

from the mountains, so that it lies on the eastern side of the plain and on the Waipori and Waiholā Lakes from one to three days, according as it is or is not obstructed in its discharge by the tides and wind. At the time when Mr. Thomson's report was written, the western or higher part of the plains was settled and under cultivation, but the eastern low-lying portion consisted of swamps and lagoons. He therefore recommended that a new and direct channel should be cut for the Taieri River from Outram to the Waipori Lake, which would have had the effect of drawing off the floods from the upper portion and concentrating them in the low-lying parts, thereby securing the former at the expense of the latter. Since that date these low lands have been reclaimed and settled upon to a considerable extent, so that the remedy proposed by Mr. Thomson would now be scarcely admissible.

Messrs. Barr and Blair suggested the construction of one or more storage reservoirs in the upper parts of the river in order to check the floods; and Mr. Blair, having examined the river, indicated several sites suitable for this purpose.

Mr. E. B. Cargill, in a letter addressed to the Hon. the Minister for Public Works, proposes to erect sluices in the gorge of the Lower Taieri, in order to arrest the inflow of the tides, and by this means to lower the average height of the water inside them. He proposes to construct a solid dam up to low-water level, above which, between high and low water, would be sluice or tide gates. By this means he contends that the rise of the water level inside the sluices would be limited to six hours' accumulation of the water in the river, and that the discharge of floods would not be obstructed in consequence of the tide having been kept out; and in any case that if the floods did rise over the land, as they were of short duration, they would do no harm, only having the effect of refreshing and fertilizing the land. This proposal does not appear to consider fully the interests of settlers in the higher portions of the plain, who, while receiving no benefit from the lowering of the permanent tides, are seriously damaged by the floods.

The discharge of a high flood is not stopped by even the highest spring tide, as is proved by the former rising about 3 feet above its level at East Taieri Bridge, the velocity of discharge only being checked, while upon the turn of tide there is a full discharge of the flood water over the whole sectional area of the river channel, the outgoing current extending to the bed of the river, which is between 16 feet and 30 feet deep at low water.

The obstruction of a solid dam raised to low-water mark would reduce the sectional area of the river to the amount of the width into the depth of the tidal range, plus the additional height of the flood, which, by reducing the hydraulic mean depth of the channel, would greatly diminish the velocity, thus causing a heaping-up of the water on the upper side to the extent of raising its surface level during flood at high water about 3 feet, and at low water about 6 feet higher than would occur if there was no obstruction. Thus, the level of high floods being raised, the time occupied in their discharge would be considerably increased by such a weir. Were the sluices so constructed as to open down to the bottom of the river, the results would not be so serious, though they would still offer great obstruction.

In the River Witham, at Boston, in England, such sluices are considered to be a great mistake.

Sir John Hawkshaw, who was called upon to report on the drainage of the Fens, recommended the removal of the sluices, as he and other engineers preferred strengthening the banks, and using sluices on the drains only. It has been found that the sluices caused the river to silt up its bed in such a manner as seriously to interfere with the drainage of the country. The bed of the river silts up to such an extent as to block the sluice doors in summer-time, and which has to be dredged out at great expense, as the impounding of the water behind the sluices and using it to flush the channel was not found to have sufficient effect.

Under certain conditions a rising tide may not have the effect of even checking the discharge of a high flood: it is not impossible that it might increase it, depending, as it does, on the relation between the slope of the water surface, the hydraulic mean depth, and the sectional area of the channel.

In the case of the Taieri, having a bar at its mouth where the channel meets the sea, it is very much shallower than some distance higher up, the consequence of which is that its width is greatly increased in order to compensate for the diminished depth; but the relations which must exist between the width at the mouth, the surface slope, and depth at the same place, together with the width, surface slope, and depth at any given point further up the river, in order to obtain the same discharge at all places, present an exceedingly complicated problem, which could only be solved approximately after the most careful measurements and surveys, requiring considerable time to accomplish, and when ascertained would have little practical value. It may, however, be easily inferred that the whole sectional area of the river channel is necessary for the discharge of the water it has to convey, for if it were not so the bed would silt up till the river had adjusted it to its requirements. In the meantime, the owners of property on the Western Plain have procured an Act of Parliament empowering them to levy rates for the construction of works in order to protect their land. A Board of Conservators was formed, which has accomplished the erection of an embankment from Outram Gorge to the Henley estate, upon the right bank of the river. After a few failures, this embankment withstood the last flood of 1879, from Outram to a short distance below the boundary of the Henley and West Taieri Districts only; the remainder, having been constructed since that date, is still untried. The portion that was then completed effectually protected the western parts of the plains on the right bank. It was ascertained, however, that these protective works had caused the flood to rise unusually high upon the opposite side of the river, which was not protected; that the railway bridge below Outram was seriously endangered; the railway station at Greytown and the line itself below that point was flooded to a considerable depth. This gave rise to complaints from owners of property upon the left bank, and from the Working Railway Department, in answer to which the present Commission was appointed by the Government to inquire into the means of alleviating the probable effects of future floods upon those lands; the owners of land upon the right bank being confident that the embankments erected will protect them.

It would seem evident that the anticipations of owners on the right bank, that they can protect themselves, are well founded, but as they have in no way been made responsible for the effect of their