I.—*On the Heavy Fall of Rain in Hobart Town, on the 26th and 27th of February*, 1854, *with reference to the Sewerage, Drainage, &c., of the City. By* His Excellency Sir W. T. Denison, F.R.S., *&c.* [*Read 8th March*, 1854.]

In laying before the Royal Society of Van Diemen's Land the accompanying return of the amount of rain which fell on Sunday and Monday, the 26th and 27th February, I wish to draw attention to the bearing of the facts thus brought prominently under notice, upon the question of the Sewerage of the Town, to which allusion was made in a paper read by me at the meeting of the Society in November 1853.

In that paper I pointed out the necessity of proportioning the size of the sewer to the maximum amount of water which would have to pass through it, and I also drew attention to the fact, that the water would be discharged more rapidly into the main sewer from a surface properly drained than when it was left to find its own way through narrow, tortuous, and imperfect channels, and, therefore, that the more perfect the system of drainage, the larger must be the main outlet.

I own, however, that I never anticipated the probability of such a fall of rain as has lately taken place, amounting, as it appears, to $8\frac{3}{4}$ inches in thirty-four hours; and it is principally with a view of placing this fact upon record, for the guidance of those who may hereafter be called upon to carry out a system of drainage for the town, that I submit the following remarks, which may be considered as

supplementary to those contained in my former paper, having a special reference to the drainage of Hobart Town.

It appears by the table submitted, which shows in the first page the rate at which the rain fell from 9 A.M. on the Sunday, to 8·50 P.M. on Monday, a period of thirty-four hours, that the total amount of the discharge was 8·68 inches.

On comparing this with the returns on the second page of the maximum amounts which have fallen in any day since 1842, when the records were first kept, we find that in November 1842, 4·05 inches fell in eighteen hours; that in November 1849, 4·0 inches fell in twenty-two hours, while on the present occasion, 6·25 inches fell in thirteen hours; so that while in November 1842, the average discharge was ·225 inches per hour, on Sunday, 26th February, 1854, the discharge was ·416 inches per hour, or not much less than double the former quantity.

It is evident that, in considering the size of the sewer required to discharge a given quantity of water, the absolute quantity is not of so much importance as the rate of delivery, and that a sewer which might be quite capable of discharging 8 inches of rain, if spread over forty-eight hours, would be altogether insufficient to pass the same in twenty-four hours.

If, then, we assume that the rate of ·416 of an inch per hour is the maximum amount which is likely to fall in the area, of which the Hobart Town rivulet is the outlet, we have next to approximate to this area, so as to get an expression for the quantity which will have to be passed through any given part of the rivulet during the same period.

I am not possessed of a survey detailed enough to enable me to give even a guess at the area, neither indeed would it be possible to deduce any very accurate conclusions

from such a survey, for the quantity discharged into the creek at the different points would vary in proportion to the greater or less slope of the ground, and the solution of the problem would therefore be so complicated as to be practically useless.

It is, however, possible to arrive at an approximation to a mean area, in a much shorter, simpler, and, with relation to the subject under consideration, a much more accurate way, by ascertaining the quantity of water passing through the creek at a given spot during any period, say an hour; and assuming this to be the amount which fell during a similar period antecedent to that at which the experiment is made, it is obvious that in this manner some practical result could be arrived at, by which the area of drainage could be ascertained with every necessary degree of accuracy.

At present we are not in possession of any accurate observations by which the quantity of water passing down the creek, at any given period, can be estimated; under such circumstances the following approximation may be admitted rather as indicating the mode of arriving at the area, than as affording more than a guess at its dimensions.

Levels and sections of the rivulet were taken at two points, one above Wellington Bridge, and the other above the Bridge in Campbell-street; the depth of water in these sections was assumed from my recollection of its height at the points in question, on Monday, February 27th, about 11 A.M., when the obstructions at these bridges were cleared away: from the elements thus obtained, it would appear that the velocity of the current above the Wellington Bridge was 14·3 feet per second, and above the Campbell-street Bridge 9·6 feet per second, and the quantity of water discharged per hour at the former was 5559840 feet, while the quantity

discharged at Campbell-street was 3248640 cubic feet during the same period. It is evident I have either over-rated the depth above Wellington Bridge, or under-estimated that above the Campbell-street Bridge; but the mean of the two, or 4404240 feet, may be taken as the average discharge.

If then we assume that the rain falling upon the drainage took any given period, say four hours, to reach the Victoria Bridge, the quantity above determined would be the amount which fell on the area during one hour, say from seven to eight on Monday morning.

On reference to the Table, we find that from 6·50 to 7·50 it rained heavily,—that from 6·50 to 7·10 one-fourth of an inch of rain fell,—that from 7·10 to 7·50 another one-fourth of an inch; so that the total fall amounted to half an inch. If, then, we multiply the number of cubic feet per hour discharged by the rivulet by 24, we shall get the number of square feet contained in the area of drainage $=105701760$ $=2426$ acres.

As I said before, this can only be taken as a very rough approximation, for I have been obliged to assume, first, the average depth of the current at the points where the levels were taken, and again to guess at the time which the water takes to flow from the hills to the bridge. It must be evident that this latter element must be taken as a mean between the shortest and longest period for which the rain, falling in the vicinity of the bridge, would be discharged in a very short time; that falling on the mountain side would, of course, take much longer to reach the outlet, the steepness of the slope of the hill side would, by adding to the velocity of discharge, lessen this difference; but it is obviously impossible to attain to anything like certainty in such a question.

It would be very desirable to institute a series of experiments during the course of next winter for determining the area of discharge more accurately; the experiments would require but very little preparation or attention: it would be desirable to clear the bed of the creek at two points above Wellington Bridge and the Campbell-street Bridge, at, say 100 feet apart, so as to give the water a fair run over the bottom, to determine accurately the section of the creek at these two points, and the difference of level or fall of the bed between them; a scale of feet and inches being then marked plainly on the sides of the creek at those points, any ordinary observer could note down, from hour to hour, the rise or fall of the water, and thus obtain the necessary data for obtaining not only the quantity of water passing, but, when taken in connection with the observations of the rain guage, of forming a very fair approximation to the length of time which the water takes to reach the point of observation.

When a sufficient number of experiments have been made to justify the assumption of the average of the results as a mean to be depended upon, it may become a matter of consideration whether steps might not be taken to intercept a large portion of the water which is forced through the rivulet in winter, and to retain it for the use of the inhabitants during the dry summer months.

A scheme of this kind, if carried out with judgment and boldness, would not only relieve the lower parts of the town from the risk of being flooded, but would afford an ample supply of water, available at all times for the extinction of fires, or for the more ordinary purposes of domestic economy. This, however, is a matter for future consideration, and I will not enlarge upon it at present. I propose to take steps to record the observations to which I have alluded above, and shall submit the results to the Society when they have been determined.