

of the trench was, as a rule, good, the quicksand coming from a few feet higher up. In some places, however, where the bottom was soft, timbers were put in to give a firm bearing for the pipes. As a result of the flow of sand into the trench, caves were formed behind the sheeting, and when for any reason a delay occurred causing the trench to be left open a little longer than usual, big falls of sand took place, due to the cave and the weight of earth above. These often pulled down the top setting of timber a few feet with it and causing the walings to snap. This constituted a great danger and the work was delayed on several occasions by the caving in of the sides of the trench from this cause. The system of cross braces shown in Fig. 1 was adopted to prevent the occurrence. Extra diagonal braces were often put in as well, but even this did not always prevent the settling down of the timber work with the falling sides. The timber consisted of two settings of 2-in. x 6-in. pine runners, the top setting being 12 feet deep and the bottom 16 feet deep. The walings and struts were of 4-in. x 6-in. pine, and the cross braces of 2-in. x 6-in. pine. A uniform width of trench was kept, and each setting was 16 feet in length, this being the length of walings used. The walings were about four feet apart vertically, three on each side for a top setting, and four for a bottom setting. The cross braces and 4-in. x 6-in. struts were placed at each end of the walings, in addition to 4-in. x 6-in. struts in the middle, the timbering thus being divided up into 8-foot bays. After the bottom setting of timber had been driven down to the full depth, the joints of the runners were covered with short lengths of 1-in. boards to keep back the sand as much as possible. This helped considerably, but did not entirely prevent the sand from washing in.

The drawing of the timbers after the pipes had been laid was attended with some danger. The bottom setting was first drawn, often exposing big caves in the sides of the trench where the material had washed away. These, with the trench, were filled up to the bottom of the next setting before any of the top timbers were disturbed. On removing the struts from the top setting the sides of the trench often fell in from several feet back to the great danger of the timbermen, but fortunately the work was completed without any serious mishap from this cause.

In passing the telephone poles, which came immediately on the side of the trench, the top setting of timber was left in for safety. In addition, stays were placed on the poles and left there after completion of the work to protect them from heeling over or sinking until the trench settled down quite firm. In some places, where the ground was very bad, particularly at a point where the trench passed close to a grove of trees, the whole of the timbering was left in the trench, and after filling such places a large amount of surplus earth remained to be hauled away. The trenches have shown very little sign of settling down since being filled and it is likely that the caves left behind the timbering where it was not drawn will silt up from underneath quicker than the filling material will find its way through from above.

After completion of the sewer it was found necessary to do a certain amount of flushing to remove the sand from the pipes. The sewer is now in satisfactory operation.

It is interesting to note that during the excavation of the trenches, which were situated some six miles from Lake Ontario and at a level of about 250 feet above the lake, a number of boulders were continually being met with, some of them over a ton in weight. The rocks from which these came were of a very varied character, and many of the boulders showed by their scored surfaces unmistakable signs

of having been ice borne. No doubt many of them had been brought from long distances and deposited here when the lakes covered a larger area than they do at the present time.

In the fall of 1911 this work was taken out of the contractor's hands and conducted by myself under the direction of E. A. James, the engineer for North Toronto, Ont.

## ROADS OF SASKATCHEWAN.\*

By A. J. McPherson.†

I have to express my gratification at being allowed the opportunity of laying before you some information regarding Saskatchewan roads and also at being able to attend your convention, as I am very much interested in learning the objects and aims of your association. I can say for the Highway Commission of Saskatchewan that they will do what they can to further the aims of the association, and from what information I have had up to the present is should be done without any confliction with our present policy, as we appear to be trying to arrange our provincial affairs entirely in accord with the ideas expressed by those of your officers whom I have had the pleasure of meeting. I understand that one of the objects of your association is to bring into existence a national highway leading from coast to coast across the Dominion. I propose to show you before I am through how this can be accomplished as regards that part of it lying within Saskatchewan. I will also try and outline the general policy regarding roads which we have been following for the last five or six years with more or less success.

**Importance and Benefits of Good Roads.**—It hardly seems necessary to refer to the importance or the benefits to be derived from good roads before such a convention as this, the members of which are all more or less enthusiastic, their presence here showing that they realize the importance of the question. The importance of proper means for facilitating easy transportation, however, cannot be over estimated. Man is naturally gregarious in his nature and everywhere he is found living in tribes and flocks. He attains his greatest success and most advanced development when living in communities. If a man lived in isolation and depended entirely on his own efforts for everything he needed he would be compelled to live in a very crude way and any advancement he made during his lifetime would die with him. This is an age of specialization and we find one community will confine its efforts to the production of one article of commerce and another to another. Other communities are engaged solely in the manufacture of one class of machinery while still others will devote all their time to the development of ideas, education, etc. It is necessary that articles thus produced or manufactured be interchanged and transported to where they are needed, and we find a commerce resulting in articles grown or manufactured in all parts of the world. The whole fabric of our modern civilization depends on the interchange of ideas and the gradual improvement on them by succeeding generations. It is thus that advancement is made. Means of communication are essential that this commerce of ideas and commodities be carried on, and the railways and highways with the navigation of the waters form these means of communication. The first trail between the haunts of two savage tribes was the beginning of civilization. We thus see that our modern

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