the temporary dams had been built, a great quantity of rain fell, and as the off-take never was intended to carry off all the drainage, the water backed up, so that the clay could not be reached. Another bed of blue clay of excellent quality was then located on the river bank, about two miles below the mouth of the slough, and was conveyed by steamer and scows at a heavy expense.

The foundation was laid as follows: A bed of this clay was deposited on the bottom of the slough about 2 feet in thickness, and 80 feet in length, that is, under the site for the box proper. This was laid in layers a few inches in thickness, carefully spread and levelled, and well tramped and pounded down. On the top of this was laid a row of brush with butts to the end. These small trees were laid close together longitudinally, from one side of the slough to the other, and at one end of the foundation. The branches standing up were "necked" in order to let them lie close. After the first row was laid, another was placed on top partially covering the first layer, similar to shingling a roof, butts all lying out in the same way as number one row. Then another row was laid in a similar manner, until the layer of clay below (80 feet in length) was covered for about two-thirds the distance from one end, or between 50 or 60 feet. After this had been completed, a layer of clay was laid on top from 1½ to 2 feet in thickness, covering the whole foundation This was thoroughly compacted, and tramped down with horses and then levelled up. Upon the top of this clay was laid another layer of brush similar to the lower layer, but this time commencing at the opposite end of the foundation butts out, and extending for about two-thirds of the way towards the first end, and thus overlapping a portion of the first layer of brush, but care being taken that there was a good layer of clay between, so that the brush in no instance would be continuous through the entire length of the foundation. Upon the top of this was laid another layer of clay similar to the previous layer and so on, until the proper height was obtained to lay the box. When the foundation reached the required height, it was carefully levelled off and made ready for the box. The lower planks of the box floor (5 x 12 x 26 feet) were then laid close together, each one being levelled up and pounded down with a heavy pounder, until it lay on an even bed throughout, in contact with the clay. Upon the top of this floor was built the box as shown on the plan.

From the box to each bank of the slough was laid clay and brush in a similar manner to that in the foundation, care being taken that in no case should the brush extend in a continuous layer right through the embankment, or that it should touch the sides of the box. The clay was laid in thin layers and thoroughly tramped and pounded down, especially close to the box, and also carefully knitted into the banks on each side by key walls. A brush and clay embankment laid in this manner was carried up on each side and on the top of the box, until the top of the banks of the slough were reached, with the exception that, after the top of the box level was reached, the slopes on each end were carried up by driving split cedar pickets about 3 inches in diameter and 6 inches apart, 4 feet into the embankment—each row being 1 foot higher than the preceding one, and 1 foot nearer the centre of the box, thus making a slope of 1 to 1 at the ends. Behind, or inside each row of pickets, was laid "heading brush" or brush laid transversely with the box to keep the clay in place. From the top of the bank of the slough, a dyke of ordinary earth-work was built to the height of the river dyke, about two feet above maximum high water. The aprons were built as shown on the plan, the walls flaring out from the ends of the box to the end of the apron, and rip-rap being hand laid outside of the walls upon the floor, to load it down. From the rip-rap walls to the banks, the slopes were built of rough brush and ordinary earth, laid in a similar manner to the clay and brush.

The gates or clappers used on the box, are of the "top hung" pattern. A difference of opinion seems to exist among the engineers of this district, as to advantages derived from that style over the "side hung" gate. The trouble experienced with the gates on this box was as follows: when the freshet first begins to come, the river only rises a few inches in 24 hours, and, according to the state of the weather, may in its steady rise exceed 6 to 12 inches in one day. Consequently, the gates not being hung perpendicularly, but when closed have a batter of about 1 inch in 12—the water keeps running in underneath the clapper, filling the slough inside, as quickly or nearly so, as the river rises outside, and the clapper to all intents and purposes floats on the stream, there being practically no pressure against it, at least not enough to close it. Weights were attached to the bottom of the clapper which assisted materially in closing them. In the case where the water rises rapidly outside, as in tidal waters, no trouble is encountered, for once it begins to rise, a head very rapidly forms, and the gates will close with a sound as of the discharge of a cannon. Another disadvantage of the "top hung" gate is this: when the slough is discharging, the water inside as a rule is very slightly higher than the falling water outside. Also there are always more or less branches of fallen trees, sticks, pieces of logs, etc., being carried out through the boxes. These must necessarily pass underneath the slightly opened clappers, and in many cases are caught between the floor of the box and the bottom of the gate. Then when the tide changes, and the water turns to flow back into the slough, the debris prevents the particular gate from closing. Well designed grillages both above and below the gates ward off much of the debris, but notwithstanding this it is impossible to keep some branches, fence rails, etc., from passing through. In the "side-hung" gates, less trouble is encountered from this. Here the gates are hung in pairs, closing at the centre of the openings, the debris can then float upon the top of the water, and not being dragged along the bottom of the box, has only the two edges of the gates to encounter, and the gates being evenly balanced, will open enough to allow the debris to pass through. This difficulty of course is only encountered when the head on either side is small, and the gates in consequence are very slightly opened. In "side hung" gates there is a slight disadvantage in that it is very difficult to prevent the gates from sagging through length of time, which prevents them from closing tightly. They must be well designed with very heavy and strong hinges.

In many of these boxes on the Fraser, the gates are hung on the outside of the box, and have an advantage that they are more easily reached should anything prevent their closing during high water.

These gates cost practically $10,000 each.

## SEWAGE DISPOSAL.

*Editor* CANADIAN ENGINEER

My attention has been drawn to a letter signed "Expert," which appears on pages 47 and 48 of The Canadian Engineer of June, 1898, containing mis-statements and inaccuracies with respect to the International system of sewage purification, which for ten years has been in this country so successfully used, and adopted in preference to all other methods, and is now being introduced into Canada and America by Mr. J. McDougall. It is evident that "Expert," who prefers to make his assertions anonymously, is not master of the subject on which he writes. His statement that the International Company has changed its filtering process from a continuous flow to an intermittent system, "thereby purifying the sewage by bacteria, which require atmospheric air regularly at short periods," is not correct, as the International Company has always recommended, and was the first to introduce, the now accepted principle that filter beds must be worked on an aerating system in order to ensure the best results. At the present time, by means of valuable patented improvements, we are able to aerate filters every few minutes, and at the same time filter at a much greater speed than any other process, and obtain a far higher degree of purity. "Expert" also makes some rash and totally incorrect statements as regards what he calls "Intricate sludge machinery." The sludge removal apparatus used in the International process is of the most simple and efficient kind, effecting great economy in the construction of sewage works, as its use does away with the necessity of large areas of tanks. The apparatus is used by the British Government, and at a great number of sewage works in this country, and its adoption is rapidly extending, which fact is proof of its success. "Expert" also says the precipitant Ferozone is a "heavy constant and useless expense," and that coal screenings are far superior to Polarite—(the filtering material of the International process). These assertions are so wholly incorrect that it is difficult to understand how "Expert" came to make them unless he wishes wilfully to mislead. As regards the cost of Ferozone,