

Roads and Roadmaking.

Highway Culverts.

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The question as to what kind of material is the best for building culverts is one which is at present engaging the attention of municipal authorities.

During the past few years the use of vitrified pipe for culverts under country roads has grown enormously, and at the present time culvert pipe has almost entirely displaced the old box culverts of timber, formerly so commonly in use. Although its first cost is usually a little more than timber in the long run it is always found to be cheaper because of the lasting qualities of the pipe and its convenience in laying. Timber culverts are continually getting out of order; constant watching and frequent repairs being needed to keep them in a serviceable condition, and at the best they will last only a few years, while well-burned vitrified pipe of the proper thickness, once properly laid, needs no further repairs, and experience shows that it will last for a great number of years.

The too-common way of laying culvert pipe has been to dig a trench, put the pipe in carelessly and cover it up. This is wrong. The bottom of the trench should be rounded out to fit, as nearly as possible, the body of the pipe from the lower surface up to the horizontal centre line; then cut little depressions in the bottom of the trench to fit the sockets, so that when the pipe is laid its entire lower surface, from end to end, will rest solidly on the ground. When the ground is soft or sandy this cannot be done, but the same result may be obtained by carefully ramming the loose earth under and around the lower surface of each section of pipe, up to its horizontal centre line, after it is placed in position. When this is done properly it is a matter of no consequence how high the bank is above the pipe, for it cannot be broken by the weight of the earth. If the face of the bank is solid and not likely to cave or slide the end pipe needs no protection other than to secure a firm rest for their lower surface. Sometimes the earth will be found hard enough to obtain this without protection; if not, then a bulk head of some sort should be made to receive the end of the pipe. If, however, from the heavy rains or overflows, the bank is liable to be undermined, then this parapet wall should be extended up high enough to give the desired protection. This bulkhead may ordinarily be built of plank, as its object is merely to keep the end section of the pipe in its proper position, but stone or brick is better. The joints should be put together with good cement, plenty of it, and not much sand in the mixture; care should be taken that the inside of each joint is scraped out when cemented, in order that no loose cement will be left projecting into the pipe, which, when it

hardens, will help to check the discharge.

In northern latitudes, where severe cold prevails, the culvert should have a good fall, and be so constructed that it will drain itself, for if the pipe is allowed to stand partly full of water, as would be the case where the outlet of the culvert was so low as to admit of back water, the expansion of the water in freezing is liable to burst the pipe, if the water rises in it more than enough to half fill it.

When the capacity of one pipe is not sufficient, two or more may be laid side by side. This practice is quite common and there is an advantage in it, in that the water would not need to rise so high to utilize the full capacity of the pipes, but they should be placed far enough apart to secure a solid bed for each pipe.

I have aimed to give, in a general way, the main points to be considered, necessarily leaving much to the discretion and judgment of the engineer in charge of the work, but we do urge the importance of two things, viz., use only the best culvert pipe, and use ordinary care in putting it in. If you do this the result can safely be left to take care of itself. Don't use inferior or second class pipe or common sewer pipe and expect the best results from it.

Streets and Street Pavements.

A street in a city or town where the best ordered modern devices for promoting the comfort, convenience and health of the inhabitants have been introduced, should provide upon and beneath its surface, first, for the accommodation of ordinary travel and traffic, second, for a drainage of the surface and subsoil, third, for conveying away the facial and liquid refuse, called sewerage, and fourth, for conducting water and gas to the inhabitants.

A few suggestions in regard to sewerage will not be probably out of place before proceeding with the description of street pavements. The importance of sewers in their relation to the health of a people cannot well be overrated. Those of ancient times were generally designed to receive or convey away both the facial refuse and surface water, and those of some of the best sewered cities of the present day have been planned and constructed with the same object in view. In districts where sewerage is used for enriching the land the question of its separation from the rain fall may be an important one. On the other hand the surface drainage of streets that are closely built up, or where the traffic is heavy, is quite as impure in time of moderate rain fall as any sewerage, and it might be unwise to allow all of it to flow directly into the fresh water courses of the neighborhood in localities where the purity of these streams could be preserved by passing it into the sewers, inasmuch as sewers are or should be water tight, as otherwise the contamination of the surrounding soil and consequently of the atmosphere by leak-

age would be the certain result. They in no sense, when properly constructed, act as drains by lowering the subsoil level. In well paved streets very little of the rain fall is absorbed by the soil, but finds its way into the sewers or other channels provided for it, and were it not for the unpaved areas, including back yards and unimproved lots, the question of drainage of the soil in built up streets would not perhaps possess great importance, especially if the soil be of a sandy or gravelly character. It has been shown in Great Britain from carefully prepared statistics that the death rate from pulmonary diseases was reduced fifty per cent. by sewerage certain towns in such a manner as to lower the subsoil water by drainage, while in other towns sewered with impervious pipes throughout, with no provision for drainage, there was no decrease in the death rate from consumption. Some provisions for subterranean drainage should therefore be made without using the sewers for that purpose, although the laying of sewers alone by cutting through the various impervious strata invariably results in the drainage of the surrounding earth to a greater or less degree. It is easy in constructing the sewers to arrange an effective system of subsoil drainage, generally at a moderate cost: by adopting one of the following plans

1st. The method of perforated inverts gives, when the invert blocks are laid, a series of continual channels in the lower portion of the sewer. The joints between the invert blocks are left open on the sides and bottom, but are closely filled and pointed with mortar between the sewer and the longitudinal channels to prevent the escape of sewage into the latter.

2nd. Make the foundations of the sewer itself serve the purpose of a blind drain by forming it of well compacted, broken stone, and place on either side a vertical layer of straw, hay, or fine brush to prevent the choking of the drain with soil.

3rd. Make a blind on each side of the sewer by filling in with broken stone or a mixture of stone and coarse gravel instead of ordinary soil.

County Poor Houses.

Session after session county councillors discuss the advisability of erecting a house of refuge for indigents of the county. The feeling in favor of such an institution is gaining strength throughout the counties where poor houses have not yet been established. The following from the *Mail* brings to public notice the state of affairs existing in one of the eastern counties: "Poverty has brought more of the inmates of the Peterborough jail into custody than crime. A report has consequently been made by the Ontario inspector of prisons which requires the county either to build a separate ward for these destitute persons or provide a poor house. In the event of the former suggestion being adopted the counts must pay the entire cost, but should they build a poor house the Ontario Government will contribute one-fourth of the outlay. It has been a frequent complaint that rural municipalities do not provide for their poor, but either ship them to the cities or put them into jails. The Government will do well to insist upon a reform."