in a business-like way, and consider these principles carefully and put them into practice, you had better cease making any money expenditures and allow the people of their own free will to make roads that will be passable, or follow the trails through the bush. Now, with reference to the placing of a one tile drain down the centre of the road to provide drainage for that road, I might say that that plan is followed in some sections. I do not practice it; I prefer having one tile drain on each side of the road. If one drain is put down the centre of the road, you will readily understand that the soil becomes saturated with water; that saturation must pass underneath the roadway to reach the tile drain, and in this way damage is done to a certain extent, though not so fully as if the drain wasn't there at all; whereas, where the drain is placed on each side, this soakage water is cut off and the roadway is kept constantly dry. After all, it is the dry foundation which must carry the load, and if you have three feet of dry soil, this will answer. (*Fig. 2.*) The gravel or the broken stone is simply placed

on the surface of the road to make a hard, smooth and durable surface—a surface that will not wear readily under the pressure of wheels, and a surface that will be impermeable to water—which will shed the water into the side ditches. It is almost impossible to properly crown the surface of these roads by using the ordinary plow and drag scraper. We are very apt to complain about the manner in which the farmers do their statute labor. I was born and raised on a farm; my father and three brothers are farmers to-day, and I have done statute labor myself and know something about it. If a supervisor is asked to build a piece of road, and is given half a dozen of his neighbors, with a few days each, to construct the road, and has no implements except wagons, plows, and drag scrapers, how can he ever expect to make a perfect and finished piece of work? You might just as well try to cut your wheat with a sickle instead of a self binder, as to try to make a good piece of road with an ordinary plow and scraper instead of the modern machines used for that purpose. I understand you have some of these machines in operation in this Province, and are doing excellent work with them. Now, when we first introduced these machines in Ontario, we did not meet with much success. A great many of our path masters had an idea that these machines were to solve the whole difficulty, and they were distinctly opposed to the introduction of machinery. Grading machines were a farce. They could make roads as they had been made, and they did not want any of these new innovations, and as a general thing they looked to the machine to make the road. They would hitch on a couple of teams of horses, run the blade into the ground, and if the machine was smashed it seemed to tickle them very greatly. In some instances they took the machines out on old gravel roads—roads built at considerable cost—graded and carefully gravelled, the surface of which became so flat that the water stood in the centre rather than being shed into the ditches. They knew the surface of the road should be crowned; they understood we were preaching this, and do you believe some of those men took the machines out on such roads, cut off the shoulders, and brought the mud in and piled it in the centre of the road on top of the gravel, thus ruining an otherwise first-class road. If you have a hard foundation on the centre of an existing road, and that road is flat, by no means should you think of cutting off the sides, bringing the earth in and piling it on top of the gravel, because that earth placed on top of the gravel will simply hold the

moisture; after a rain it becomes thoroughly saturated, goes into a quagmire, and when the teams come on, the wheels cut through the soil and into the gravel foundation below, these ruts will stand full of water, which goes down and penetrates the hard foundation; it saturates the gravel bed; the frost comes on, heaves the whole thing, and in the spring of the year the road is simply a quagmire. The proper plan is to reverse the machine, cut off these sides and turn the earth out, that is, raise the centre by cutting off the sides and turning the earth out. Some people say, in that way you will fill the ditches. Well, of course, if they are straight, sharp, and fixed on the side of the road, you will fill them up; but up in Ontario we pitch that stuff across the ditch and spread it. Then take a little clean gravel or broken stone and dress up the surface of the road, and you will have a road that will last you a great many years by a little attention. In connection with road machines I would insist, if I were in charge, that a man be employed to go with each machine, and that that operator be constantly with that machine. He will soon become accustomed to working it, every day will add to his experience, and in a short time he will become an expert. These machines were made to perform a certain work: they have no brains; they know nothing about road building, and unless the operator does, you might better be without them. It requires four horses and sometimes six to properly operate one of these machines. Two teams of horses on one of these machines in pretty stiff ground, if unaccustomed to that class of work, will do a good deal of flying backwards and forwards—they will rush on for a little time and then stop, and it makes the power very unsatisfactory to the operator. Steady power is required. For that reason I would recommend you to hire a couple of teams to go with each machine. Spend your money in that direction—get the foundation of the road first drained, spend money in draining the roads, then crown your roads and grade them; spend money in grading them, hiring teams and hiring proper men to operate the machines, and you will find, with this quarter of a million dollars which you are spending in this Province, you can accomplish a wonderful work. It will be spent among your own people, and in a very short time you will complete a revolution in the construction of your roads. Do it on business principles, and do it in the same business-like way as you would work your farms.

The next question is the selection of material. You have some gravel in this vicinity, and no doubt you have in the Province a great deal of gravel — that is, a stone about an inch or an inch-and-a-half in diameter, not greater, and from that down to fine particles. Then you have another gravel bed composed of clean stone, sand and clay. Our practice is to allow teams to drive in to the gravel bed, the teamster scrapes down the soft earth, clean sand, clean stone and gravel to the bottom; this is pitched into the wagon, drawn away and put on the road. Gravel which contains sand and earthy matter will set quickly and readily, and in the dry weather under traffic will make a smooth surface and apparently a good road. But you watch that gravel. After a couple of days rain in the fall it will go into ruts, the earthy matter attracts the moisture, it breaks the bond in the metal, and in a very short time you will find that you must scrape off the mud and put on another coating of gravel. Clean material, and clean material only, should be used, and if you have not clean gravel then consider the wisdom of crushing stone. Round gravel and stone placed on a road will not make as solid a surface as crushed material, because round stones will not form a perfect bond. They will constantly slip under heavy traffic, and ruts are thus formed, and you know that ruts are the bane of our roads. The advantage of crushed stone over round gravel is that the stone is broken into cubical fragments. The material is passed on to a screen and is divided into different sizes. First, that which will pass through a 2 inch screen, then that which will pass through a 1 1-2 inch, then through a 1 inch, then a 3-4 inch screen, and finally the dust and screenings. Place a layer of the coarser stone on the bottom, then a layer of the next grade on that, then a layer of the next on that, and then a layer of the finest stone on that again, and cover the whole with the dust and screenings. Roll this properly; one block of stone will fit into the interstice of the other, and about ten inches is formed of a perfect stone. No water can pass through it, and there will be no displacement of the material even under the heaviest loads. Then what is there to wear that road out? When the rain comes the water simply washes off the dust; instead of the road being dissolved and turned into slush and mud, it is simply washed off and made cleaner than it was before the rain. If, however, gravel is plentiful, and you wish to use it entirely, then see that clean gravel is used. Place that on the road and place it on to a width of

about eight feet in the centre. Our practice is, after the road has been properly graded or crowned, to run the grading machine down the centre, letting the edge of the knife pass by the centre line; turn out a little earth from the centre of the crown; then reverse the machine and bring it back through the surface the other way, leaving, as it were, a flat surface on top of the road about eight feet wide. (*Fig. 3.*) Place the gravel or stone in this space to a depth of from eight to twelve inches. Then run the machine down one side and back the other, bringing in that excavated earth to form a shoulder, and complete the crown. If you have a roller, pass it up and down over the whole crown of the road—the gravel, the broken stone and the earth edges—until it is rolled perfectly hard and smooth. This will resist the weight of the greatest load, and you will have a road which will call for comparatively little attention for the next quarter of a century.

So much for the principles of road making. If the material is available there will be no difficulty in making roads. If the material is not available it would be wisdom for you to consider some plan of having this material provided for the municipalities which have not any within their limits. The Hon. Provincial Secretary says, as a general thing, the counties are given an equal amount of money for their roads, and he states that in certain counties where the conditions are favorable first-class roads are being constructed by the statute labor. It might be well for you then to get the department to consider the wisdom of classifying the different counties and making these appropriations according to certain requirements, which requirements would be based upon their condition; thus a county having plenty of material would receive less money than a county having no material. Grade the appropriations in that way.

Then as to the system—lay down a system. A system is absolutely required; it is necessary in every branch of business. Classify the roads according to their importance; specify on your plan what the width of the road should be and what the crown should be. In Ontario we make the width between the ditches twenty-four feet, and we make the crown a rise of one inch to one foot from the centre to the side. These may not suit you, but this Association should decide upon some plan, and lay it down and see that it is followed. In our Province we have about sixty road supervisors to every township.

Every road supervisor is monarch of all he surveys. He thinks that as soon as he is appointed path-master he is fitted to perform that work, or any kind of work, even that embodying scientific principles, and he considers it an indignity for me to offer any instructions as to how that work should be done, or for a neighbor to make any suggestions which he may think proper. He will go out and say: "We will make the width of this road sixteen feet; that is wide enough." The next supervisor says: "That is nonsense; the road should be twenty feet." The next says it should be thirty feet, and the next says forty feet. One supervisor would contend that the grade should be made perfectly flat. The next supervisor will contend that the grade should be made just sufficient to shed the water nicely into the ditch, and the next supervisor says there is nothing like a good crown, and he heaps it up so that it is dangerous to turn from the centre of the road. These men cannot all be right, though they may be exercising their best judgment. One object of this Association is to lay down plans to secure uniformity in work and perfect system, and that is one of the first questions to be solved. In our townships the Municipal Councils specify what the width of the roads should be, how much crown should be put on, what the depth of gravel should be, and how it should be placed, what constitutes a day's work, and all that sort of thing.

Its roads are an indication of the state of prosperity to which any Province has attained, and it behooves you to see that your roads are improved in a manner consistent with the improvements upon your farm lands. Let every dollar be spent in a manner that will produce the very best results—let the quarter of a million be spent in making roads of a first-class character. It must be gratifying to you to see that your representatives in the Local Government are here to-day for the purpose of aiding you in this important matter, because I do consider that it is the most important question before the people of this Province or any Province. I think it is a question in which the Legislature can afford to assist you in arriving at the very best plans to follow. In the older settled parts of Ontario, the Government gives no assistance whatever. They place the responsibility and expense of building the roads upon the people, and in that Province we are expending three and a half million dollars yearly on the roads, in addition to the statute labor. In some sections the roads are as hard and smooth as billiard

tables—they are perfect samples of roads. In five years every road in that Province will be equal to the roads in the old country, and in ten years every road in the Province will be macadamized, and judging from the men here to-day and the active interest which is taken in all parts of this Province, I venture to say that you will see to it that with the assistance of your Legislature, inside of ten years the same results will be produced in this Province, and in the same manner that we are producing them—not by additional taxation or increased burdens upon the people, but by utilizing in the very best manner the enormous amount of money and labor which is being spent here annually. It is a question of properly spending the money, of laying down a system, of preparing your plans, organizing yourselves together, uniting your labor, concentrating your money expenditure, spending that labor and money in conjunction with each other, the money providing the machinery, operating it, and purchasing material; the labor hauling and placing the material on the roads; observing the true methods of road making. With these plans followed I venture to say that inside of ten years your roads will be equal to the roads of any other Province.

On motion of HON. G. F. HILL, seconded by MR. F. M. MURCHIE, the following resolution passed :

Resolved, That in the opinion of this Convention, a representative “gathering from all sections of the Province, it is desirable to form for “the Province of New Brunswick a Good Roads Association, having “for its object the betterment of the highways of the Province and the “dissemination of information on the best methods of road making, “and the promotion of local societies in the several parishes or districts of the several Counties; and to promote the discussion and “consideration of all subjects having reference to the construction and “maintenance of highways, taxation and expenditure, and the best “system of maintenance and supervision, and the advancement of all “legislation tending to secure the object desired, namely, good roads.”

On motion of Mr. S. L. PETERS, seconded by Mr. FENWICK, the following resolution was passed and adopted :

Resolved, “That the Chairman of this meeting select a Committee, “not exceeding five, including himself, who are authorized to nominate “and report upon the persons suitable to fill the respective positions “of President for the Province, and a Vice-President for each of the

"Counties of the Province, and a Secretary-Treasurer, and the Executive Committee of the Association for the whole Province."

The Committee named consisted of W. F. BURDITT, HOWARD TRUEMAN, JOSEPH HORN BROOK, J. J. MCGAFFIGAN, and JOHN O'BRIEN, M. P. P.

Moved by Mr. JOSEPH HORN BROOK, seconded by Mr. CURRIE, and adopted:

Resolved, "That the Executive Committee of the Association shall consist of the officers of the Association, *ex officio*, together with seven others, to be chosen with regard to the convenience of their frequent meeting together, and that five of the members of said Executive Committee shall at all times form a quorum, upon notice having been mailed to each of the members of said Committee of any meeting to be held."

Moved by Mr. W. S. TOMKINS, seconded by Mr. HOWARD TRUEMAN, and adopted:

Resolved, "That it shall be the duty of the Vice-President of this Association to take active measures for the organization, in the several parishes or districts of their respective Counties, of District or Parish Good Roads Associations, which Associations, when formed, will be affiliated with the central or Provincial organization, and that the Vice-Presidents shall be the medium of communication between the central organization and the respective Parish or District Associations, and that the central organization shall aid, with information, suggestions and instructions, the various local organizations; also that the Vice-Presidents shall organize Advisory Committees in each County."

Moved by Mr. HOWARD TRUEMAN, seconded by Mr. JOSEPH HORN BROOK, and adopted:

Resolved, "That the Chairman be authorized to appoint a Committee of three, including himself, to draw up a Constitution for the Association."

The following were appointed as such Committee:—W. F. BURDITT, J. S. ARMSTRONG, and S. L. PETERS.

Adjourned to meet at the McLaughlin Building, Germain street, at ten o'clock the following morning.

Tuesday, September 21st, 1897.

A PUBLIC MEETING was held, at eight o'clock in the evening, under the auspices of the Saint John City and County Good Roads Association. The Chairman, Mr. W. F. BURDITT, explained in opening the meeting, that while it was called more particularly for the purpose of discussing local matters, the city streets and streets of the suburbs, it was not desired to restrict the discussion to that particular topic, and the meeting would be glad to hear from gentlemen who were present from other parts of the Province.

After a brief address by Mayor ROBERTSON, the Hon. A. T. DUNN, Surveyor General, on being called on, said: I thank you, Mr. Chairman, for giving me the opportunity for making a few remarks, but I am here more for the purpose of learning than of giving advice. I had the pleasure of listening to Mr. CAMPBELL's address this morning, and I agree with him that the first great principle to be observed in the construction of roads is drainage. The great difficulty, however, which we have to contend with in this Province is that in many localities we have not the material to make the roads. Then another difficulty with us is that we have a very great mileage with very few people. I had the pleasure of driving over some of our roads with Mr. CAMPBELL this afternoon, and while he considered some of our roads very good, there were others which he considered very bad. I hope that this movement will awaken an interest among the people in the outlying districts, who do not now seem to take that interest which they should, and once an interest is awakened, I have no doubt but that success will follow.

A. W. CAMPBELL, C.E.

Ontario Government Road Commissioner,

On being called, referred at some length to the best methods of constructing city streets, discussing different kinds of paving and the conditions prevailing in and around the City of Saint John. Continuing, he said:

I am very glad indeed to see that so many representative men from the rural municipalities have taken a trip to the

City of Saint John to-day for the purpose of discussing this question of improved roads. We know that you have a very great road mileage in this Province to keep up, that your population in certain sections is sparse, that material in certain districts is scarce, that the work of road improvement therein is very expensive, and I am very glad to see that you have come out to-day for the purpose of banding yourselves together to meet these difficulties and face them as you have faced similar difficulties in this Province before. You have no system in the rural municipalities for making and maintaining your roads. You have no organization among yourselves for uniting your labor, concentrating your expenditure, and trying to improve your roads, and it is for this purpose that you have formed this Association to-day; it is for the purpose of trying to educate yourselves in the best principles of road construction, and how best you may procure these roads for the least possible outlay. Money, no doubt is scarce—we are living in an age of hard times—but the scarcer the money is, the more necessary it is that you should study carefully the best way of producing the very best results with the least possible outlay. Now, for the past ten years, you have been expending about a quarter of a million dollars a year upon your roads. You have been largely wasting that money, for the lack of system and organization. You have not been following the true principles of road making, and therefore you cannot expect to produce first-class roads. You have been working in a scattered manner. In each Township you appoint about fifty or sixty commissioners and surveyors. These commissioners have charge of all the roads in the Parish, each surveyor having charge of a short section. Each surveyor is given a few men with a few days labor to make and maintain a long strip of road. In this way, I contend, that your forces are too much scattered; that you should have less commissioners or surveyors, and these commissioners should be better men. The Commissioners are chosen not so much upon their merits, I presume, as upon their ability to spend money, and it is an unwritten law that the Commissioners shall be changed annually. The difficulty of this is that as soon as a

Commissioner learns something about the principles of road construction he is asked to step to one side and a greenhorn takes his place. In our Province, in a great many instances, we find new men appointed one year undo the work which the man the year before strove to do properly. These men have different opinions and different ideas as to how the work should be done, and each man goes out on the streets or on the roads without any fixed plan or any definite purpose, and he simply acts on his own ideas, very often to the detriment of the road. It is advisable that you should try and concentrate your forces by collecting together as much of your labor and your expenditure as possible and having that expenditure made under one supervisor or commissioner, chosen on account of his knowledge of road making. Let these Commissioners meet annually, discuss the question of road making together, interchange ideas, and better fit themselves to perform the duties which devolve upon them. It is a question which requires discussion, and it is a question which the more you discuss, the more you will learn about it. I am frequently asked if it will improve the condition of the farmers to improve the condition of the roads. One man asked me if it would raise the price of wheat, and another asked me if it would increase the price of hogs. Now I do not know how it is down here. These questions were asked me about a year ago in the Province of Ontario. I have been talking good roads up there for about a year, and sure enough the price of wheat has increased and the price of hogs has also advanced. I would not like to say that it was due entirely to this discussion or to the improvement of our roads, but I tell you, gentlemen, every farmer knows that a first-class road is a blessing, and he knows better than we do what are the advantages to be derived from first-class roads. There is in connection with this matter not only a financial benefit, which cannot possibly be summed up, but there is a moral and sentimental benefit, which cannot be measured in dollars and cents. A great many of your farmers, I venture to say, can stand on their door-steps in certain seasons of the year and behold the roads a quagmire, and at other seasons look upon them as beds

of dust. When you go to market you have to travel through them; when you go to church they are your inseparable companions, and you cannot take a full load at any time while these roads are bad, and in every imaginable way they are discouraging and offer the greatest opposition to doing your business as business men would do theirs. Men tell me that the farmers of to-day have not very much to do, they can afford to go oftener to market and take smaller loads; that at certain times during bad roads they have nothing to do and can sit down and make more money than by spending so much in the construction of roads. Now, while a true, keen business man has no time to lose, an unsuccessful business man has lots of time to lose. It is the same with a farmer. A successful farmer has not a day to lose, but an unsuccessful farmer is a man who has plenty of time to go often and slowly to market, with small loads, and in fact has lots of time to toast his shins around the kitchen stove. In these days of keen competition and low prices it is necessary that we should make the best of our time — we should improve our means of transportation in every imaginable way. In this Province you have spent an enormous amount of money in the construction of railroads. You have spent so much money that you have to-day a network of railways in this Province, so extensive that it is almost impossible to know where you would find use for another. You have expended money in equipping fast lines of steamships to land your produce in the markets beyond the sea; you have assisted the other Provinces of this Dominion in constructing railways — in fact, in throwing one line across the Continent even in advance of public sentiment — and all to improve your means of transport. But, gentlemen, tell me what would be the benefit of all this expenditure if you had no common roads leading from the farms to the railway depots. These railways are carrying an enormous amount of freightage each year, but you know that there are millions of tons of freight, in addition to that carried by all the railways of the country, which, in one form or another passes over the highways of this country, and is it not an important question, after constructing all these lines of transportation —

these main lines—these trunk roads—that you should now at least pay some little attention to the improvement of the arteries of the railroads leading to the farm yards and to the markets. Some men contend that the improvement of the roads certainly cannot be entirely in the interests of the farmers, but must be furthered by some other separate class of people who will be specially benefitted. Now, during the past few years there has been, true enough, a new form of vehicle appear upon the highways of the world. In the past century human genius has invented and transformed certain means of transportation both upon the water and upon the railways of the world, and in addition to that, human genius has also been diverted to the improvement of the vehicles of the road, and there has been produced one vehicle which fills a long felt want and which for convenience, for ease of transit, for ease of manipulation, for fleetness and for serviceability to nearly every class of the community, cannot be surpassed—I refer to the bicycle of to-day. Previous to the introduction of the bicycle as a carriage or conveyance the question of improved roads was considered to a small extent. Certain individuals tried to show to the farming community, as well as to all other classes of citizens, that bad roads cost the country millions of dollars per year through loss of power required in transporting commodities. Devices were made for the purpose of measuring the loss of power or resistance offered to vehicles by bad roads, and fabulous figures were prepared to show this enormous amount of loss, but these were all considered so many dry statistics and were passed over. As soon, however, as the human being was made the motive power, people, of necessity, began to study the condition of the road—every grade was detected, every rut was noticed, every stone was observed, and in every instance it was carefully noted the amount of extra power which was demanded to overcome these obstructions. Even as an educator in the improvement of our roads, the bicycle of to-day stands as one of the great benefactors. Railway companies spend fortunes in reducing grades and in making their roadbed hard and smooth, so that it will offer the least possible resistance to traction, and

the main object with them is to reduce as far as possible the amount of power required to carry their load or to move their train. The same principle employed by the railways should be employed by the people of this country, and that principle is just as important in the transportation of our commodities over the common roads as it is in the transportation of these commodities over the railroads of the country. It is true that an enormous amount of money has been spent in this country in making roads, but we are far from having what we should consider first-class roads, and it is all on account of the system — the lack of interest, the lack of organization — and I predict that from this Association to-day will come an organization that will create in this Province a live interest, an interest which will, in a very few years, without any great additional expenditure, make the roads of this Province equal to the roads of any other country. When we consider that in England, previous to the year 1816, the same system which we have in operation here for the construction and maintenance of our roads was in operation in that country, it may be encouraging for us to know that they took the same steps to improve their roads which we are now taking to improve ours. These people, seeing the importance of improved roads in lines of transportation, formed themselves together into associations. They said, "We are scattering our forces; we are scattering our money; we are not observing the true principles of road making, and there must be a change." They called into requisition the services of the celebrated MACADAM. He laid down the principles to be followed; he got the people together and stirred up an interest among them. They constructed as much each year as they possibly could, they did it thoroughly, they did that year after year, and the result is that to-day the roads of England are England's pride. They are perfectly constructed, hard and smooth, easily travelled, and are simply ideal roads. The construction of the roads of Scotland were undertaken in the same way, and to-day they are Scotland's boast. The roads of France are ideal roads, and the roads of Germany, Norway, and Italy are equal to those of any country in the world. But the

roads of Canada are bad. By no means are they in keeping with the enormous amount of money and labor expended upon them; by no means are they in keeping with the manner in which our private property is improved, or with the improvements made upon the public property of the country; but if we adopt the plans followed by the countries I have mentioned—get ourselves together—lay down this system—organize, create an interest, follow the principles of road making, use proper material, properly prepared and properly applied—in a very few years I venture to assert that the roads of Canada will be equal to the roads of any country in the civilized world.

On being asked to give his ideas as to the value of wide tires, compared with narrow, MR. CAMPBELL said:

We are spending considerable time and money in constructing roads; we claim to be doing all we possibly can towards improving these roads; we claim that we would do more if we had the money with which to improve them, and yet, notwithstanding the enormous expenditure which we are putting on these roads, is it not strange that the people should spend additional money in purchasing narrow tires with which to destroy these roads? Narrow tires will destroy the best roads that we can construct. In France the tires on wagons hauling very heavy loads are eight inches in width, and the front axle is shorter than the hind axle. In this way the wheels do not run in the same line, but act as rollers and improve the roads. In England the tires on lumber wagons are four inches wide, and on drayage wagons six inches, and the front axle is shorter than the hind axle, the wheels thus forming perfect rollers. The heavier the load you put on a wagon with such tires, the more improvement it is to the road. With narrow tires the heavy load tends to drive the tire like a knife into the surface of the road. It will form a rut, and that rut will hold the water, and each succeeding wagon will simply churn the rut deeper. Narrow tires act as a pick on the surface of the road, while wide tires act as a roller. In nearly all

the European countries wide tires are used. They are being used extensively now in Ontario. A short time ago the City of Ottawa passed a bye-law relating to the width of tires, and I think the farm wagons are now obliged to have tires three-and-a-half inches in width, and the drayage wagons four inches.

For some time there was quite an argument as to the power required to haul wagons furnished with wide tires. Many people claimed that they were harder to draw and did not improve the roads, but it only required a few examples to satisfy the people of the benefits to result from wide tires and the damage done by narrow tires. A heavier load can be hauled on wide tires than on narrow tires. Where a road is rutted by narrow tires the wide tire has a tendency to settle in that rut and therefore draw harder, but if the tires were all wide the ruts would not be formed, and they would then draw easier. The width should be at least four inches. (*Fig. 5.*)

MR. BURDITT. — I would like to read to you the results of experiments made by PROF. WATERS, Dean of the State Agricultural College of Missouri. The Missouri Good Roads Association, at its recent convention in Columbia, declared in favor of wide tires, and PROF. WATERS added to the tabulated results of the tests made between narrow and wide tires the following:

“By using the wide tires an average of fifty-three pounds draught is saved. A horse is computed to exert a pull of one hundred and fifty pounds for ten hours, travelling at the rate of two and one-half miles per hour. On this basis the wide tires save slightly more than one-third of the exertion of the horse.”

The experiments with heavy wagons from which the conclusions of PROF. WATERS were reached formed the most interesting part of the proceedings of the Convention, and the results of all the tests were carefully noted. In every test it was demonstrated that the wide tire lessens the labor of the horse, and is in other ways far superior to the narrow tire, which is the most commonly used.

Wednesday, September 22nd, 1897.

THE GOOD ROADS CONVENTION opened this morning in the McLaughlin Building, Germain Street, at ten o'clock, a. m., Mr. W. F. BURDITT in the chair.

The session was opened by the reading of the resolutions adopted at the meeting on Tuesday morning, respecting the organization of a Provincial Good Roads Association.

The Nominating Committee reported that the following had been chosen and were now nominated as the Officers of the Association:

HON. G. F. HILL, M.P.P., Saint Stephen,	President.
HOWARD TRUEMAN, Point de Bute,	Vice-President.
W. F. BURDITT, Saint John,	Vice-President for Saint John.
F. M. MURCHIE, Saint Stephen,	“ Charlotte.
JAMES HORN BROOK, Studholm,	“ Kings.
WILLARD D. WILBUR, Dorchester,	“ Westmorland.
S. L. PETERS, Queenstown,	“ Queens.
H. G. WILMOT, Oromocto,	“ Sunbury.
W. S. TOMKINS, Southampton,	“ York.
C. L. SMITH, Woodstock,	“ Carleton.
A. J. BEVERIDGE, M.P.P., Andover,	“ Victoria.
A. BERTRAND, M.P.P., Edmundston,	“ Madawaska.
WILLIAM A. WEST,	“ Albert.
LAZARE GUIMOND,	“ Kent.
WILLIAM WISE, Chatham,	“ Northumberland.
E. M. BOURGEOIS, Tracadie,	“ Gloucester.
NEIL SHAW, Dalhousie,	“ Restigouche.
J. S. ARMSTRONG, Saint John,	Secretary-Treasurer.

Directors:—W. W. HUBBARD, Sussex; J. J. MCGAFFIGAN, J. M. BARNES, Saint John; HON. H. R. EMMERSON, Dorchester; DR. A. A. STOCKTON, WILLIAM SHAW, Saint John; HON. L. P. FARRIS, White's Cove.

On a ballot being taken, the above named were declared elected.

HON. C. H. LABILLOIS, Commissioner for Agriculture, on being called upon, said:

Mr. Chairman and Gentlemen: When I came here this morning I did not expect to be the first called upon to make a few remarks. However, coming as I do from the far north of this Province, and being the only representative present from the Counties of Restigouche and Gloucester, I feel that I would not be doing my duty to those Counties if I did not make a few remarks. I was certainly very much pleased with the address of MR. CAMPBELL yesterday morning, and also that which he delivered last night, as I have taken a great interest in the matter of road construction for the past fifteen years, during which time I have represented the County of Restigouche in the Legislature. There were one or two points that struck me very forcibly during his address. One was the neglect of the Commissioners who are appointed from time to time in charge of the roads. That drew my attention to another point, which was, perhaps, overlooked, and that is the very little interest that is taken by the Municipal Councillors throughout the Province in seeing that the statute labor law is carried out. As you are aware, at the January meetings of the County Councils, Commissioners are appointed to carry out the provisions of the Highways Act, but after they are appointed the Councillors take no further interest in the matter in the way of seeing that they do their work. I have noticed sections in my own County, where the County Councillors live, where no statute labor is performed. Last summer I made a visit to the lower section of the County of Restigouche and found the Great Road in a terrible condition. The people told me they did not see how they could support me any longer on account of the fearful condition of their roads, but they had done no statute labor upon it. Well, I sent the road machine down there under the charge of a perfect stranger. The people of the district were very much prejudiced against it, and had gathered from all quarters to see it work. The man who was operating the machine found that the road was in such a condition that the machine could not be worked upon it; it was covered with fence rails, big stones, and boulders and manure piles. However, he started in to work the machine in those places where some work could be done by it, and the result was that in less than three quarters of an hour about thirty-five or forty men went to work and cleaned off that road for three miles,

and two days after the people there did not know their own section of the country, so great was the change brought about by the improvement in that road.

In my opinion the road machine should be put to work on the roads as early in the Spring as possible, so that the great heat of July would dry these roads up. If the work was not done until late in the season the heavy rains of August would come on, and the work would certainly not be as well done.

The Hon. Provincial Secretary, no doubt, spoke the truth when he said in his remarks that it would be very difficult to work up Parish Associations and keep them alive, but the only way we can get the farmers to take an interest in and look after the roads more closely is by Parish Associations. If the Chief Commissioner had the services of two or three men who understood the making of roads, to go from Parish to Parish and address the people as to the best methods of road construction, there is no doubt but a great improvement would soon be made in our roads. The great difficulty is that the people do not know how to make roads. The Councillors select men as Commissioners because they are friends and supporters, and by the time a man has learned a little about road making he is changed.

I am glad this movement has been started and this Association formed, and I believe that if an interest can be awakened throughout the country it will be of great benefit.

MR. BURDITT.—I would like to call attention to the fact that the new Highways Act provides that tires of a certain width shall be placed on wagons after the 1st of May, 1899. The section of the Act is as follows:

“On and after the first day of May, in the year of our Lord one thousand eight hundred and ninety-nine, the wheels of every vehicle loaded with stone, gravel, sand, or other material of any kind or nature whatsoever, when the load exceeds in weight one and one-half tons, shall, when used and passing over or along any Highway, be provided with tires not less than four inches wide; the owner or person in charge of any such vehicle shall, for every offence against this section, incur a penalty of Five Dollars.”

I think the meeting would like to hear what the Chief Commissioner of Public Works has to say on this question, but before calling

on him I would like to call attention to the Connecticut Wide Tire Law, which is largely followed by other States, and which is as follows :

“All vehicles having an iron axle two inches square, or an axle of equivalent capacity, shall be equipped with tires not less than four inches in width.

“All vehicles having an iron axle one inch and three quarters square, or an axle of equivalent capacity, shall be equipped with tires not less than three inches in width.

“All vehicles having an iron axle one inch and a half square, or an axle of equivalent capacity, shall be equipped with tires not less than two-and-a-half inches in width.

“Any person who shall violate any of the provisions of this Act shall be fined not more than One Hundred Dollars.”

HON. MR. EMMERSON—I do not know that I am very well qualified to discuss this question. It is one of a very practical character, and when the section was placed in the Highways Act it was rather with a view to giving notice to the people throughout the Province of the intention to change at some future date the width of the tires. I think that we can all accept without discussion the fact that wide tires are essential to the preservation of good roads, once you have them, and that it is economy, whether upon the farm or upon the highway, to use wagons with wide tires. The Legislature gave notice that on and after the first day of May, 1899, wagons carrying certain loads should be provided with tires of a certain width. I think that notice was sufficiently long. It has been suggested to me, not merely since I came to this meeting, but on previous occasions, that it would be very much better to have this section revised, so that it may be more explicit — so that it may, indeed, be more workable, for the reason that under the provisions as now contained in the section, you are required if you have a certain load to have a certain width of tire ; but how are we to know the weight of the load? If any of us were brought up before a magistrate, and it was found that our load was a pound under weight we would get off on a technicality. Now it has been suggested to me, and I think wisely, that the width of the tire should

be governed by the size of the axle, and there might be other provisions inserted to make the law more efficient and more workable. It was suggested at one time, I think, in the Legislature by some of the representatives that this section should be changed. It was at a rather late stage of the proceedings, and I then stated that before another session had passed by, or at least before the time had expired, we would draft a section in amendment, but that the one placed in the Act was sufficient for the purpose of giving notice to the people throughout the country who are interested in the matter that at a certain time there must be a change. Of course it would be deemed a very great hardship if any such enactment were placed upon the statute book without due notice. The expense incident to the change would be deemed a very great hardship. Another thing, the carriage builders would suffer severe losses if, after having made a certain style of wagons, these wagons became unsaleable by reason of the change in the law, and they might fairly and equitably ask that they be recompensed for their loss. We always approach such a question with a little bit of timidity and perhaps a little hesitancy. However, I think the Legislature has taken hold of the matter in a way that must convince the people that the only desire is to bring about what is so much in the interest of the people themselves.

MR. S. J. SHANKLIN — If a change is to be made I wish to draw the attention of the Association to the matter of axles. Axles are made of different materials. Some are cast, some are of wrought iron, while others are of steel; and if you propose to make the width of the tire to correspond with the size of the axle I think it would be well to consider at the same time the quality of the axles and not the size altogether.

HON. MR. HILL — A point occurred to me yesterday with regard to wide tires and the difference in the length of the axle. **MR. CAMPBELL** spoke of the front axle being made shorter than the hind axle so that the wheels would run in different tracks and form rollers. Now, a gentleman living in a section near where I live, and a very intelligent man, has been making wagons for himself and also for sale — truck wagons — and he is putting on four-inch tires and is making the forward axle longer than the hind axle, instead of shorter. The object of that, he says, is to make the wagon turn easier. With regard to the load governing the width of the tire, it

seems to me that in times past that scheme was found unworkable. It seems to me that it would be better to require that all one-horse truck wagons be provided with tires three inches wide, and all two-horse wagons with tires four inches wide, and thus you could see at a glance whether the law was being carried out.

With regard to the expenditure of our money on roads, one great reason why so much is wasted is because of the diffusion in expending that money and the want of any responsibility. What we want is concentration of power of expenditure and concentration of responsibility. We have tried that in the district where I live. We have taken the road machine, taken the money under our control, placed it under one man's supervision, and sent him out to do the work, and we have found that more has been done this year than has been done for three or four years together before. Some people phasing over the roads say that more has been done this year than during the whole of the past ten years. I think that if the Government would sweep away the statute labor law and put on a direct tax instead, it would be far better. Of course the people would grumble at first, but they would soon find that instead of doing a nominal day's statute labor on the roads they would do a day's work and would get a fair day's wages. The same people who now do the statute labor would do the road work and get good wages for it. You will never get good work done on the roads until you pay a fair remuneration, and you will never get a proper supervision of the work until you pay fair wages for it. I think our system of selling job work, which has been supposed to be the best, does not work well. Our Commissioners get five per cent. on an expenditure of ten, twenty or fifty dollars, and you cannot expect them to exact a fulfilment of the contracts made by the people to build the roads, and then again they do not want to be hard on their neighbors. What we must have is more concentration of power, more concentration of responsibility, and those who do the work must be paid as they would be in any other business.

MR. JOSEPH HORN BROOK — I would like to endorse the remarks made by the **HON. MR. HILL**, and also to ask a question or two of **MR. CAMPBELL**. I have had some experience in road making in Kings County during the last seven years, and I find the condition of things very much similar to what **MR. HILL** has stated. When

we first started out with road machines the people put every possible obstacle in our way, and rather announced that it was an innovation that would not be successful, but after a year or two the machines have become so popular that no person will ask to have any public money expended, so far as turnpiking is concerned, in any other way than by road machine, and I think we get the credit of having about as good roads in Kings County as there are in any County of the Province, because we have adopted the modern system of road making a little in advance of the other Counties.

I would like to ask Mr. CAMPBELL's views as to the making of roads in districts where the soil is inclined to be made up of clay and wet soil — no stone available, but lots of brush. We have not money enough to put in a tile drain, but have been in the habit of brushing the roads through these swamps in order to make them durable. I would like to know what Mr. CAMPBELL's views are on this point, and how he applies brush, if at all. My system of brushing is this: When I find a section of road that is composed of soft clayey land, surrounded by water, and with no very good outlet, my system is to raise the roadbed with brush. As a general thing I use green brush, with small brush for the top, and with the butts all to the centre of the road. Then I saddle it off and raise the centre of the road to a fair crown, and the points of the brush extend through to the side of the road and leave a drainage for the water.

Mr. S. L. PETERS — I have been using brush for the last two or three years. This year on one section of our roads, which was composed of a clayey, spring soil, we had a good deal of trouble. Our culverts would only stay in for a year or two at the outside. This year we used small trees, about five inches at the butt, for the purpose of making culverts. An excavation was made a little larger than usual, and these trees were placed on one side at a time, after having the limbs cut off clean on all sides but one, the side with the limbs on being placed next the embankment. Small brush and earth was put between the trees, and in this way it was practically wharfed up on one side about two and a half feet. The operation was then repeated on the other side, and cedar was then put across the culvert and covered with spruce plank. My own impression is that there is no kind of material that will give us so much satisfaction.

During the rains that we have had, this piece of road has been practically dry. Twenty minutes after a rain storm you can drive a heavy wagon over it and leave no marks.

I have here a chart of a section of road, and I would like to have Mr. CAMPBELL's criticism on it. (See notes, page 51.)

MR. ARMSTRONG.—I would also like to ask Mr. CAMPBELL whether burnt ballast—that is, clay broken up into small lumps and burnt—has been used to any extent for road making where stone is not available.

A. W. CAMPBELL, C. E.—I might say that you have asked me questions this morning concerning certain points in which I believe you have had more experience than I have had myself. In certain parts of the Province of Ontario they have to contend with just such difficulties as you have specified, and have to use brush to some extent. We look upon it, however, as a very temporary means of getting over bogs and morasses, and we are striving, as far as possible, to make outlets from such places down through the adjoining territory to provide a system of drainage for these low places, in order that we may get a foundation, and we cover that with gravel. I do not see how there can be much difference of opinion as to how the brush should be laid on the road. The system of turnpiking the road, that is, of constructing open ditches on the sides and using the earth for raising the grade of the road above the water line, is a very practical one. In railway construction in the early history of the country it was found necessary to raise the grade of the road in places three or four feet above the surface of the ground in order to get so much dry or solid foundation. This was found to be a very expensive system, and now side ditches are constructed, and the foundation is obtained by lowering the water line instead of raising the roadbed, therefore at the present time a railway can be constructed at a very much less cost than it could in the early history of the country. Your plan of excavating ditches and raising the grade so as to bring the surface of the road above the water line is the only practical one where drainage cannot be obtained. Then placing brush on the road, with the ends to the centre and the tops out, is the method followed. The system suggested by Mr. PETERS for building culverts is certainly a very novel one and has its advantages. In low morasses and swamps we frequently find that in the

Spring and Fall seasons a rush of water washes out our roadbed, but by adopting the method which he has suggested it does appear to me that it will tend very largely towards keeping the grade of the road in position and preventing the rush of water from destroying it. It is to me a suggestion of some value, and I am glad I have heard it. Otherwise the plan suggested by MR. HORN BROOK is the plan followed by us. I would suggest, however, that you endeavor as far as possible to secure an outlet down through the adjoining territory.

With reference to the chart which has been prepared and is shown here, I find that it is drawn to make very nearly the dimensions that are specified by myself in the construction of country roads. The width of the road between the shoulders of the ditches I generally make twenty-four feet; this is twenty-one feet. The amount of rise or crown I understand is placed at one inch vertical to each foot horizontal from the shoulders to the centre of the road, the same crown as specified by myself. The plan of placing the material appears to be by excavating in the centre of the road to a width of ten feet and placing the stone to an average depth over the whole cross section. I can hardly understand that it is the intention of the designer that an excavation should be made ten feet wide in the centre of the roadway to receive the road-making material. The plan followed by myself (*Fig. 3*) is to first make the crown and then roll the surface thoroughly from ditch to ditch. Then pass the road machine down the centre of the crown, taking off about three inches in depth and turning it out to the road side. Then reversing the machine and coming back, turning an equal amount out to the other side, and knocking off the crown, thus leaving a level surface on the top of the road, with a slight ridge of earth at each side of the ten feet space. This forms a receptacle for the gravel or stone. The stone or gravel is then placed on this flat surface to a depth of ten or twelve inches, according to the strength of road required, and tapering off to nothing at the sides. The machine is then run along one side and the earth turned up, and run back along the other side in a similar manner, and the whole surface is made uniform and the crown is made perfect. Then the roller is passed over the surface of the gravel or broken stone, and the loose earth brought up to the shoulders, and the road is completed. In the case of ordinary field stone being used, they are broken and placed in the excavation.

The whole is then covered with a gravelly soil to bind the particles together, and is rolled. In such a case I would approve of the design suggested, but I do think that the excavation is slightly more than is required, and that the material should be placed on in a more tapering manner than appears on the design. Otherwise I would approve of it.

HON. MR. HILL.—I would like to ask MR. PETERS what the cost of such a road would be?

MR. PETERS.—It was mostly done by statute labor, and I can hardly make a calculation, but where the stone is handy it ought not to cost more than \$1.50 per rod.

A. W. CAMPBELL.—With reference to the use of burnt clay, it is used very largely in the Southern States as ballast for railroads, and it is used to some extent in the construction of their highways. Where the frost is not severe this material appears to have given very great satisfaction. Burnt clay, however, cannot be burnt so as to vitrify the material and make it non-absorbent. It will absorb the moisture, and a severe frost acting upon the moisture in the clay will pulverize it, and in a very short time will separate it. It has not been used in the Northern States or in Canada, and it is believed that it would not prove serviceable on account of the frost.

In answer to a question as to whether steam stone crushers were used in Ontario, and whether they were giving satisfaction, PROF. CAMPBELL said: In our country we have gravel in the majority of sections, but that gravel is very dirty, and probably contains from thirty to fifty per cent. of sand and earthy matter, which is considered by us very objectionable material. Where stone is plentiful steam crushers are used; they are used very extensively throughout the Province. You have an abundance of first-class material in this Province, especially in this district, and I certainly think it would be one of the wisest investments you could make to purchase a stone crusher, take it along through the different sections, crush and prepare the amount of material that will be required for the year's work, leaving it where the people doing their statute labor will find it prepared and ready for the work. To break stone by hand is a very expensive process. These crushing machines will

break from eight to ten or twelve cords of stone per day, and the preparation of the material will not cost more than a dollar a cord. It is a very cheap way of preparing the material, and it is the only way of breaking the stone so as to leave the blocks cubical, and of coursing the stone so as to place it on the roads as it should be placed—that is, in sizes varying from two-and-a-half inches in diameter down to dust screenings. A road constructed of this material will last for years, but a road constructed of gravel and earthy matter will only last a year or two, when it will be found necessary to repair and reconstruct it.

MR. BURDITT.— Would you recommend broken stone to be put on country roads in thin layers, that is, where it would not be possible to build the regular MACADAM road, say twelve inches deep, would you recommend a thin layer of broken stone?

PROFESSOR CAMPBELL.— If a thin layer of broken stone is put on there is not sufficient body to cause a union of the material, and the traffic will drive the blocks of stone into the foundation of mud, and will not make a good road. I would not recommend a less depth of crushed stone than eight inches to be put on a road—from that to twelve inches.

MR. SHANKLIN.— How would an eight inch layer of crushed stone stand the frost and traffic in the spring?

PROFESSOR CAMPBELL.— If the foundation is thoroughly drained it will stand it all right. If it is not thoroughly drained the frost will act on the water and will destroy the road.

MR. GEORGE RAYMOND.— The way we construct culverts in my section of Kings County is this: We take two hemlock planks, three inches by seven inches, to form the sides of the culvert, and over these we place a three-inch hemlock plank, ten inches wide, and nail it to the side planks with six-inch wire nails. The top plank need not be put flush with outside of side planks, but these can be set back one inch to make more water space. Three dowells of one-inch round iron, eight inches long, are then inserted in side planks about one inch from the bottom, to prevent the pressure of earth

from squeezing them together. The length of culvert will be regulated by width of road, and on an average country road of sixteen feet in width the cost of such a culvert would be \$1.75. Culverts of this description have been in use in Norton, Kings County, for twenty years.

MR. C. N. VROOM— I wish to say that I heartily agree with the words that have fallen from the lips of the President of this Association, that statute labor should be entirely done away with. I believe it is one of the greatest wastes of the present day. I believe in the use of the road machines sometimes, but I even think then that their work is not always good. Put it on a gravelly soil, and it does good work, but in a great many cases it is put on clay soil, and it rounds up the road nicely, but for want of convenient gravel the work is about wasted. Sometimes a road is built a rod wide and crowned about two inches in the foot, and the result is that the wagons have to go along the centre of the road, and it is dangerous to try and pass another wagon. Ruts are made where the wheels travel, and soon shoulders are formed on the edges of the road; the water lies in these ruts, and the result is that the road is soon destroyed. It seems to me that there should be a thorough revision of the methods of granting money for roads. I think there should be one or two men in each County to look after the roads—men appointed by the Government and paid by the Government, and men who thoroughly understand road making. If necessary require them to pass an examination on road making. If this course were adopted I believe that the \$7,000 granted in our County towards bye-roads could be so expended that in a short time we would have good, settled and permanent roads. Another thing, I believe there should be a gradual cutting down of the hills to get the roads down to as low a grade as possible, and no permanent road work should be done on the hills until they are cut down as far as possible. I would suggest that the men in charge of the roads should be in consultation with a committee appointed by the Municipal Council, and representing different parts of the County, so that the work would be done where it was most needed, and not where the Commissioner chooses.

I might say that some seven or eight years ago the experiment of laying pipe culverts was tried down in our County, and they have been so satisfactory that this year we are laying more, and I think

in the end they will be found cheaper and much more serviceable. We use cement pipe. (*Fig. 6.*)

MR. A. W. CAMPBELL — I am surprised to find that the use of pipe for culverts is so little understood here. With us, of course, we use cement, concrete or vitrified pipe for building culverts and sluice-ways. These range in size from eight inches to two feet. If a larger capacity is required we place two pipes side by side, and sometimes three, leaving about three inches of earth between each row of pipes to prevent the traffic from squeezing them together and breaking them. We find it necessary in laying these pipes to leave from a foot to eighteen inches of earth on top of the pipes. If it is left close to the surface of the roadway the traffic will destroy the pipe. These pipes, of course, should have a free outlet leading from them. If they are allowed to stand full of water the frost acting upon the water will break the pipes, as it will break iron pipes, but as long as there is a fairly free outlet from these culvert pipes we find that they have stood in places for twenty or twenty-five years, and are as good to-day as when put in. I remember of constructing a culvert once under an embankment twenty-one feet high — twenty-one feet of earth over the top of a two-foot culvert pipe — so there is no danger of the culverts collapsing under the weight of earth placed upon them, and there is no danger of them being destroyed by the frost if there is a fairly free outlet. They are cheaper than timber culverts and last very much longer. The life of a timber culvert is only about six years, and then it has to be renewed, but when once you have constructed a pipe culvert that item of expense is off your hands.

We are also using stone for abutments and piers in building all our bridges, and placing steel superstructures thereon. In this way when once constructed they will be durable and a large item of expense will be saved.

The President, HON. GEORGE F. HILL, here took the chair, and the following Constitution was adopted:

I. NAME.

The name of this Association shall be THE NEW BRUNSWICK GOOD ROADS ASSOCIATION.

II. OBJECT.

The object of the Association shall be:

1. To combine as far as practicable the efforts of all persons engaged in the work of road reform in the Province.
2. To awaken an interest in the subject among the people at large.
3. To receive, publish, and discuss any well considered plans for local, provincial, or national action of legislation.
4. To aid in providing for a proper road exhibit and instruction in road making at farmers' institutes, dairymen, creamery and other association meetings, and other suitable gatherings throughout the Province.
5. Through its Executive to consult with the Government and the municipal and city authorities, and work together with them in furtherance of the objects of the Association.
6. To receive and expend in the furtherance of the objects of the Association any moneys that may come into its hands.
7. To employ any agents expedient in the dissemination of information, and the superintendence of work that may be delegated to it.
8. To establish the Association on the broadest possible basis throughout the country, so that its influence may be of weight in any direction in which it may ultimately be thrown.
9. To obtain and spread among the Local Associations full information regarding recent legislation for road improvement.
10. To obtain and publish full information regarding methods of road building as practised in various parts of Canada, the United States and other countries.

11. To procure and furnish to the Local Associations at reduced prices all valuable publications on the subject of roads and road legislation.

III. MEMBERSHIP.

Anyone interested in the objects of the Association may become a member by signifying in writing to the Secretary his desire and intention to do so.

IV. MANAGEMENT.

The work of the Association shall be managed by a Board composed of the following officers, viz.:

President, Vice-President at large, Vice-President for each County, and a Secretary-Treasurer; and seven directors to be elected by the Association, to be chosen with regard to the convenience of their frequent meeting together.

Five members of the Board, including not less than two of the office-bearing members, shall constitute a quorum for the transaction of business at any meeting of the Board, a notice of the meeting having been posted to all the members.

V. ELECTION OF BOARD: ANNUAL MEETING.

After organization the general officers and directors shall be elected annually at a general meeting of the Association, to be called at the time and place to be decided on by the Board of Directors, notice being given by adequate advertisement. Only members shall be eligible for election to the Board of Management. Election shall be by nomination and ballot, a majority of the votes of duly qualified members present at the regular annual meeting being sufficient for a choice.

The term of service of members of the Board shall extend from the close of the meeting at which they are elected to the close of the next succeeding annual meeting of the Association, or till their successors are appointed. Any member of the Board may be eligible for re-election.

VI. ANNUAL REPORT.

The Board of Management shall make a report at each annual general meeting of the work of the Association for the preceding year, which shall include a report from the Treasurer in regard to the receipts and expenditures of the Association.

VII. CONTROL OF FUNDS.

The funds of the Association shall be deposited in a chartered bank, having an office in the City of Saint John, in the name of the Association, and be subject to the joint order of the Treasurer and one of the Board of Directors. No expenditure exceeding the sum of twenty-five dollars shall be made except authorized by resolution passed at a meeting of the Board of Management.

VIII. AUDIT OF ACCOUNTS.

The books and accounts of the Association shall be audited annually by a public accountant, whose report shall be submitted by the Board at the annual meeting of the Association.

IX. OTHER MEETINGS.

Special meetings of the Association may be called by order of the Board as often as may be considered advisable in furtherance of the objects of the Association, announcement being made in the notices calling such meetings of any special business to be considered thereat.

X. CHANGE OF CONSTITUTION.

The constitution and bye-laws of the Association may be amended by a two-thirds vote of the duly qualified members present at any general special meeting of the Association, provided that the amendment has been announced in the notice calling such meeting.

Adjourned *sine die*.

NOTES, ILLUSTRATIONS, ETC.

NOTE I.—USE OF BRUSH ROADS.

A layer of brush is often used under the surface of the roadway as a sort of underdraining. In clay land the road is apt to become very dusty during continuous dry weather, and when made in such weather, as was the case on the road between Saint Mary's and the Nashwaaksis last year, many cartloads of dust may blow off in a single day.

If the work is attempted in dry weather the clay should be watered and rolled to place. The same remark is applicable to any work on clay done in such weather.

NOTE II.—MR. S. L. PETERS'S CULVERT PLAN.

The excavation must be sufficiently large to give ample room for construction. Commence at one side of the proposed culvert opening and place a small spruce or fir tree, four or five inches at the butt, and of length sufficient to reach across the road, with limbs trimmed off all sides but one, and these remaining limbs extending away from the culvert opening. Place small bushes parallel to the roadway with their butts resting on the cross log, and fill over them three or four inches of clay or road material, ramming it to place. Place another cross log with side branches, small bushes, and filling, above the last, only reversing the butt of cross log, and so on to the desired height. The other side is constructed in the same way. Trim the butts of the bushes with a saw. The cedar timbers to carry the covering should extend at least four feet beyond each side of the culvert opening, the covering being of three-inch plank, securely fastened.

Recommended for a low, wet spot where drainage is not free, otherwise vitrified clay pipe, or something similar, would be preferable.

NOTE III.

MR. PETERS'S form of roadway was somewhat similar to that proposed by MR. CAMPBELL, but he proposed to fill the trench with common field stone wedged in together, then go over it with hammers and break down the projecting points and cover it with a coating of gravel.

NOTE IV.

Under drains, with poles and brush, or field stone in the bottom, may be used with fair results in many cases.

In easy ground, and where transportation charges do not affect prices greatly (the work being done in the ordinary way by men that have become accustomed to it), tile draining can be done for sixty cents per rod of single line.

Possibly cheaper work could be done with a loosening plow, that is on the market, and a refilling plow that can be easily rigged.

Drainage work should be done using a simple levelling instrument to determine the grades, and in a dry time if possible.



FIGURES 1 AND 2.

Figure 1 shows cross section of highway, with underdrains under side ditches, and crowning, rising one inch per foot from edge of ditch towards centre. All as recommended by A. W. Campbell, C. E.

Figure 2 shows cross section, with rise of $1\frac{1}{2}$ inch per foot, as recommended by him for use on hills; it also shows underdrain under centre of roadway, objected to by him on the ground that saturation must pass underneath the roadway to reach the tile drain.

The lines of drainage are only assumed, as they would vary in different kinds of soil, and it would take some years for them to settle down to their flattest slope.

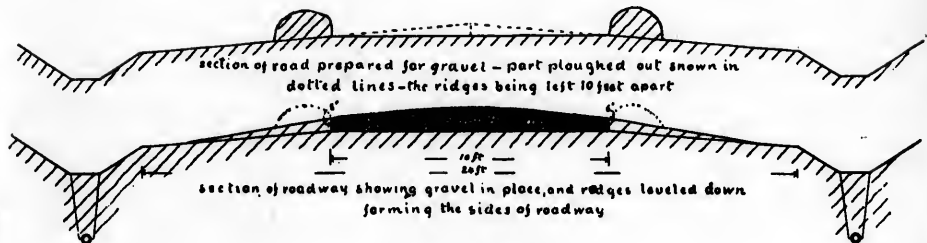


FIGURE 3.

Figure 3 shows mode of preparing for and graveling or macadamizing a country road, recommended by A. W. Campbell, C.E. The roadway is first constructed as in Figure 1, and thoroughly rolled, or compacted by the traffic; then the centre is ploughed off with road machine as in first view above, making a level space from eight to ten feet wide, with ridges thrown up. The space between the ridges is filled in with gravel or broken stone, nine inches deep in centre and six inches at sides; the ridges are then graded down towards the ditches and all rolled, being made even and compact as in the second view.

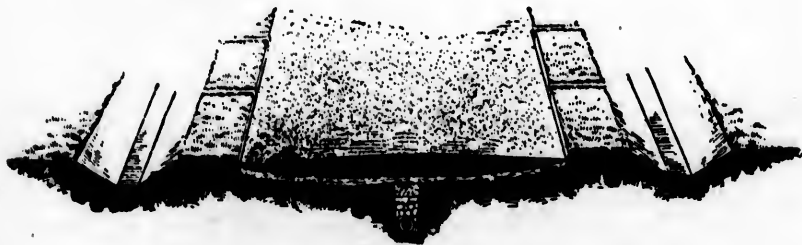


FIGURE 4.

Figure 4 shows a clay or heavy dirt roadway, recommended for use (in *Country Roads*) by J. B. Potter, when good road material cannot be had (Mr. Campbell does not approve of the turf edging as shown between the roadway and the ditch), described as follows:

"When gravel or sand cannot be obtained, the improvement of a clay road is sometimes difficult. A good under drain may be laid along the centre of the road and the earth removed from the roadway to a depth of about one foot at the centre, from which point the excavation

should rise by a gradual slope to each side. On the bottom of this excavation a layer or bed of hay, straw or evergreen brush should be laid to a depth of about four inches (when compacted), and the earth should be then filled in and formed to the true shape of the roadway. This method of treatment will tend to keep the roadway dry and prevent the formation of mud."

Figure 5. — The Richardson Adjustable Wide Tire (from *Country Roads*) by J. B. Potter. These may be used to increase the width of tire on any wagon. The view to the right shows adjustable tire separate, the one on the left shows it adjusted to a farm wagon wheel.

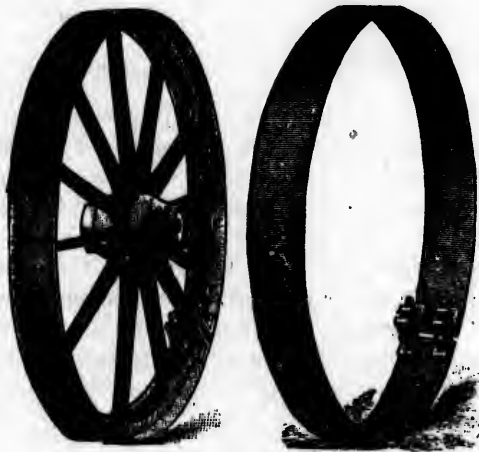


FIGURE 5.

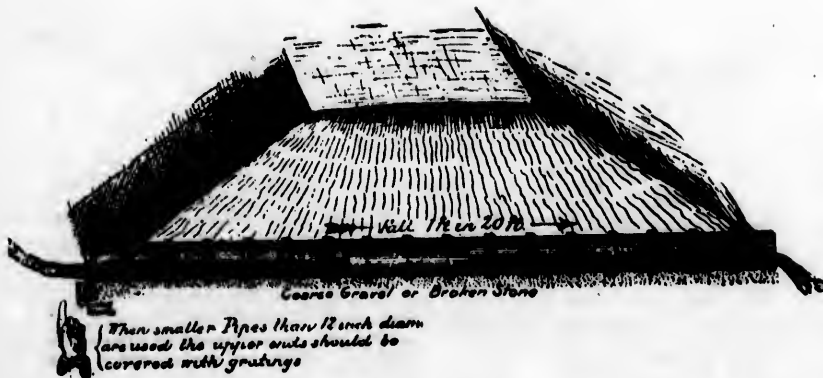


FIGURE 6

Figure 6.—Cross section of roadway embankment showing vitrified pipe culvert. The pipe is well fitted, carefully bedded in a bed of coarse gravel or broken stone, the joints cemented or filled with stiff clay and carefully covered. In many places the abutments at the ends may be omitted, but to protect the pipe and the bank it is best to terminate each end of the drain in a good wall or block of rubble masonry, or brick.

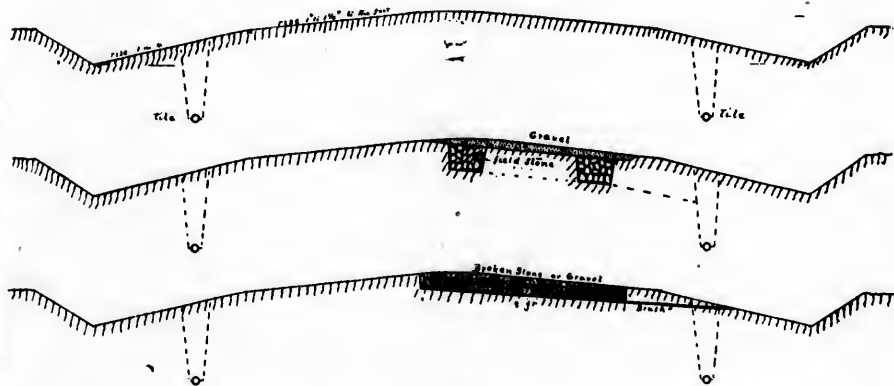


FIGURE 7.

Figure 7.—Sections of roadway suggested for discussion in addition to those proposed by MR. CAMPBELL.

View 1 shows cross-section of earth road with roadway proper crowned $1\frac{1}{4}$ inch to the foot, from sixteen to twenty feet wide; the inner slope of ditch drops down one foot in four, the outer slope rising one in one-and-a-half; the under drains are placed about two feet outside the inner edge of ditch slope. In making a new road all loam and vegetable matter should be removed, unless it is of little depth, and to be covered by a thick coating of good material. The supposed advantages of these plans are that they are easily constructed and kept in order by road machine, bad material being plowed off the road and up the outer side of ditches; then fresh material may be brought from the outer slope of ditch to repair or grade up the roadway.

A simple contrivance could be rigged to clean the ditches frequently and prevent alders from growing; the underdrains are placed out of the way, but at the same time where they can be broken out by plow and filled in again by machine.

View 2 shows a cheap form of stone road. Furrows sixteen inches wide by twelve deep are run under the wheel tracks at one side of the roadway. (They may be arranged at the centre of the roadway, but the idea proposed is to leave an earth track at one side for use with light traffic when the road is in a dry state. No continuous driving should be allowed on the earth track in wet weather.) Field stones are then packed in the furrows (eight hundred cubic yards to the mile) and three or four inches of gravel spread above.

Cross-drains should be made from the furrows sloping towards the under-drain at intervals as indicated by the dotted line.

Instead of the furrows being in whole or part plowed out, temporary plank sides may be used to hold the field stone in place till material is plowed up by the road machine to form the road around the stone.

In sand, where rock cannot be had, clay can be substituted in the furrows, with sand top; on clay land sand in furrows, with clay top.

View 3 shows a hard gravel or MacAdam track placed as in View 2. It is proposed that the surface indicated by the heavy line should be first constructed, on which (or perhaps only on the part outside the stoning) a layer of fine evergreen brush, dyke grass, or other fairly durable material, should be spread to carry off any water that may penetrate the finished surface; then temporary planks are arranged, where required, to confine the gravel or road metal, which should be rolled to place in layers and the earth plowed up to its edges, the temporary plank removed, and all evened up and rolled together.

ACCOUNT OF CONVENTION

OF THE EXECUTIVE OF THE

NEW BRUNSWICK

Good Roads Association

WITH DELEGATES FROM ALL PARTS OF THE PROVINCE, HELD IN THE
OLD COURT ROOM, LEGISLATIVE BUILDING,

FREDERICTON, N. B.

ON THE SEVENTEENTH AND EIGHTEENTH OF FEBRUARY, 1898.

The members and delegates present were as follows:

S. C. ALWARD, C.C., Westmorland.
J. S. ARMSTRONG, Secretary-Treasurer.
G. F. BANKS, C.C., Sunbury.
JEROME BOUDREAU, F.D., Gloucester.
W. F. BURDITT, V. P., Saint John.
A. J. BEVERIDGE, M.P.P., V.P., Victoria.
A. BERTRAND, M.P.P., V.P., Madawaska.
W. E. BOURGEOIS, V.P., Gloucester.
JOHN BETTS, C.C., Northumberland.
ISAIAH BRIDGES, T., Saint Stephen.
ROBERT CRAIG, F.D., Restigouche.
DAVID CURRIE, F.D., Victoria.
MELTON DAYTON, T., Edmunston.
A. C. DOW, F.D., York.
J. HOWE DIXON, F.D., Albert.
HON. H. R. EMMERSON, M.P.P., D.

HON. L. P. FERRIS, M.P.P., *D.*
 P. FARRELL, T., Fredericton.
 LAZARE GUIMOND, V.P., Kent.
 H. B. HALL, F.D., Queens.
 THOMAS HAYS, C.C., Restigouche.
 JOSEPH HORN BROOK, V.P., Kings.
 G. F. HILL, President, Charlotte.
 W. W. HUBBARD, *D.*
 JOHN IRVIN, F.D., Kent.
 DAVID JOHNSON, C.C., Charlotte.
 ORA P. KING, T., Sussex.
 JAMES LOWELL, C.C., Saint John.
 G. H. MARTIN, T., Saint John.
 J. J. MCGAFFIGAN, *D.*
 F. M. MURCHIE, V.P., Charlotte.
 JOHN MUIR, F.D., Kings.
 W. D. MARTIN, T., Moncton.
 ROBERT MCKINNEY, F.D., Charlotte.
 W. J. OWEN, F.D., Carleton.
 R. O'BRIEN, Saint John C. and C. G.R.A.
 S. I. PETERS, V.P., Queens.
 H. H. SMITH, F.D., Sunbury.
 C. L. SMITH, V.P., Carleton.
 GEORGE SEYMOUR, C.C., York.
 H. J. STEPHENS, C.C., Albert.
 GEORGE P. SEARLE, F.D., Northumberland.
 WILLIAM SIMPSON, F.D., Westmorland.
 NEIL SHAW, V.P., Restigouche.
 WILLIAM SHAW, M.P.P., *D.*
 A. A. STOCKTON, M.P.P., *D.*
 S. J. SHANKLIN, F.D., Saint John.
 W. S. TOMPKINS, V.P., York.
 HOWARD TRUEMAN, V.P., York.
 H. WILMOT, V.P., Sunbury.
 W. A. WEST, V.P., Albert.
 WILLIAM WISE, V.P., Northumberland.

NOTE. — V. P., Vice-President; *D.*, Director; F. D., Farmers Delegate; C. C., County Council Delegate; T., Town Delegate.

The Meeting opened at 7.30 p.m. on Thursday, 17th February.

The President, in opening the meeting, spoke very briefly, saying that he would dispense with anything like an opening address, as a number of resolutions had been prepared, and they might as well get down to business at once.

Mr. W. F. BURDITT, seconded by Mr. J. BETTS, moved the following resolution :

Resolved, "That, whereas, it is generally believed that there is "great room for improvement in the condition of the public highways "throughout the Province, and that such improvement, if it could be "brought about, would, by facilitating the means of communication "and transportation at all seasons of the year, result in large pecu- "niary and social benefits to the people ; and

Whereas, "It is the opinion of this Convention that better results "might be obtained from the expenditure of money and labor now "made upon our highways, and it is the object of the New Brunswick "Good Roads Association to acquire and disseminate knowledge as to "the best methods of making and repairing highways, and discuss "among practical men the best means of bringing about the desired "improvement ;

Therefore Resolved, "That the Provincial Government be respect- "fully petitioned to make a grant to this Association to aid it in "carrying out its objects, as set forth in the constitution and bye- "laws."

Mr. BURDITT, in moving the resolution, said that railways had been spoken of as the arteries of commerce, and the people of this Province had spent a great deal of money in developing an extensive system of railroads throughout the country : but if railroads were the main arteries of commerce, he thought that the common highways might be fitly described as the veins and smaller arteries by which merchandize and the farmer's produce—the life blood of commerce—was conveyed to and from those main arteries, and without which the latter would be useless. He thought that everyone present would agree with the statements in the preamble of the resolution as to the necessity for improvement, and the great benefits to be derived there-

from, but there would probably be differences of opinion as to how that improvement could best be brought about. To discuss this question was one of the principal purposes of this Convention. There were a great many practical men present whose experience in road making would be valuable, but any one man's experience was very limited as compared with the aggregate experience of all, and still more so when compared with the accumulated experience of all those who had worked, and studied, and written upon the subject in this and other countries during the past hundred years. Since the agitation for better roads commenced in the United States some years ago a vast fund of information had been gathered from all sources, and this information was available to us. Conventions had been held at which men of the widest experience from all parts of the country had met together to discuss methods of road construction and kindred subjects. The executive of the New Brunswick Good Roads Association felt that in the same way great benefit could be derived if those who are interested in these matters in this Province, particularly the men practically engaged in the work of road construction, could meet together to compare notes and discuss questions bearing on the subject of highway improvement, also that we should avail ourselves of all the information we could get from outside sources and disseminate it as widely as possible throughout the Province. But all this could not be done without incurring some expense, and therefore he moved the resolution which had been read.

MR. BETTS thought it would be a good way to encourage the good roads movement to distribute through the Province literature having a bearing on the question, and spoke of the "good roads" pamphlet* distributed by the Association, in which he had found many good suggestions. He thought the necessity for good roads was evident on all sides.

MR. J. S. ARMSTRONG, in speaking to the resolution, said that there was not any doubt that good roads were required all over the Province. That in his talks about good roads at the various agricultural meetings he had often spoken of hard stone roads as the best —

*"Country Roads," by Isaac B. Potter, published by the League of American Wheelmen, 12 Pearl Street, Boston, Mass.

the only good roads where they could be afforded—but they must not imagine from that that he expected them to be made throughout the Province. He quite realized that that was impossible at present. But this meeting was called together to find out as far as possible what were the *best* roads that could be made in the different districts with the means available. At a meeting of the executive it had been decided that all main resolutions should be submitted in writing to the committee on resolutions, so that the discussions should proceed in an orderly way, and he invited the delegates to send in any they wished, but he specially urged them to discuss the resolutions and move any amendments they saw fit. Many of the resolutions were prepared with the intention of exciting discussion.

Hon. H. R. EMMERSON, on rising to address the convention, was cordially received. He said it might not be advisable for him to tell them all he knew about roads, because if he did so there was danger of their knowing too much.

He had many times been convinced of the fact that there was a wide spread apathy on the part of the people as to the condition of the roads, and that there was a sectional desire prompting the request for road grants. He thought he could detect in the interest that was now being evinced in good roads a forward movement. It was a sign of the times that bade them go on and have hope for the future. The Government was anxious to promote good roads in the Province because of the economic advantages that would accrue to the people from them. If there was more interest evinced throughout this Province for good roads there would be less necessity for the expenditure of public money, or there would be less complaint as to the size of the grants if they were expended. We recognize certain evils, and we must consider the best way to remedy these evils. Referring to the Highway Act, he said the Government would be pleased to have their advice, but it was very difficult to get a consensus of opinion. If they were to get the opinions of all the gentlemen present on this Act they would have just as many different opinions as there were men in the room. If it were possible to have one man in command of the construction and maintenance of the roads in a country much more satisfactory results would be obtained than at present. This was his personal conviction, though he did not think it

would be agreed to by the majority of the people or by the Legislature. He thought the good roads movement had already borne good fruit in awakening interest in this important question. The present Highway Act only differed from the Act of 1886 in that it concentrated the responsibility more largely than did the other. The Act is not perfect—he did not expect to live long enough to see a perfect Act. There were some clauses which might require amendment. In some places the Act worked all right, and in other places there were complaints. But the working of the Act depended, to a large extent, upon the men who are appointed by the County Councils to administer it.

In closing, he assured them that the Government, and, he had no doubt, the Legislature, were disposed to assist the good roads movement in every possible way.

DR. STOCKTON, being called upon by the Chairman, said that it gave him much pleasure to be present. He quite agreed with MR. EMMERSON that it was important to have good roads in the Province as far as our means would permit. It seemed to him that it was impossible for agriculture to make much progress unless there were good roads throughout the Province.

The Chief Commissioner administered the great roads, which were the main highways and mail routes before railways were introduced, but now some of the great roads were not as much used as what were called bye-roads. It seemed that it was a proper matter for this Association to consider whether or not this distinction should be maintained, and if so, if it would not be better to place some of the little used great roads on the bye-road category, and some of the much used bye-roads upon the great road list.

Having a given amount of money to spend on the bye-roads, he thought there should be uniformity in the construction of roads throughout the municipalities. The county should be divided in districts or made into one district, and an experienced man, one with some engineering knowledge, should be employed to see that the money was spent to the best advantage.

In building roads he would offer one or two points on road making: They should be wide enough for two teams to pass easily. They should also be well and deeply ditched. Also the loose stones should be kept off the roads. A good way to do this in a district

where there is not sufficient money to employ a man to give his whole time, is to let the road out in small sections, and to have the different men keep their own piece of road free from stones, etc. Again some permanent work should be done each year. Better far to build five rods of good and permanent road than one hundred and fifty rods that will be washed away by the first thunder shower. He held that work should be done in June or July. Work done in the fall was of little use.

Regarding the Highway Act, he said if it were necessary to make changes in it he would be glad to lend his assistance to the work. He thought the members of the Legislature would do anything within reason to carry out the objects which they all had in view.

MR. HOWARD TRUEMAN thought there was a fine field for effort in connection with the work of the Association.

Others spoke in favor of the resolution, and it was put and carried unanimously.

MR. J. S. ARMSTRONG moved, seconded by Mr. W. A. WEST :

Resolved. "That it is expedient that local improvement societies be organized in all village districts for the purpose of discussing and studying roadmaking and the management thereof, raising funds for sidewalks, planting trees and keeping them in order, removing dead ones, and otherwise improving and beautifying the roadside; and that a committee be appointed later to draft a constitution for such societies and look up literature bearing on the subject, distribute the same, and otherwise promote this object."

In moving the resolution, MR. ARMSTRONG said that it was not one likely to excite much discussion, as all were likely to agree to its intent, but any suggestions as to how it could best be carried into effect would be acceptable.

It was carried unanimously.

MR. W. S. TOMPKINS moved, seconded by MR. CHARLES SMITH :

Resolved, "That in the opinion of this meeting it would be an advantage to wholly substitute a money assessment for statute labor."

In moving the resolution **MR. TOMPKINS** spoke of the great advantages of the money assessment system as he had seen its workings in British Columbia, and he strongly urged its adoption for our Province instead of continuing to allow the performance of statute labor, which was too often a farce.

MR. BURDITT said that while he was personally in favor of cash assessment, and felt that the day was approaching when the people generally would see it to their interest to voluntarily substitute the cash assessment for statute labor, he thought that the country was not yet ready for a compulsory measure. From his knowledge of the rural districts of the Province he was convinced there were many localities in which it would work great hardship to compel people to pay in money instead of working out their tax. In some sections it would be very difficult to collect a money tax, and he thought that in such districts better results could be had under the present system if the statute labor were properly directed and controlled.

MR. KING and **MR. BETTS** strongly supported the resolution. **MR. NEIL SHAW** said that he had many years' experience as road commissioner, and that he considered that the measure proposed was not practicable.

MR. LOWELL said that he had always obtained good results with statute labor. He knew of a case in which one thousand dollars in statute labor accomplished more than three thousand dollars cash, but he thought it depended very largely on the commissioner or road masters in charge of the work.

MR. SHANKLIN was in favor of cash assessment; it had been adopted in the Parish of St. Martins, St. John County, from which he comes, and was found to work well. He pointed out that the cash system did not prevent any man from working upon the road who wished to do so, the only difference was that they were hired by the commissioner to do a fair day's work for a fair day's pay, and he thought that better results were obtained in that way, but the results depended mainly upon the commissioners who directed the labor. Under a good commissioner people were sometimes willing to do more work than their tax called for.

Mr. J. S. ARMSTRONG, seconded by Mr. H. J. STEPHEN, moved the following amendment:

"That it is the opinion of this meeting that it would be for the public good to do away with statute labor as soon as it may seem practicable, and that the government be asked to amend the Highway Act so that a proportion, say twenty-five per cent. of the tax bills, both property and poll tax, be payable in cash, the balance to be optional where it is under the present Act."

Mr. ARMSTRONG said it seemed almost necessary to have some cash coming into the commissioner. In many districts there was next to none. In such a case, if road work was done with a road machine, the commissioner's compensation would be a charge on the whole parish. This causes friction. If there was a certain amount on hand it would facilitate this and other matters. He recognized the difficulty of carrying the full change to cash assessment before the people generally are educated up to a realization of the great benefits that would ensue. A very animated discussion followed, many thinking that the amendment would complicate matters too greatly, among whom was the Hon. Mr. EMMERSON, who reminded those present that the existing law was an optional one. The counties could regulate the statute labor as they liked.

Mr. S. L. PETERS was unable to agree with the sentiments expressed in the amendment, nor was he in accord with the resolution. He advised them not to crowd the farmers, but to tell them what they wanted done, and give them a chance.

C. L. SMITH, M. P. P., said to get at the right system it was necessary to get at the tax. So long as we continue the statute labor we will never make much improvement.

The resolution was further discussed by MESSRS. MCGAFFIGAN, SEARLE, BETTS, HORNBrook, W. A. WEST, W. L. McFARLANE, HENRY WILMOT, and others.

Mr. WEST thought the adoption of the amendment would complicate the road law so that it would be difficult of enforcement. Regarding the resolution, he thought it proposed a change for which the country was not ready.

MR. W. S. TOMPKINS again spoke in support of his resolution, making a strong bid for the meeting to pass it.

MR. MCGAFFIGAN, in a vigorous speech, strongly condemned the present system employed for doing statute labor. He claimed that the farmers who did the statute labor loafed, and smoked, and talked politics along the road instead of working.

MR. S. L. PETERS claimed that the road work was honestly done in Queen's County.

MR. TOMPKINS created a laugh by stating that on a visit to Queen's County not long since he had to ride in an ox cart because it was the only kind of a vehicle that could be got over the roads so wretched was their condition.

The vote was then taken on the amendment, which was lost by a large majority.

The original resolution was then put and lost by a small majority.

The proceedings of the meeting were very lively and interesting. The best of good humor characterized the discussions.

At 10.30 o'clock the meeting adjourned.

FRIDAY MORNING.

The following resolution was introduced by MR. ORA P. KING, seconded by MR. W. F. BETTS:

Whereas, "It is desirable that the road commissioner should be freed as much as possible from collecting the road taxes, and yet that he should have definite information by a certain date as to who claim the privilege of working out their road tax;

Therefore Resolved, "That provision be made in the Act somewhat as follows: That the regular Parish tax collectors make out and distribute the road tax notices at the same time as other country tax notices, and that the said road tax notices have a coupon attached showing the items of the road tax, and with blank spaces to be filled up by the ratepayer if he be desirous to work out his tax, and with a notice that unless the ratepayer duly fills out

"the blank and delivers it to the road commissioner, personally, on
"or before a certain date, he will be required to pay the tax in
"cash, this coupon only being used in districts where statute labor
"is in operation, and that commissioners be authorized to add to the
"list names which have been omitted by the assessor."

MR. KING said that from what little experience he had with the new Highway Act he found that one of the chief complaints of the commissioners was that the distribution of the notices took up a considerable amount of their time, and they could ill afford to give the time necessary for the distribution of those notices for the remuneration allowed them under the Act. It seemed to him (King) that if the distribution of the notices or the collection of the money could be placed in the hands of some one engaged in that class of work, such as the collector of parish rates and taxes, poor and county taxes or school taxes, it would free the commissioners from that labor which in his opinion they justly complained of. It seemed to him that very much better service could be obtained under the Act if the commissioner's hands were freed as much as possible, so that he could devote that time to the matter of good roads. He has little enough time to devote to the roads, and is poorly paid for that time.

MR. BETTS said he heartily agreed with the resolution, inasmuch as he found that in some parishes there was not sufficient money paid in to pay the commission of the commissioner. It was said that this was going to create a tax and make it a hardship upon the ratepayer, but he thought that if this were adopted the assessing to pay the commissioner would be done away with, and it would come directly out of the people instead of indirectly as at present.

MR. KING said he had tacked on to the resolution a statement that it would be desirable in his opinion that the commissioners be authorized to add to the list furnished them by the assessors any name that might be omitted by the assessors. Possibly this should be in the form of a resolution, but he had joined the two together with a view to getting an expression of opinion from the meeting. It had been his experience that the assessors in making up the list almost invariably omit names which should be on, and in the

interest of the roads every man who is assessable should be on that list. While the Act of 1886 made provision for this, he did not think the present Act did, and in his opinion that power should be given the commissioners.

MR. WM. WISE said that before they proceeded to pass any such resolution he thought it would be well to find out what the Government proposed to do with respect to dividing the Province into districts. If the Government intended to appoint salaried men they should collect the taxes and do all that kind of work.

HON. MR. EMMERSON said that to his mind the course proposed by the resolution would not work at all. It would further complicate the Act, which was none too simple now. The idea of the Act was to place the responsibility upon the commissioner, and if such a course as that outlined in the resolution was adopted, the responsibility would be taken away from the commissioner and placed upon the collector, and if any question should arise the commissioner would say that he was not responsible.

MR. S. L. PETERS said he concurred with the chief commissioner. The resolution says the commissioner shall not be required to serve the notices, but it requires the ratepayer to travel all the way from his home, no matter if he lives ten or twenty miles away, to give notice to the commissioner what his desires are.

MR. KING.—I would like to ask if the onus is not upon the ratepayer now to notify the commissioner?

MR. PETERS.—He is only required to notify him by writing.

MR. KING said he did not agree with the chief commissioner that this resolution would complicate the machinery of the present Highway Act instead of simplifying it. It seemed to him (King) an easy matter for the assessors to furnish two lists—one to the commissioner and one to the tax collector. The commissioner has his list before him, and he receives the notifications from the different ratepayers as to whether they intend to do their work. You are not freeing him from any responsibility. He knows there is a certain amount of work to be done; that he will have a certain amount of

money coming into his hands, and that there will be a certain amount of labor at his disposal, and he is thus in a better position to do good work. It seemed to him (King) that instead of complicating the Act it was doing away with something which the people who complained of the Act complained of very bitterly.

DELEGATE.—Another objection to this resolution is that the collector of rates would often not deliver those notices until too late to do road work. In many cases the notices of the County taxes are not delivered until after the 1st of August, and therefore if this resolution becomes law the road work, if it had to be done on those notices, could not be done that year at all. My idea is to place the responsibility more particularly upon one person. Divided responsibility never brings forth good results. If you enlarge the responsibility you will get better work. As to the question of remuneration, the greatest complaint in my County is that under the present law the commissioners receive too much.

DELEGATE.—I do not think you ought to add to the machinery of the Act. I understand the commissioners have to give bonds, and if this resolution was adopted it would mean that they would have to give bonds for some other man to perform his duties. The collectors are appointed by the Council, and they might, perhaps, refuse to perform this work. If they object the Council would have to be called together, which would mean a great deal of trouble and expense.

MR. J. H. DICKSON said he was opposed to this resolution, as he did not consider it at all necessary. In the early part of the season the commissioner has to go over his district to ascertain the state of the roads in order that he may properly repair them, and that is the time for him to give the notices.

MR. KING said the only thing that the resolution changes from the present Act is in the distribution of notices by the collectors. The only question is whether the collector should distribute the notices, or the commissioner.

HON. MR. EMMERSON said he thought he could detect in the resolution a desire to wrench from the ratepayers the money, instead of allowing them to perform statute labor in lieu of their tax. He

did not think the country was ripe for such a law as that. He thought the Act should be so amended as to amalgamate the summer and winter roadmasters.

The resolution was defeated by a large majority.

MR. W. F. BURDITT called attention to the subjects appointed for consideration at this meeting, and asked that the discussion be confined as closely as possible to the subjects laid down. These subjects were as follows:

Questions Relating to Administrative Organization for the Control and Expenditure of Funds, Supervision of Work, etc.

(1) How does the present system of supervision and control of expenditure work in your county? Can you suggest any improvements?

(2) Could any changes be advantageously made in the appointment of commissioners?

(3) What should be the duties of commissioners and extent of their jurisdiction?

(4) What can be done to increase the interest of County Councils in seeing that the best possible results are obtained from the expenditure made?

(5) What is the practice in your County with regard to the appointment of surveyors or roadmasters? Is a good selection made? Are such appointments somewhat permanent or subject to frequent change?

(6) What should be the duties of roadmasters? How are such duties usually performed?

(7) Could the duties of roadmasters be formulated and set forth in a list of printed rules?

(8) Is the present practice of "selling road work" satisfactory in its results?

The following resolution was moved by MR. THOMAS HAYES, seconded by MR. JOHN BETTS:

Resolved, "That the government be requested to so amend the "Highway Act of 1896 as to provide that the roadmasters appointed "by commissioners from year to year remain in office until their

"successors are appointed, and that their responsibility be more clearly defined so as to state definitely that the road master shall perform his duties under the instruction of the commissioner from whom he receives his appointment, and be responsible to him."

MR. HAYES said he thought the roadmasters should be appointed by the County Council at their January session, as well as the commissioners.

MR. J. S. ARMSTRONG read sections 48 and 56 of the Highway Act bearing on this question.

MR. JOSEPH HORNbrook said the object of the resolution was to enable the commissioner to appoint a roadmaster who should remain in office throughout the year unless removed for some cause. As the law now stands, or as it is carried out, one roadmaster appears to be appointed for the winter season and another for the summer, and before the Council can re-appoint commissioners at their January session we very often have heavy snowstorms and the roads become blockaded.

MR. S. I. PETERS thought it was a very desirable amendment if the Act did not now provide it.

MR. TRUEMAN said that by this amendment we were taking away the power of the commissioner. It is within the power of the commissioner to say that the roadmaster shall act throughout the year. Under section 56 of the Act the commissioner can appoint a roadmaster until his successor is appointed.

MR. W. A. WEST said that in his County (Albert) the Council had passed a bye-law saying that the officers should remain in office until the second Tuesday in February.

MR. GEORGE SEYMOUR was in favor of roadmasters being appointed by the County Councils, but whoever appointed them their term of office should be defined, and they should remain in office until their successor is appointed.

MR. SEARLE said the commissioner could turn the men out to break roads, and he need not appoint roadmasters at all.

MR. W. J. OWEN said that in Carleton the appointment of the roadmasters was a cause of dissatisfaction. He thought this would be remedied if the roadmasters were appointed by the County Council.

MR. W. A. WEST.—I consider that the commissioner has full power to appoint and dismiss these roadmasters, and in my opinion it is a very wise provision in the law.

MR. ARMSTRONG pointed out that the resolution refers to two kinds of roadmasters, the winter and summer roadmasters, and that they are not necessarily the same under the Act. It apparently was desirable that the winter roadmasters should specially retain office till their successors were appointed, as the commissioners who appoint them come into office in the middle of the winter, and if a new man is appointed it takes some time before he can act definitely. The Act in regard to the summer roadmasters, following as it does the old Act, under which the roadmasters had full control in their districts, is liable to be interpreted by them as giving them the same powers—wrongly no doubt. But what is wanted is to have it put in plain words that they are to carry out the instructions of the road commissioner.

Resolution carried unanimously.

HON. MR. EMMERSON called attention to the fact that under Section 55 of the Highway Act the commissioner is responsible, and he himself is subject to a penalty for neglect if the roads are not kept up. The roadmasters are not in any way responsible. So in respect to Section 48, he may or may not have the roadmaster in the summer; he can appoint him or not, just as he pleases,

The following resolution was moved by MR. JOSEPH HORN-BROOK, seconded by MR. W. A. WEST:

Resolved, "That the County Council shall have authority to constitute a larger division than a Parish, or they should have power to appoint a chief commissioner over a set of Parishes or divisions or over all the county, and his enlarged powers and emoluments should be defined; and further

Resolved, "That provision be made to enable the Council to so appoint."

MR. HORN BROOK said the object of this resolution was to secure uniformity of work. We are on the verge of a new system of road making, and while most people understand the old system very few understand the new one which is to be inaugurated. One of the necessities of a good road was turnpiking, but there has got to be a better system of drainage adopted and a better system of gravelling. The commissioner appointed by the County Council should be an experienced roadmaker, and he should be able to instruct the roadmasters to make a uniform kind of road. Under our present system each commissioner has a different idea as to how the road should be made, and as a result there is no uniformity.

MR. SEARLE said he thought the appointment of such a man should be made by the chief commissioner of public works.

MR. S. L. PETERS said that if the power of the commissioners was enlarged he thought the commissioners should be under the direct control of the chief commissioner, and the appointment should be made by the chief commissioner. The chief commissioner is held responsible for the expenditure of the money, and it is only fair that he should have the power of appointment.

MR. ARMSTRONG suggested that if a practical man were appointed to look after this work he could examine bridges in the county under his control, and by making slight repairs, in many cases hundreds of dollars would be saved to the Province.

MR. BURDITT said the County Councils might perhaps object to their funds being expended by a man appointed by the Government.

MR. J. H. DICKSON moved the following amendment:

"That in the opinion of this meeting it would be more conducive to the betterment of the good roads if the chief commissioner would appoint a commissioner who would have supervision over the roads in each county."

After some further discussion, at the suggestion of Mr. Burditt both the resolution and the amendment were withdrawn and the following resolution was substituted and carried:

Resolved, "That in the opinion of this meeting it would be desirable to have competent men appointed having special know-

"ledge in roadmaking, drainage, etc., who would have the supervision of work and expenditure over larger divisions than are now allotted to the commissioners appointed by County Councils.

The following resolution was moved by Mr. HOWARD TRUEMAN seconded by Mr. DAVID JOHNSON :

Resolved, "That in the opinion of this meeting the commissioners should have power to apply labor and funds in any part of the highway division rather than that all the labor and taxation of a given district must necessarily be expended within that district."

Mr. S. J. SHANKLIN was in favor of the resolution. Under the present law large sums of money were spent on short pieces of road. For instance, down in St. Martins there was a road about one mile long on which five hundred days' labor was spent every year, and this could not be prevented.

Mr. S. L. PETERS considered that this would be most unfair. If there were certain districts which could take care of their own roads they should be allowed to do so, and where assistance is needed it should be got from the Government. Under such a system as outlined in the resolution the commissioner would have the power to expend the money right at his own door.

Mr. DAVID JOHNSON told of a road in the County of Charlotte. In one district on that road there were four settlers, while right in the next district there were forty-four, and all the labor and all the money of those forty-four ratepayers was put upon their own section, and besides that they got bye-road money. He contended that there was nothing fair in that.

Mr. SEARLE said they had had such a law a number of years ago in his Parish. They paid their taxes in cash to the Town of Chatham and never received a cent of it.

The resolution was passed.

Mr. J. J. MCGAFFIGAN moved the following resolution seconded by Mr. W. S. TOMPKINS :

Resolved, "That in the opinion of this meeting it is advisable that any person or persons purchasing at public auction work to

“be done upon any great or bye-road in this Province shall be required to place with the commissioner selling said work a bond in double the amount of the value of said work, or a cash deposit of twenty per cent. of the value of the work, and that the work should be performed under a definite contract with specification.”

MR. MCGAFFIGAN said that under the present system the performance of the work was merely a matter of honor between the party and the commissioner. The commissioner sold the work at a certain price, and when he went to see if that work was done very often he found that it was not. Parties find after the heat of the sale is over that they have taken work at too low a figure, and as they are under no obligation to perform that work very often they pay no attention to it whatever. In such a case the commissioner is powerless to compel the performance of the work, and it was to remedy this difficulty that he (McGaffigan) had moved this resolution.

HON. MR. EMMERSON said the resolution involved the alternative proposition of giving a bond or putting up a cash deposit. It might be all right enough to give a bond, but if the party did not perform his work the commissioner would not want to get into a lawsuit with him. If a cash deposit were put up no doubt the work would be done, but it would be a hardship on those who might not have the money to put up. A poor man who could not put up the necessary deposit might be the very best man to do the work.

MR. ARMSTRONG suggested that the resolution be modified so as to provide that the commissioner could exercise his discretion as to whether he would accept the lowest tender. He is sworn to act for the best interest of the public.

HON. MR. EMMERSON said this was a matter that could not be remedied, and had to be left to the honesty, common sense, and good faith of the people.

MR. DAVID CURRIE said the adoption of this resolution would impose a hardship on the poor man, as it would prevent him from getting the work. It was giving the man with money a chance to get the work at a higher figure than it was worth by reason of there being no competition. He knew of a bridge in his own County

(Victoria) for which a man was paid \$300, while there were plenty of people who were willing to build it at a much less figure, but they had not the money necessary for the deposit, and therefore could not tender.

MR. MCGAFFIGAN said it was evident that the chief commissioner did not like to take the responsibility upon himself of adopting this suggestion. It was all very well to talk about the hardship to the poor man who could not make a deposit, but we should also consider the hardship to other people under the present system. When a man took a contract and then failed to carry it out it was imposing a hardship upon the County and upon the people who had travelled long distances to the sale and were willing to have taken the work at a few cents a rod more. Councillors and politicians should not be afraid to pass a law dealing with this subject.

MR. THOMAS HAYES said such a law would bear very heavily upon the poor man. Many of the men who attend the sales have not a dollar in their pocket, and the rich men would do the work much better than the poor man.

MR. JOSEPH HORN BROOK thought security should be given, as thereby more would be saved to the Government than the poor man would lose.

MR. SHANKLIN said he thought in all amounts over \$25, bonds should be taken. He thought if bonds were required parties would not bid so low that they could not do the work. In his opinion a money security was out of the question.

MR. WILLIAM SIMPSON said he thought there was nothing to prevent the giving of bonds, but there was a good deal of formality about it. His practice was to sell the roads, and if the party did not do the work according to contract he did not pay him until it was properly done. In nearly all cases, after commencing the work, instead of losing his money, he does it up promptly.

The resolution was defeated.

HON. MR. EMMERSON said he would like to have the Convention take into consideration the question of wide and narrow tires, and he read from the *Engineering News* of March, 1897, the result of a

test of resistance to vehicles on common roads, made by the United States Department of Agriculture, as follows:

"To demonstrate the practical advantage of wide over narrow tires the following test was made: A piece of clay road was made thoroughly wet, and over one portion a heavily loaded wagon with two-inch tires was rapidly drawn, and over the other portion an equally heavy wagon with four and five-inch tires was drawn the same number of times. In the latter case the front axle was shorter than the rear axle, so that the wheels did not run in the same track. The result was that the narrow tire cut the road into ruts several inches deep, while the broad tires rolled the road into a smooth surface. The tractometer showed that twice as much pull was necessary to draw the same load over that half of the road cut by the narrow tires."

Adjourned until 2 P. M.

FRIDAY AFTERNOON.

MR. BURDITT stated that the subjects for discussion at this afternoon's session were:

Questions Relating to the Practical Work of Road Construction and Repair — Good Location, Drainage, Proper Formation, and a Hard, Smooth Surface the Four Cardinal Requisites of a Good Road.

(1) Could the location of any of the highways in your county be changed within reasonable limits so as to afford better drainage and easier grades by circumventing hills, avoiding bogs, etc.

(2) Has anything been done in your county to improve the roads by re-locating, so as to avoid hills, swampholes, or other parts that were difficult and expensive to keep in repair, and with what results?

(3) What is your experience with regard to drainage or the need of it? What general rules or specifications, if any, could be laid down for the guidance of roadmasters as to surface drainage?

(4) Has under-drainage been practiced in your county, and with what results? What general rules, if any, can be laid down as to the conditions under which under-drainage should be adopted, and how best accomplished?

(5) What general rules, if any, can be laid down for the construction of cross-drains or culverts? Have terra cotta, cement, or iron pipe culverts been used in your county and with what results? Do you not think they would prove more economical and satisfactory, if properly laid, than wooden culverts?

(6) What is the best width, crowning and general form—including depth and shape of gutters or ditches for surface drainage—for different classes of highways? Would it be practicable to formulate definite specifications for the guidance of roadmasters and commissioners with the view of obtaining a greater degree of uniformity in the work of different districts? Within what limits might such specifications be varied?

(7) What general rules, if any, can be laid down with regard to various kinds of materials for surfacing, their use and application? What are the best surfacing materials available in your district, and what is your experience as to results from use of different kinds?

(8) Are there any roads in your county subject to such traffic that it might be considered advisable and in the interest of true economy to thoroughly macadamize them, according to the most approved specifications of modern road engineers? What means can be suggested for accomplishing permanent improvements of this kind?

(9) How can more or less constant care of the principal highways be provided for? Could statute labor be utilized for the purpose, or how could it be accomplished? Great damage to roadways is often occasioned for want of a few minutes or an hour's work at the right time—"a stitch in time saves nine."

(10) To what extent is improved machinery used in your county? Could not the use of it be further extended with advantage? Could not road rollers, such, for instance, as the water-ballasted steel roller of about five to eight tons maximum weight, be used with advantage, and possibly in some localities rock crushers in addition to the road machines or grader now coming into general use?

(11) How can damage to highways, caused wilfully, or by carelessness and excessive use, be prevented or remedied, such, for instance, as the washing of roads by obstruction of ditches and watercourses, or the hauling of very heavy loads on narrow tires?

MR. RICHARD O'BRIEN moved the following resolution, seconded by MR. BURDITT:

Whereas, "It appears from expressions of opinion in this Convention the time has arrived, or is near at hand, when better and more permanent work than any heretofore undertaken will be required upon the highways of this Province; and

Whereas, "There is a general lack of technical knowledge as to improved methods of highway construction adopted in other countries;

Therefore Resolved, "That this Convention suggest to the Provincial Government the advisability of appointing a competent engineer as Provincial Inspector of Highways for the purpose of carrying on an educational work, and such other duties as may be assigned to him."

This was carried.

MR. JOSEPH HORN BROOK moved the following resolution, seconded by MR. J. H. DICKSON:

Resolved, "That this Convention approves of the steps taken by the Legislature in providing that on and after the first day of May, 1899, loaded vehicles shall have wide tires, but would urge that they vary the provision in the way of making it more easily enforced, and provide that it can be enforced on the complaint of any ratepayer."

And suggest that the following provisions be suitable:

"All vehicles having wrought iron axles two inches square, or an axle of equivalent capacity, shall be equipped with tires not less than four inches in width.

"All vehicles having a wrought iron axle one-and-three-quarter inches square, or an axle of equivalent capacity, shall be equipped with tires not less than three inches in width.

"All vehicles having a wrought iron axle one-and-a-half inches square, or an axle of equivalent capacity, shall be equipped with tires not less than two-and-a-half inches in width.

"Any person who shall violate any of the provisions of this Act shall be fined not more than — dollars."

MR. HORNBOOK said the object of this was to protect our roads and aid the farmers who have heavy loads to haul. The highest authorities agreed that a heavy load could be hauled much easier with a wide than with a narrow tire, and the wide tire will act as a roller and preserve the road, while the narrow tire destroys it. The Highway Act as it now stands reads as follows :

“WIDE TIRES ON CERTAIN VEHICLES.

“(2) On and after the first day of May in the year of our Lord one thousand eight hundred and ninety-nine the wheels of every vehicle loaded with stone, gravel, sand or other material of any kind or nature whatsoever, when the load exceeds in weight one and a half tons, shall when used and passing over or along any highway be provided with tires not less than four inches wide ; the owner or person in charge of any such vehicle shall, for every offence against this section, incur a penalty of five dollars.”

It would be almost impossible to enforce this Act, as there would be no way of ascertaining the weight of load, but if the suggestion contained in the resolution be carried out there will be no difficulty, as a man will not put a heavy load on a small axle.

MR. J. H. DICKSON said it gave him much pleasure to second the resolution. He had been puzzled to know just how the present law could be enforced, but the suggestion contained in the resolution solved the difficulty.

MR. BETTS said he was in favor of wide tires, but it seemed to him there should be some provision for wagons with wooden axles.

MR. TRUEMAN said the resolution read “All vehicles having wrought-iron axles two inches square, or an axle of equivalent capacity.” That would cover any kind of axle.

MR. HAYES asked if all the trucks now in use by the lumbermen and farmers of the Province would have to be done away with and new ones substituted inside of a year?

MR. HORNBOOK. — Only the tires will have to be changed. New tires can be put on any wagon with very little expense.

A DELEGATE stated that when the wide tire law came into force in the State of Maine the people built an inch and a half on each side of their two-inch tires and put a six-inch tire over the whole, and tires of this kind have been running for two or three years.

MR. DICKSON said he thought some means should be taken by the Government to have notice given through the local press of the date when the Act would come into force.

HON. MR. HILL suggested that the Government or the Association have printed handbills distributed in the stores and blacksmith shops throughout the Province giving this notice of what the law requires. It was not to be supposed that this law would be enforced with harshness or severity; that every person whose wagon was not quite up to the standard would be immediately seized upon and fined. A law like this, with new penalties and making new provisions, was never enforced with the utmost strictness in the beginning, but people would have to come to it eventually.

MR. HILL referred to a road in the City of Calais which it was found very hard to keep in condition by reason of the heavy loads of lumber hauled over it by four and six-horse teams. The City finally passed a law that on all four and six-horse wagons the tires should be six inches wide. One large firm of lumbermen, who owned a large number of wagons, objected very strongly to this change, as it would cost them more than one thousand dollars to make such a change. However, it was done, and after using the wide tires for two or three years the head of that firm tells me that he would not substitute the narrow tires now for twice that amount, so great has been the benefit of the change on his teams. Experiments everywhere have shown that on poor roads the increased power obtained by the use of wide tires is at least fifty per cent. greater than where narrow tires are used, and besides that they keep the roads in good condition instead of destroying them. He (Hill) thought the front axle should be longer than the rear axle, thus enabling the wagon to be more easily turned, and making it easier to pass obstructions, as if the front wheel cleared it there would certainly be no danger of the rear wheel striking. Though there would be some expense at first connected with the

change from narrow to wide tires, and it would, perhaps, come a little hard on the poorer people, yet in the end the poor man with his team will be just as much benefitted as the rich man with his carriage.

MR. HUBBARD said it was important that notice of the change should be given to carriage manufacturers, as he had found by inquiry that they did not make a wider tire than two-and-a-half inches, and he had been assured by one firm of manufacturers that this law would never be enforced.

The following amendment to the resolution was moved by MR. W. A. WEST:

Resolved, "That all two-horse team wagons have a tire not less than four inches, and all single horse team wagons have a tire not less than three inches."

After some discussion this was withdrawn and the original motion was carried.

The following resolution was then moved by MR. DICKSON, seconded by MR. HORN BROOK:

Resolved, "That the Government be asked to advertise the proposed change in tires by having the section of law published by handbills throughout the country."

This was carried.

MR. BURDITT said it was agreed that the foundation of all true road work was proper drainage. No matter what was put on the roads unless there was proper drainage good roads were impossible. Sometimes it was found impossible to see a proper outlet for the water, and he thought that in such case the commissioners or supervisors should have power to open an outlet through adjoining properties to carry this water off. He would therefore move the following resolution, which was seconded by MR. HORN BROOK:

Whereas, "There is no provision in the Act for carrying the drainage away from the road side, and in many cases it is absolutely necessary that drains should be carried, for a greater or less distance away, over or through private property, and the local highway

"commissioner and those under his authority should have power to enter upon private lands or property and construct such drain, doing as little damage as possible, and if any permanent damage is suffered thereby, provision should be made whereby the owner could recover damages from the Road District or County;

Therefore Resolved, "That due provision be made therefor."

This resolution was discussed by several of the delegates, all agreeing that in nine cases out of ten the direct cause of bad roads was improper drainage. It was not sufficient to deepen the ditches, but it was most important to have a proper outlet. The speakers agreed that this question of drainage could not be too strongly urged upon the commissioners and supervisors.

MR. ARMSTRONG moved the following resolution, seconded by MR. WISE:

Resolved, "That it is most important that the benefits of underdraining the roads, wherever the frost heaves them to any extent, should be made clear to all in the Province, and that they should be encouraged to push drainage work; and therefore that the Government should consider the expediency of underdraining with tiles short stretches of the most travelled roads, in four or five places in each County, under such conditions as they may see fit, employing men of experience."

MR. ARMSTRONG, in speaking to the resolution, said that the question of drainage was the most important one in connection with road making. This, and the wide tires, were the two things that would go a long way towards making the desired improvement in our roads at the smallest cost. And that while side ditches were necessary to carry off the surface water, underdraining was quite as necessary, and even more important in many cases.

In some places the ground is of an open sandy nature and drains itself naturally, but whenever the frost heaves the ground and makes a bad spot in the spring, it is evident that underdraining is required. The effect of the underdrain is to draw the water down from the surface so that there is a comparatively dry and compact stratum or layer of earth through which the surface water does not readily penetrate, but any that does, sinks down towards the level of the

underdrain and the frost does not penetrate this layer to any great extent. Thus a solid foundation is formed for the road.

If the Government could be induced to make this exhibition of underdraining it would be of great benefit as showing its use in road work, but also agriculturally in teaching the people how to underdrain their lands. For even at fifty dollars per acre the cost was often returned in the first crop or two.

MR. WEST said that to his mind underdraining was the very fundamental principle of good roadmaking. The idea of underdraining was not to catch the surface water, but was to prevent the sub-soil water from rising to the surface. The surface drains for carrying off the surface water were all right, but unless there was a system of underdraining the water would rise to the surface and make the road soft. He thought tile drainage the cheapest and most effective method for underdraining. MR. WEST gave an illustration of the benefits to be derived from underdraining. Down where he lived there was a section of road which had been simply a sea of mud every spring for years, and it was no uncommon thing for the horses to get mired there. Some years ago he had put in a system of underdrainage on that road, and now it was always dry and hard and in splendid condition. He thought the idea contained in the resolution a good one.

MR. WILMOT expressed the opinion that the best results could not be obtained unless these tiles were laid by experts. He had found this out by observation.

After some further discussion in line with the remarks of previous speakers the resolution was carried unanimously.

The question as to the most suitable width of road was discussed, and sixteen feet between inner edges of the kind of ditch shown on Fig. 7 was mentioned as quite sufficient. No resolution was formulated on this question.

The matter of grading and ditching, the proper form of the surface of roadway, and the depth and slope of ditches, was fully discussed, many of the practical roadmakers present giving their

experience along this line. Diagrams showing the model method of construction, grade and underdraining were circulated, and a variety of opinions on this question were advanced, and the following resolution passed:

Resolved, "That the form of cross-section Fig. 7 in the report of "the Convention be recommended."

The value and proper use of road machines then came up for discussion. A number of delegates who had had experience in the use of the road machine took part in this discussion, and all expressed the opinion that the road machines were very valuable when handled by experienced men. It was suggested that the Government appoint an experienced man to operate new machines purchased by the Province and sent to different districts so as to instruct local men in the use of them, as the machines seldom did good or satisfactory work when operated by inexperienced men.

The following resolution was moved by MR. JOSEPH HORNBOOK, seconded by MR. BETTS, and passed:

Resolved, "That the use of the road machines has been found "very satisfactory, when thoroughly tried, under proper management, "and therefore its more extended use is strongly urged upon all "sections of the Province."

HON. MR. EMMERSON called attention to the growing tendency to encroach upon the highways in all sections of the province by parties when building fences, and some action would have to be taken to have this regulated. It might even be necessary to have a survey made of all the highways of the province in order to obtain uniformity in the width of the highways.

MR. EMMERSON called attention to the fact that in the County of Kings last year the road tax amounted to \$12,602, and outside of what was excused it was found that about fifty per cent. of this was paid in cash and fifty per cent. in labor. This would seem to show that under the operation of the Act the condition of things was not quite so black as was painted. He believed that in a few years any Good Roads Convention meeting here will be in favor of paying the road tax in cash.

The following resolution was moved by MR. BETTS, seconded by MR. KING :

Whereas, "The Highway Act of 1896 provides that the council of any Municipality may, by bye-law, declare that the provisions of this Act, allowing performance of labor in lieu of road tax, shall not apply to such Municipality, Parish or Parishes therein; and

Whereas, "Several County Councils have shown a disposition to adopt the provisions of said Act; therefore be it

Resolved, "That the Legislature be requested to amend said Act so as to provide that any Municipality may, by bye-law, declare that a cash assessment be paid in lieu of statute labor of 90 cents in lieu of \$1.50; 30 cents in lieu of 50 cents as provided for in sub-section 1, section 31 of the Highway Act."

This resolution passed without much discussion, as the matter had been thoroughly discussed at a previous meeting.

Meeting adjourned until 7.30 o'clock.

EVENING SESSION.

MR. HILL stated that he would be glad to receive any resolutions or remarks that might be offered.

MR. BURDITT said that he did not know what the views of the delegates might be in reference to the use of rollers. MR. HORN BROOK, he thought, believed rollers were not much required, but others thought rollers would be valuable supplements to the road machines. For the purpose of bringing the matter up for consideration he read the draft of a suggested resolution.

MR. PETERS thought it was very important that heavy rollers should be used in road making. A new road should be gone over with a steel roller. He also thought a road should be wet when rolled, and unless this were so it would be almost useless to roll it.

MR. HORN BROOK approved of what MR. PETERS said in reference to the road being wet. He said you could not thoroughly make a

road when it was dry and dusty. You could roll it when it was dry, travel on it all summer, and it would remain firm, nice and level, but as soon as rain came in the fall it would become a mud hole. If, however, it was worked thoroughly when wet, and rolled, it would settle down firm and become a compact road, and would not be opened up in the fall by the rains. There was no good road made in the United States or Canada with broken stone but what was thoroughly saturated with water first. They put water on and thoroughly drench it, and then either put on a steam roller or horse roller. A road should be rolled from the outside to the centre. A roller would be of great advantage if you were gravelling a road after it had been turnpiked.

Some delegates expressed the opinion that road machines or graders were more required than rollers, and that the Government should not be asked to purchase rollers for those districts which were already supplied with road machines until other districts were supplied with the graders.

MR. PETERS thought every Parish should own a roller with a road machine, and moved the following resolution, which was carried :

Resolved, "That the use of heavy rollers in connection with the "road machine in road work, and in grading the roads, is almost of as "much importance as the road machine, and that highway commis- "sioners be urged to procure rollers, or the use of rollers, whenever "possible to do so."

MR. BURDITT said that attention should be given to the constant or continuous care of the highways. A great amount of damage was done to a road on account of not repairing it just at the right time. Constant supervision and constant attention to the small repairs was the idea.

MR. BETTS said that there was a time of year that the roads needed the vigilance of some person in authority. In the spring of the year snow remained on the road until very late, and then there was a great rush of water, and if there was not some person on hand to look after things hundreds of dollars worth of work was destroyed.

MR. HILL thought the Counties should be divided in sections, and each section looked after by those having the distribution of the bye-road money and great-road money, and that a certain portion of this money should be reserved for emergencies.

MR. SHANKLIN said that in case of necessity where a commissioner becomes good for any money, he should have some guarantee that it would be paid.

MR. BETTS moved:

Resolved, "That the commissioners be impressed with the importance of maintaining good roads by exercising constant vigilance, more particularly in the early spring, or when exigencies of the case require: and, further, that when the finances will allow, a permanent man be kept on said road."

Carried.

MR. PETERS said that the ordinary methods of protecting the banks of intervalle land along the river from the wash of the stream and ice and logs seldom accomplished the desired end satisfactorily. He had a model of the system devised by him for protecting the banks, and explained the process. Any person who wished to know in detail about the method could get the information by addressing him at Queenstown, Queens County.*

MACADAM ROADS.

MR. BURDITT said that several of the delegates present had remarked during the Convention that the day was near at hand, if not already here, when better and more permanent work in road construction than any heretofore contemplated would claim our attention, and he thought that this Convention should not break up without some reference being made to the best kind of roads—those thoroughly built with broken stone according to the system of Macadam, as developed by modern engineering skill. It will be said that we have

*The method proposed by MR. PETERS is similar in construction to that which he proposed for the side walls of his culvert on page 51, except that the face is made sloping.

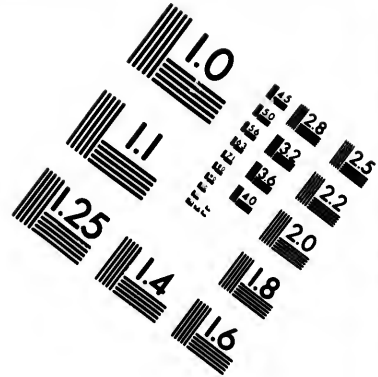
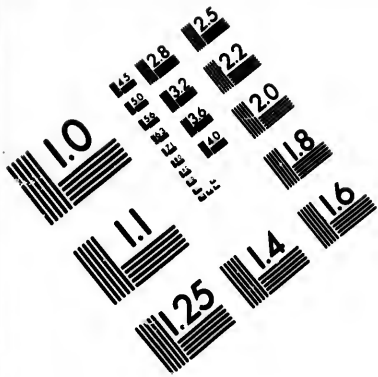
not the means and cannot afford in this Province to build the costly roads here referred to, but while he admitted that the day was yet distant when such a system could be adopted to any great extent throughout the Province, he thought that there were some localities where the traffic was heavy such as the principal highways leading into the larger towns, in which even now it would be the truest economy to build MacAdam roads in the best possible manner. To show that the building of such highways did not necessarily add to the burdens of the people, he would refer to the experience of the State of New Jersey—the pioneer State in road improvement—where it had been found that the enhancement in the value of property along the macadamized highways amounted to sufficient within a few years after their construction to more than counterbalance the cost of the improvement, and that the interest on the bonded debt incurred for the purpose could be paid without any increase in the tax rate. On the same line was the experience of the State of Kentucky. The representative of that State, speaking at the National Road Conference in 1894, said :

“The question about this matter which is of great interest to our farmers is the question of taxes. When we first began to build those roads the county levy was thirty cents on the \$100, and when we had got through building them, and had spent \$60,000 of the county’s money, it had been reduced to fifteen cents on the \$100, which astonished them very much. But the increased value of the land along the road has almost doubled the taxable value of the county, and has thus reduced the levy so greatly.”

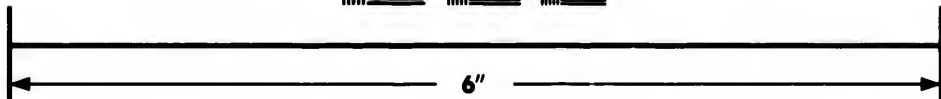
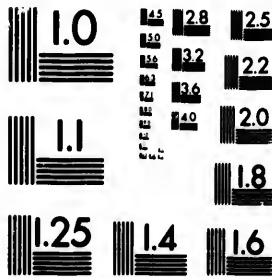
I would also like to read one or two extracts from opinions expressed by the farmers of New Jersey upon this subject. One writer says :

“Prior to 1893 I lived within two miles of a stone road leading to Camden. My tenant hauled manure from Philadelphia during the fall and winter, going down with two horses and bringing out a load with them. When he got within two miles of home he had to double up his teams in order to bring the two-horse load the balance of the distance to my farm. It took him longer and was more fatiguing to the team to come those two miles than to come the entire ten miles from Philadelphia to Merchantville, and he was





**IMAGE EVALUATION
TEST TARGET (MT-3)**



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23 WEST MAIN STREET
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10

"frequently obliged to throw part of the load off to get home with the four horses. It is this waste of time which makes it important to farmers that we should have improved highways."

Another New Jersey farmer says:

"Before the building of the turnpikes twenty-five baskets of potatoes were considered a load from the farm I now occupy to market. After the turnpike was built fifty to sixty baskets were considered no more of a load than the twenty-five a few years previous. And now since the stone road has been built our load is eighty-five to one hundred baskets, and during the past winter our team has carried over one hundred and fifty loads of manure from Philadelphia, several of which I weighed and found to amount from 6,869 to 7,920 pounds clear of the wagon, which alone weighed 2,300 pounds—a combined weight of four-and-a-half tons. Many of these loads were drawn from the city to the point of leaving the stone road with only two horses, and the result has been the saving of over \$100 in my manure bill for the year."

Another writer says:

"I operate a farm of two hundred acres near the line of the recently completed 'White Horse' Telford Road. I consider this road one of the greatest public benefits ever conferred upon the people of this locality. At a distance of eight miles it brings us nearly an hour nearer the market. It enables us to dispense with one team. Our teams are in better condition and require less feed and attention in doing the same amount of carting."

Another says:

"I would not sell my house and accept another worth \$7,000 as a gift and be obliged to live in it if two miles from a macadam road. No farmer in this neighborhood would buy a farm not located on a macadam road. Now that they have a sample of the road they all want it."

Many more similar examples, MR. BURDITT said, might be given showing the high estimation in which these macadamized roads are held by those who are privileged to use them, but he would not take up any more time of the Convention on this subject.

MR. D. W. MARTIN said that the subject of macadam roads was one which particularly interested him. In the City of Moncton, which is built on a clay soil, they had found great difficulty in getting satisfactory results from work done on the streets. Any gravel or other material they might place on the surface soon worked down into the clay, and in spring and fall the roads were almost impassable on account of mud, except where they had laid wooden block pavement. He would like to get some information as to the best means of remedying this state of things.

MR. BURDITT replied that the conditions described by MR. MARTIN emphasized the necessity for underdrainage. For detailed information in regard to making macadam roads he would refer MR. MARTIN to some of the pamphlets which the Association had for distribution, but he might say that it was utterly useless to put broken stone or other surface material upon such soil as they had in Moncton unless the subsoil was made dry and firm by a thorough system of underdrainage. Sewers were intended for carrying off surface water, and they alone did not afford sufficient means for draining the soil. They were made tight so that the subsoil water could not get into them.

MR. MARTIN said underdraining was objected to on account of the expense, as the frost penetrated to a great depth at Moncton, and the drains would have to be laid six feet below the surface to get clear of frost.

MR. BURDITT, in reply, explained that when the water was drawn out of the soil the frost did not penetrate as it did in a soil that was saturated with water, hence it had been found that four feet beneath the surface was quite a sufficient depth at which to lay tile drains anywhere in this country.

MR. HORN BROOK said that in the United States when they struck a soft surface they laid a quantity of very large stone in the bottom. You should not attempt to make a foundation with small stone, but put coarse, heavy stones in the bottom and then put on your broken stones. If you put the broken stone or gravel on a wet

or undrained soil it did not matter how much stone you put on, it would go down and the water and mud would come to the surface.*

MR. ARMSTRONG, in answer to some points raised by MR. MARTIN, said that there was no difficulty in running the tile drains in any direction required and connecting them with each other or with the sewers. If the land was flat they might have to give them less slope than was desirable; in that case they would have to use larger tile. His idea was that underdraining lowered the subsoil water; the surface water was in a great measure cared for in other ways. One object was to obtain a thick layer of dry earth so that the frost would not penetrate it, and in such mud as they have in Moncton he would put three lines in a wide street.

MR. ARMSTRONG, referring to remarks of MR. EMMERSON at the afternoon session, with regard to encroachment on the highways, read the following resolution which had been prepared by the committee:

Whereas, "It is very generally impossible to ascertain where the "legal bounds of the highways of the Province are, or should be; it is, "therefore, recommended that the Legislature provide for the appointment of a commission, comprised of one or more engineers, with all "necessary powers, to traverse all lands and define and mark out and "record the bounds of at least the principal roads of the Province."

MR. JOHNSON thought the resolution involved a pretty serious question. The practice of encroachment on the highways had become a great nuisance.

MR. W. S. TOMPKINS thought that the Government should provide the engineers with a body guard when they started them out on that mission.

MR. EMMERSON said that, of course, he recognized the fact that in the early history of the Province proper provision was not made in this respect. He found that in some of the Counties this was a very

*NOTE.—MR. HORN BROOK is here referring to what is called Telford Pavement. It is an excellent but somewhat expensive road covering akin to macadam. In it, after the roadway has been excavated to the proper depth and shape, a layer of rather flat stone, set on edge, is packed by hand, the rough points are broken off with hammers, and the small pieces wedged in among main layer; broken stone, the same as in macadam, is then distributed in layers and rolled to a smooth surface.

serious evil, but in others, perhaps, they had not felt it, nor had any difficulty as regards this evil, and that was a question which, perhaps, would be pertinent at this stage. The question he would put was: Should this be done in Counties where they require it, and, if so, should the other Counties contribute to the costs, or should the cost be borne by the Municipalities? He was glad to see the resolution, but asked the question because there was a delicate point as to whether the expense was to be borne by the Municipality or whether it meant that the Provincial Treasury was to be drawn upon. There were some Counties where this would not be required to be done, and should the public funds be drawn upon to have the remedy applied in some Counties and not in others? That was for the delegates to take into consideration. If they voiced the opinion of the people of the Province, and wanted the money expended in this way, the department would not cry over it.

PRESIDENT HILL thought the object of the resolution could be accomplished by legislation which would give power to Municipalities to have the work done where it was necessary.

MR. PETERS said if there was any legislation to be had in reference to fences they should be abolished.

After some further discussion, the resolution was withdrawn.

The following resolution was then put and carried after a brief discussion:

Whereas, "Great damage is frequently done to the highways by "obstruction of ditches and by other encroachments;

Therefore Resolved, "That the attention of the Government be "directed to the advisability of empowering highway commissioners "to compel any one causing damage to the highway by any obstruction or encroachment to repair said damage to the satisfaction of the "commissioner or be liable for damages, and that the commissioner must "act on the written complaint of any stated number of taxpayers."

Carried.

PRESIDENT HILL, in addressing the meeting, said that he had been elected President of the Good Roads Association much against his will. He thought the President should reside in St. John, where

the movement had originated. In view of that, and with the hope that a younger man might be procured, he begged leave to tender his resignation.

MESSRS. ARMSTRONG and BURDITT both protested, and MR. HILL finally consented to remain in office.

MR. OSMAN, M. P. P., thought it would be advisable to encourage as much as possible the erection of wire fences along the highways of the Province.

MR. STEVENSON thought that the best way to construct roads on side hills was to have them incline towards the inside rather than towards the outside, as when they sloped towards the outside the water washed them away very quickly.

MR. ARMSTRONG approved the idea, but said that frequent cross drains would be necessary.

MR. HOENBROOK thought that the rush of water that would accumulate on the inside down the hill, if this system of construction were followed, would sweep away everything. He suggested that the roads be built very wide and almost level, but with a slight slope to the outside, and the outside edge be finished off with a ridge of small stones or coarse gravel.

MR. SEARLE thought that if the road sloped outward, ice would form in the winter and it would be impossible to keep a sleigh on the road.

MR. HALL said it would be well to try and do away with small wooden culverts and substitute something better, as the frost heaved them. He moved the following resolution:

Resolved, "That this meeting recommend the use of earthenware pipes, or that pipe of similar nature be used very largely instead of log culverts."

Some delegates objected to the use of earthenware or cement pipes on the supposition that in this climate they would be destroyed by frost unless laid very deep. To disprove this an extract was read from the report of the Convention held in St. John last

September, in which MR. A. W. CAMPBELL, C.E., referred to his experience in the use of such pipes for culverts in Ontario, and showed that if they were properly laid with a free outlet, there was no danger of their destruction by frost. (See page 47 of Report of St. John Convention).

Resolution carried.

MR. KING moved :

Whereas, "It is the intention of the Government to have the "proceedings of this meeting printed and attached to the previous "minutes of the meetings held in St. John, September 21 and 22, "1897, for distribution throughout the Province ;

Therefore Resolved, "That a number of copies (to be left to the "discretion of the Government) be sent to the Secretary-Treasurer "of each Town Council and of the County Council of each County "in the Province for distribution by him throughout such Town and "County."

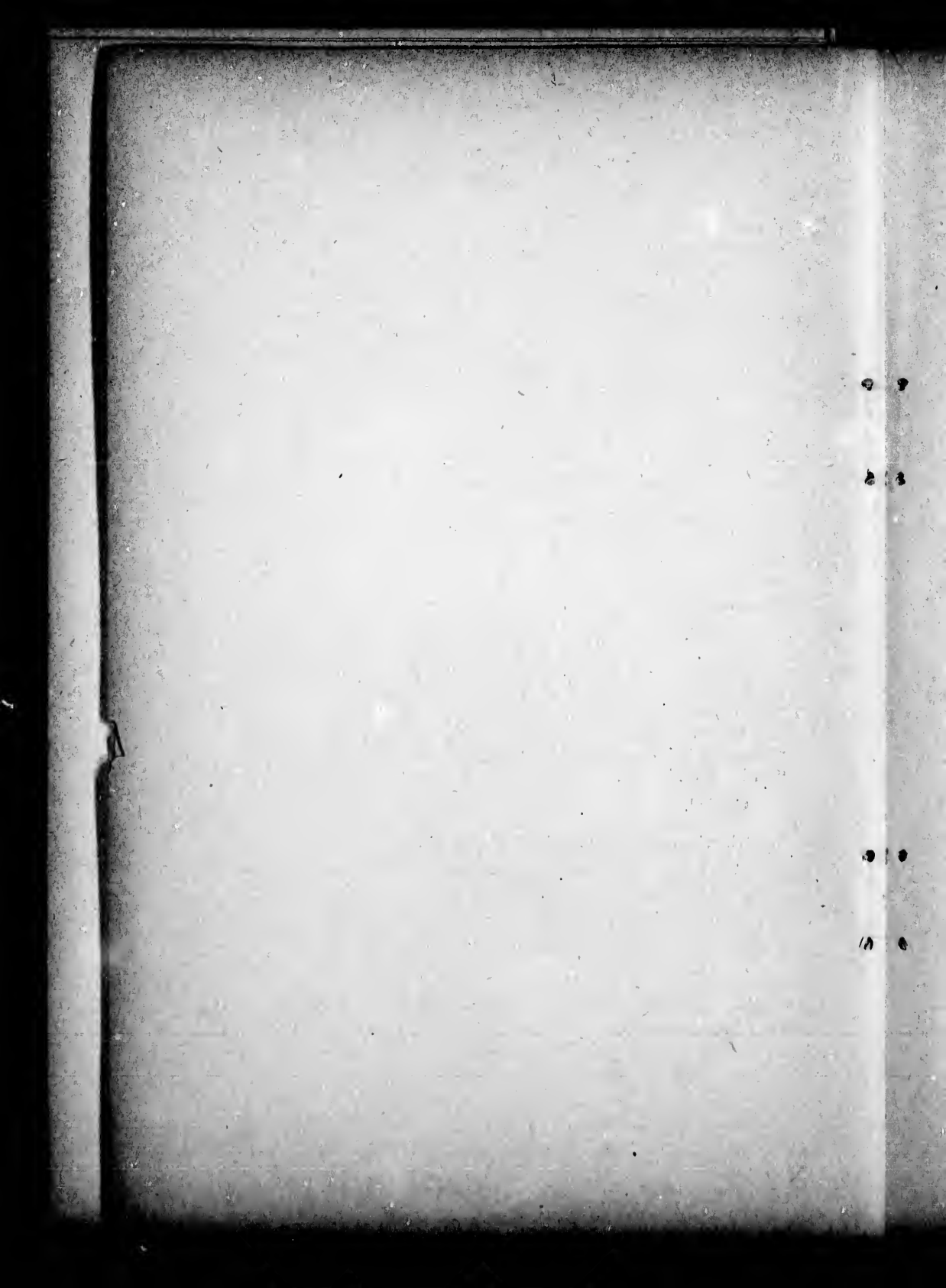
Carried.

Moved by MR. BETTS, seconded by MR. WISE :

Resolved, "That the thanks of this meeting be tendered to the "Government for the encouragement they have shown the Associa- "tion, and the material assistance they have rendered it in carrying "on its work."

Carried.

The Convention then adjourned *sine die*.



ROAD DRAINAGE.

BY ISAAC B. POTTER, *President L.A.W.*

WHY DRAINAGE IS IMPORTANT—NO WELL DRAINED ROAD CAN BE LONG MUDDY—AMOUNT OF RAINFALL—SIDE DITCHES; HOW TO MAKE THEM; THE DITCH GAUGE; HOW TO MAKE AND USE IT—LOCATION OF SIDE DITCHES—UNDER DRAINS—LEVELING—STONE DRAINS AND TILE DRAINS; SELECTING TILE; SIZES TO BE USED; LAYING TILE; TOOLS AND MATERIALS.



IMPORTANT COUNTRY ROAD, NEAR ALBANY, N. Y.

The road surface shown in this picture is drawn from a photograph. The section of road shown in the foreground is drawn to show the condition of a saturated earth roadway; the small channels and interstices between the particles of earth being filled with water which cannot run off till drainage is provided for.

The first necessity of every good road is drainage. Dirty water and watery dirt make bad going, and mud is the greatest obstacle to the travel and traffic of the farmer. Mud is a mixture of dirt and water. The dirt is always to be found in the roadway, and the water, which comes in rain, and snow, and frost, softens it; horses and wagons and narrow wheel tires knead it and mix it, and it soon gets into so bad a condition that a fairly loaded wagon cannot be hauled through it. We cannot prevent the coming of this water, and it only remains for us to get rid of it, which can be speedily done if we go about it in the right way. Very few people know how great an amount of water falls upon a country road, and it may surprise some of us to be told that on each mile of an ordinary country highway anywhere in this country (three rods wide), there falls each year an average of twenty-seven thousand tons of water. Water is a heavy, limpid fluid, hard to confine and easy to let loose. It is always seeking for a chance to run down hill; always trying to find its lowest level. In the ordinary country dirt road the water seems to stick and stay as if there was no other place for it; and this is only because we have never given it a fair opportunity to run out of the dirt and find its level in other places. We cannot make a hard road out of soft mud, and no amount of labor and machinery will make a good dirt road that will *stay good* unless some plan is adopted to get rid of the surplus water. To state it briefly, every country road should have side ditches — one on each side of the roadway, wherever possible.

SIDE DITCHES.

Side ditches are necessary because the thousands of tons of water which fall upon every mile of country road each year in the form of rain or snow should be carried away to some neighboring creek or other water channel as fast as the rain falls and the snow melts, so as to prevent its forming deep mud and destroying the surface of the road. When the ground is frozen and a heavy rain or sudden thaw occurs, the side ditch is the only means of getting rid of the surplus water, for, no matter how sandy or porous the soil may be, when filled with frost it is practically water tight, and the water which falls or forms on the surface, must either remain there or be carried away by surface ditches at the sides of the road.

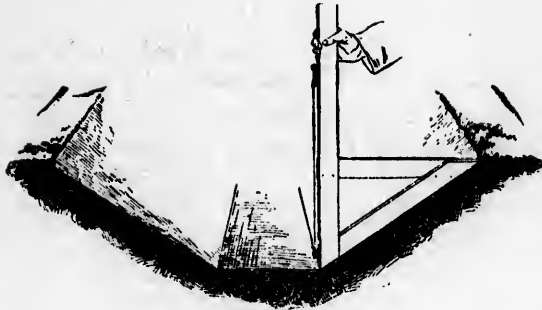


FIGURE 8.

Showing proper form of ditch to be dug along the side of the country road. The sides are broad and flaring and have slopes of "1½ to 1;" that is the slope extends outward a horizontal distance of 1½ feet for each one foot of vertical rise. The bottom of the ditch may be from six inches to one foot wide. The gauge is provided with a plumb line, fastened to the upright strip, as shown in the figure, and by this means the upright piece is held vertical and the slopes made to correspond with the edge of the diagonal strip.

The bottom of a side ditch should have a gradually falling and even grade or run, and broad, flaring sides. Look at Figure 8. It shows you the forms which a side ditch should have. Its banks will not cave in. It can be easily cleared of snow, weeds and rubbish; the water will run into it easily from each side and it is not dangerous to wagons and foot travellers. It is, therefore, a much better ditch than the one shown in Figure 9, which represents the kind of ditch very often dug along the country roadside.



FIGURE 9.

Showing form of side ditch frequently seen along country roads. The sides of the ditch are too steep and quickly "cave in" at sides and edges, thus obstructing the flow of water at the bottom. This form of ditch is also dangerous to travellers.

THE DITCH GAUGE.

To make the ditch shown in Figure 1, and to make it with even, flaring sides, so as to produce a workmanlike job, we had better use a rough gauge like that shown in Figure 8.

This gauge is made to fit the proper cross section of a good surface ditch, and by "fitting" it in the ditch as we go along, the shape of the ditch will be kept uniform and correct. The gauge can be made of any convenient strips of wood, and the dimensions are described in the text below the figure.

LOCATION OF SIDE DITCHES.

If possible the side ditch should be about three feet from the edge of the travelled roadway, and there should generally be a side ditch on each side. If the travelled roadway is fourteen feet wide, there will then be twenty feet of clear space between the ditches; if the travelled



FIGURE 10.

MR. A. W. CAMPBELL, in his address in St. John, did not favor leaving a shoulder, or three foot sodded space, between the road formation and the edge of the ditch, preferring the section shown in Figure 1, though with more rounded crowning than your secretary has shown. Figures 7 and 10 are added as good ditching sections, when work is done by the road machine. Figure 10 is the same as Figure 7 except in that it shows mode of deepening the ditches in passing a small rise of ground, and where extra depth is required to obtain sufficient fall. On any road where two loads of hay are likely to meet, the edge of the steeper ditch slope should not be less than ten feet from the centre of the road.

roadway is sixteen feet wide, there will be twenty-two feet of clear space. Now and then we shall find a place where the roadway is too narrow for these figures, and in such cases we may have to get along with a single ditch and a narrow roadway. The best rule is the rule of common sense.

Sometimes side ditches are entirely omitted and the shallow gutters at the sides of the wagon way are depended upon to carry off the surface water. This form of construction is shown in Figure 11. These gutters sometimes serve a good purpose, especially when made in regular shape and with good grade (as can be done with a good road machine), but they are likely to be clogged and destroyed by passing wagons, and for this reason alone it is better to make one or more separate side ditches when possible. When the highway space is too narrow to admit of the use of a side ditch, and in fact, in all cases, it is important to keep the angle ditches at the edge of the roadway clean and smooth by cutting out the angle and smoothing the surface; using a road machine and roller if these can be had. The work of a road machine in cleaning out an angle ditch is shown in Figure 6. On this point more will be said in the next chapter.

Common side ditches catch surface water and surface water alone. When the surface of the roadway becomes rough and rutty by the passing of wagons, the ruts and low places hold the water and prevent its passage into the side ditches, and although these ditches carry most of the water which falls, there is often enough left in the roadway to create deep mud and produce much harm. In spring the frozen ground prevents the water from passing downward into the soil, and it remains to form mud on the surface.

Side ditches should be kept clear of weeds, grass, alders and all sorts of material that will tend to clog the ditch and stop the flow of water. They should be regularly examined and the greatest care taken not only to keep the ditches open, but a free and unobstructed drainage from the roadway into the surface ditches should also be maintained.

UNDER DRAINS.

No way has yet been found of getting entirely rid of this mud, but nearly every dirt road can be greatly improved and a practically dry road obtained nearly the year round by the use of one or more lines of under drains. It is safe to say that there is scarcely a dirt road in the country which cannot be so improved by under draining as to yield benefits to the farmers a hundred times greater in value than the cost of the drain itself.

Few people understand what a great amount of water is held by different kinds of soil. It has been found by actual experiment, that a cubic foot of sand will retain from twenty-seven to thirty-two pounds

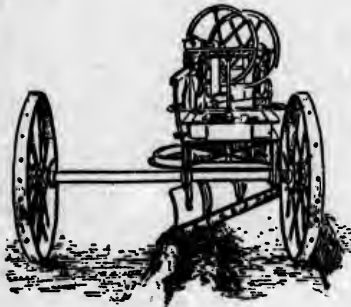


FIGURE 11.

Showing "angle ditch" at side of roadway being cleared and opened by the use of a road machine. These machines are great savers of time, labor and money, and will open ditches, clean out weeds and rubbish, and give proper shape to a country road quickly and more uniformly than can be done by hand work.

In most soils this water evaporates very slowly and we cannot prevent the formation of mud except by drainage.

Many miles of road are on low, flat lands and on springy soils, and are, for many weeks in the year, overlaid by a wet sub-soil. Whenever frost heaves the roadway, and in coming out makes it bad for any length of time, it is a sign that it needs underdraining. In all such cases, and, indeed, in every case, where the nature of the ground is not such as to insure quick drainage,

of water; loamy clay, about forty-one pounds; stiff clay, forty-five pounds, and "humus" (soil formed of decomposed animal or vegetable matter), over fifty pounds. In other words, the weight of water in a cubic foot of humus, is more than one and eight-tenths the weight of the same earth in a practically dry condition, while the weight of water in a cubic foot of loamy clay is about one-half the weight of the entire cube.



FIGURE 12.

Showing form of under drain made with field stones. The ditch is first dug and carefully graded at the bottom; then large flat stones are carefully placed at the bottom so as to form a clear passage of good size for the flow of water. The ditch is then half filled with rough field stones (with small sizes on top), and on these a layer of sod is placed with the grass side downward. The rest of the ditch is filled with earth. If sod is not to be had, fine brush, hay or straw may be used instead.

the road may be vastly benefited by under drainage. An under drain clears the soil of surplus water, dries it, warms it and makes impossible the formation of deep, heavy, frozen crusts which are found in every undrained road when the severe Winter weather follows the heavy

Fall rains. This frost causes nine-tenths of the difficulties of travel in the time of sudden or long continued thaws.

Examine the pictures on pages and cover. Each shows a variety of ailments, but the chief trouble in each case is a lack of drainage. Thousands of miles of these impassable roads may be found for weeks at a time. Drainage is the fundamental necessity. There can be no good road without it.

Showing another form of under drain made with field stones where flag like stones are easily obtained. The drain is filled by two flags (*h h*) set up against its sides and meeting at the bottom, kept apart above by stones of any shape large enough not to fall in and obstruct the water way (*g*); above that by a layer of stone or clean gravel, then earth above (*f*) instead of stone, as shown.

Under drains are not expensive. On the contrary, they are cheap and are easily made, and if made in a substantial way and according to the rules of common sense, a good under drain will last for ages.



FIGURE 13 (added by Secretary).



Use the best tools and materials you can get; employ them as well as you know how and wait results with a clear conscience. Slim fagots of wood bound together and laid lengthwise at the bottom of a carefully graded drain ditch will answer fairly well if stone or drain tile cannot be had, and will be of infinite benefit to a dirt road laid on

springy soils. If the drain cannot be laid in the centre of the road without seriously interfering with the passage of wagons, the ditch can be dug on one side of the roadway and between the roadway and the ditch. It should not be less than four feet deep, and this depth will, in most cases, be about right. If we decide to use field stones, we should select flat ones to form the opening or channel at the bottom of the drain, and they should be laid with care, so as to leave a good sized opening, as shown in Figure 7. The method of building this drain is described briefly in the text under the figure.

HOW A DRAIN WORKS.

If we put a dry sponge in an open dish and place it outdoors in a heavy shower, the sponge becomes filled with water and we say it is "soaked" or saturated. If we then make a hole in the bottom of the



FIGURE 14.

Showing how the soil under the road is drained by an under drain. This figure shows the ordinary form of roadway made by a road machine, with no side ditches except the angle ditches formed by the blade of the machine. The drainage water is drawn out of the soil by the tile drain at the left, and the top line of saturated earth is lowered to about the level of the tile. The drain may be put either at the side or the centre of the road. It works about the same in either position. It should be on that side of the road on which the natural surface of the ground is the higher.

dish, the water at once finds an outlet and a large portion of it runs out; the sponge soon becomes lighter in color and lighter in weight and, if exposed to the sun, will quickly dry. Nearly every soil is made up of a large number of particles filled with pores and separated by very small channels, and these pores and channels absorb water just as the sponge does, and will hold it for a long time unless there is an outlet at the bottom through which the water may run out. This

outlet is provided by an under drain. The water is heavy and limpid; its natural course is downward; it enters the drain tile through the openings between the different lengths of tile (the "joints") and runs along down the grade inside the pipe till it reaches the outlet.

Each little channel between the particles of earth acts as a feeder to the drain and each drain will clear the earth of drainage water down to about the level of the tile. The water cannot leak out through the open joints of the tile because the earth below and at the sides of the tile is already completely filled with water and cannot contain more, and as long as the channel of the drain is not entirely filled with water, the soil will continue to empty its drainage water into the tile. Figures 10 and 14 show the way in which an earth road is drained by one or more lines of tile.

LEVELLING.

The use of a simple drainage level is easily learned, and the roadmaker who can employ a level in his work is certain to have the best

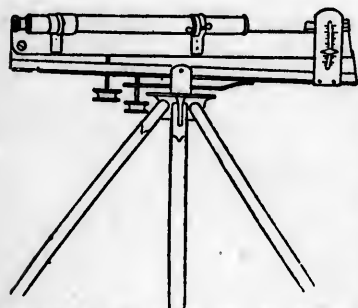


FIGURE 15.—HARRIS'S GRADE LEVEL.

results. It will aid him in fixing and staking out grades for the roadway, for surface ditches and for underdrains, rapidly and accurately, and besides insuring a better and more permanent job, it will be a source of satisfaction to him in every branch of his work. The cheaper forms of levels sold by dealers in surveyors' instruments will generally answer every purpose. There is now in the market a special "drainage level" which, by an ingenious mechanical device, is made to indicate grade at each point of the ditch or roadway without requiring the roadmaker to "figure it out." The appearance of the grade level is shown in Figure 15. The price ranges from twelve dollars upward. Full directions for using the level is contained in a handbook supplied by the maker, and it is scarcely worth while to include them here.

THE DRAIN DITCH.

Before beginning to dig, lay out both sides of the ditch by two lines of stakes set 25 feet apart lengthwise with the ditch. Do this carefully. For a depth of four feet, in stiff clay soils, a width of 16 to 20 inches at the top of the ditch will be about right if narrow drain tools are used. If any part of the ditch is deeper than four feet, widen the top in proportion to the increase of depth. Use sharp narrow spades for digging and cutting the sides of the ditch, and if you have much underdraining to do get a set of draining tools, or at least a ditching spade, a tile spade, and a "draining scoop" or finishing scoop to use in

shaping the bottom of the ditch to fit the tile. These, with a level, and careful work will be enough. If the sides of the ditch show signs of caving in, brace them with short pieces of board or plank and cross brace as shown in Figure 18.



FIGURE 16.
Finishing Scoop for shaping bottom of drain ditch to proper grade and of correct form to receive tile.

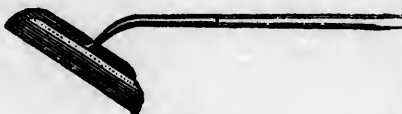


FIGURE 17.

Mile's improved Draining Scoop for removing earth from the bottom of the ditch and preparing a bed for the tile drain.

Begin at the lower or down stream end of the ditch so that water will run out as you go along with your work. Do not open too great a length of ditch at a time; put your tile in place as you go along and cover it. It will then help to keep the ditch dry and will make your work easier. Be very careful to keep an exact grade as you go along; a succession of humps and hollows will cause your drain to clog and will in time ruin it.

GRADE OF DRAINS.

If possible give the bottom of your drain ditch a fall of at least six inches for each hundred feet of length. A fall of three inches will carry the water, but with light grades extreme care must be used in forming the ditch bottom to exact grade in every part, and the lighter you make the grade the greater will be the danger of a sluggish flow of water and the clogging of the drain.

SIZE OF DRAIN.

If poles, withes, or faggots are used (as they sometimes are when stone and tile are scarce or too expensive) they should be laid lengthwise in the bottom of the ditch to a height of not less than six or eight inches. The ditch should be six inches wide at the bottom, and the poles, withes or faggots should be carefully covered with sod, with the grass side down, before the ditch is filled. If stone is used, select flat pieces to form the opening, and make the cross section of channel at least four inches in smallest dimension. If tile are used, the proper size will depend on the length of the drain and the condition of the ground. If the drain is long, the soil wet and "springy," and the grade light, a five inch tile will be about right, and whether one or two lines of tile should be used must depend on the judgment of the roadmaker. Under ordinary conditions the following rule may be used:

For drains not longer than 1,200 feet use a 3 inch tile.
For drains 1,200 to 2,000 feet long use a 4 inch tile.

Beyond 1,200 feet, towards the lower end use 4 inch tile, and so on. If the fall is less than what is desirable, the size of drain should be increased.

Wherever it is possible to avoid it, the rate of fall should not decrease, but when it must necessarily do so, and there is any considerable difference, a silt box should be placed at the point of change.

For drains 2,500 to 4,000 feet long use a 5 inch tile.

Remember the rule, that double the diameter gives four times the capacity. A four inch (round) tile will pass more than four times as much water as a two inch tile, because it has an opening four times as large and an inner surface (which obstructs the flow of water by friction) of less than four times the inner surface of the two inch tile. A three inch tile will pass about thirty-five gallons of water per minute when laid on a grade having six inches fall per hundred feet. But a larger drain is never out of place in a roadway, and it is better in some than the smaller one. It admits more freely the warm air in spring and hastens the thawing of the frost and the drying of the road.



FIGURE 18.

Cross section of ditch with traced plank supports to prevent caving in.

QUALITY OF TILES.

Avoid soft, underburned tiles, which can generally be detected by their pale color and by the soft, dead, "punky" sound given out when they are struck by a steel blade or hammer. They are likely to become softer when saturated by water, and to yield to the pressure of earth or become destroyed by frost. Avoid, also, over-burned tiles, which, though often extremely hard, are generally shrunken, more or less warped, and difficult to lay and to match joints one with another. Select straight, hard tiles of a strong, bright cherry color, and see that they give out a clear, ringing sound when struck by a trowel or piece of steel. All tiles should be assorted before using, and the least perfect pieces should be put in the up stream or inlet end of the drain.

LAYING DRAIN TILES.

If your drain fails in a single spot it fails entirely, and no drain is better than its worst laid tile. The grade cannot be guessed at or carelessly followed, and in most cases it will be best to employ a skilled ditcher to do the work. A taut line should be stretched lengthwise with the ditch and over its centre, and this line should be exactly parallel with grade of the



FIGURE 19.

Workman at work in drain ditch: taking out bottom with draining scoop and laying tiles as described in the text.

bottom of the drain and about seven feet above it. This being done, Dr. Manly Miles, in his excellent little work on "Land Draining,"* gives the following directions, than which the author can suggest no better:

"The ditch having been dug to within eight or ten inches of the bottom, and the line properly adjusted over the middle of the ditch, two men may begin the work of finishing the excavation and laying the tiles, which we will suppose are for a four-inch main, beginning at the outlet. A level-headed boy, or the proprietor as superintendent if he does not prefer to lay the tiles himself, will facilitate the work by managing the measuring rod, and performing any other service that may be required, from time to time, outside the ditch.

"One of the men standing in the ditch, with his face towards the outlet, with the six-inch draining spade slices off the earth, or loosens it to nearly the required depth, moving backwards as the work progresses, while the tile-layer stands facing him and throws out the loose earth with a shovel scoop, or the draining scoop, Figure 17, as may be most convenient. When the excavation has been finished for a distance of three or four feet, the tile-layer planes a groove in the bottom of the ditch with the draining scoop, to the required grade, as gauged with the measuring rod, and lays two or three tiles in it with their ends closely in contact, and covers them with five or six inches of earth, on which he then stands, packing it around the tiles as he proceeds with his work. The next section of the ditch is then prepared for three or four tiles by a repetition of the process of excavation—planing a groove for the tiles—laying them and covering with earth, to form a platform on which the tile layer advances, and the same routine is again repeated.

"By following this system, it will be seen that the feet of the workmen are not within eight or ten inches of the bottom of the ditch, the man with the draining spade standing on the earth to be excavated, and the tile-layer on his underdrained platform, as represented in Figure 19, is exempt from the annoyances of mud and water that are usually associated with the work of draining. If the bottom of the ditch is soft, and water is running over it, the man with the draining spade will be standing in mud, which will interfere with his efficiency and the general progress of the work. This can, however, be obviated in a very simple way, that more than repays the extra trouble it involves. A one and one-half or two-inch pine plank about six feet long, and a little narrower than the bottom of the ditch, is laid down for him to stand on. Near the upper end of the plank a hole should be bored, in which a small rope is tied, its free end being thrown over the edge of the ditch to keep it out of the mud. With this the plank can be pulled back from time to time, as may be required."

COST OF TILE DRAINS.

Of course, no exact figures can be given to show the cost of laying underdrains, since the expense will vary with the cost of labor, the difficulties of digging, the size of tiles used and other items.

*Published by ORANGE JUDD COMPANY, New York, 1892.

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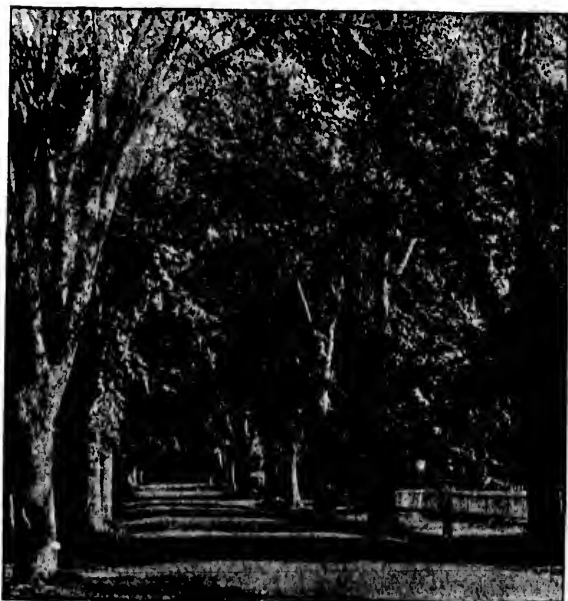
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OUR VILLAGE ROADS.—AS THEY TOO OFTEN ARE.



AS WE SHOULD LIKE TO SEE THEM.

