ERGOT.

By the Rev. W. W. Spicer, M.A., F.R.M.S.

[*Read 12th June*, 1877.]

In a paper on alien plants which I had the honour to read before the Fellows of this Society at their last meeting, I took occasion to mention that one of the imported grasses a Lolium (known in England as Darnel), had an evil reputation, as it was believed to be poisonous—but that this was a calumny on the grass—the fact being, that the several species of Lolium though not themselves poisonous, are apt beyond other fodder grasses, to be infested by a very poisonous fungus, the well known Ergot. Curiously enough within the last few days, our Curator has placed in my hands specimens of a highly ergotised Lolium, not however the Darnel, *Lolium temulentum*, but a much more valuable plant, the common Rye grass, *Lolium perenne*. The specimens are before you, and I thought it might be of interest if I drew your attention to a danger which, where it exists is generally in great abundance. Ergot is a fungus, belonging to the genus Cordyceps, which, (like so many of the order to which it belongs) is parasitical upon other plants. Many of the species indeed attack the lower animals, and probably some of those present have witnessed its effects in what are called "vegetable caterpillars" where the fungus grows from the head of the victim and completely destroys it. One of the best known is *Cordyceps robertsii* peculiar to New Zealand; but we have one at least in this colony, *Cordyceps gunnii*.

However, this is much too large a subject to enter upon now. The particular species of Cordyceps before us infests many of the grasses, more especially rye, maize and rye grass, and is one of the most deadly and dangerous poisons in existence. Its habit is (as may be seen in these specimens) for the spores to fasten on the growing seed, whereby the character of the latter is completely changed both structurally and physiologically. Under the strange influence exercised by the Ergot, the seed instead of growing into a healthy grain becomes elongated, slightly curved and exceedingly hard, so that it has the appearance of a black horn or spur growing out of the centre of the glumes. The plant too, from being one of the most nutritious of fodder grasses imbibes a poisonous principle, of the deadliest nature. The first effect in those who swallow it, is to produce a loss of appetite and stupefaction. Dogs that have been experimented on, howl frightfully until they are completely under its influence, and then lie down and groan. In fowls the comb and crop are said to turn black. It is unhappily no less notorious for the

dreadful effects it produces on the human frame, when it exists in considerable quantities in bread corn (as it often does in rye, in the north of Europe) causing the most terrible ulcers and gangrenes, which at length destroy the limbs.

However, every evil has a counter-balancing good,and Ergot is not altogether vile; as in the hands of medical men it has been found to be a valuable medicine, though I understand that its action is uncertain. This may be owing to the fact that the quality of the ergot varies with its place of growth and other circumstances. The best (from a medical point of view) is said to come from rye plants grown in dry airy situations on a sandy or chalky soil, whereas Ergot grown in damp shady valleys is of inferior quality. Moreover the plant has no dangerous action until it is quite ripe, but as a week is sufficient to bring it to maturity there is not much consolation in that. There are two kinds recognised, one of which is purple inside when the Ergot is broken across, whereas the other has a white interior. Our present specimens belong to the latter category.

Of its history in this island I know nothing, never having had it brought under my notice before. Hooker in his great work on the Flora of Tasmania merely observes:—"Ergot occurs on grasses in Tasmania, but it is uncertain to what species of Cordyceps it owes its origin." It would be well perhaps, if the attention of farmers was drawn to the subject, with a view to stamping out the obnoxious fungus, wherever discovered. At the same, time it must be stated, that the human subject (so far as Tasmania is concerned) is not likely to be affected by it, inasmuch as I never heard of its attacking wheat, and what rye is grown here is not made into bread. The quantity of the latter cereal too is infinitesimal, for I find by returns issued in to-day's Hobart Town *Gazette*, that out of 68,882 acres devoted to the cultivation of the cereal grasses, 67 only are occupied by rye, against 38,977 acres of wheat.

NOTES ON THE HOBART TOWN STORAGE RESERVOIR.

By T. Stephens, Esq., F.G.S.

[*Read September 11th*, 1877.]

The question of the water supply of Hobart Town is one of annually increasing importance. The supply itself has been largely increased, but is, and must continue to be insufficient, so long as no provision is made for securing a reserve which may be utilised when the direct service from Mount Wellington is reduced by a dry season, or by other causes. Until a further provision is also made for filtering the water before it enters the town, it must continue to bring with it the impurities with which it necessarily becomes charged during the passage through open channels or imperfectly covered flumes. Attention must soon be directed to the now useless storage reservoir, on which so large a sum has been expended to no useful purpose, and it may be well to inquire into the causes of failure, and consider whether there is any hope of its ever being made even partially available for the objects for which it was designed.

It is almost superfluous to remark that the whole of the area lying between the Derwent and Mount Wellington has been subjected to very great geological disturbance. Any one passing up the Huon road may see at a glance that the sedimentary rocks have been greatly dislocated by the intrusion of igneous rocks in vast masses and dykes, producing a variety of disturbances among the sandstones of the locality. At the toll-gate, however, there is a more important displacement which does not appear to have been caused by merely local intrusions. Here a vast mass of the mudstone, a member of the Upper Palæozoic Series of the southern rocks, has been vertically elevated, together with the originally overlying sandstones, some of the remains of which may be seen on the opposite side of the Sandy Bay Rivulet. The relations of the mudstone to the sandstone formation which abuts against it are, at this point, somewhat obscure; but on both sides there are unmistakeable indications of an extensive fault, which appears to cross the Hobart Town Rivulet, not far from the Cascades Brewery, and I have no doubt that it traverses the valley occupied by the storage reservoir almost, if not quite, on the very site of the dam. Here then is a very simple explanation of the cause of the leakage which I have been told gave a good deal of trouble soon after the embankment was first made, and which has been, I believe, attributed to landslips. This, however, is not a case of simple landslips, though they will always occur under like conditions. Where an extensive fault of this description has been occasioned by the violent disruption of a vast mass of variously compacted rocks there is necessarily a fissure of unknown depth along the line of fracture, and the rocks on both sides being more or less shattered by the grinding process to which they have been subjected, will surely slide and settle down whenever they have been undermined by natural and other causes, as in the present instance. Another great fault crosses the valley close to the upper

end of the Reservoir, but this has no important bearing on the subject under discussion. There may, however, be a third fault at right angles to the others and running along the original bed of the rivulet; but I am at present inclined to think that the apparent break in the mudstone rocks is merely one of the results of the sub-aerial erosion by which the existing valley has been chiefly formed.

It will be readily seen that in the first instance an unfortunate selection of a site was made, a site which would have been objectionable for any reservoir, and especially so for one which required so high an embankment to hold back the necessary quantity of water. Whether any geological examination of the spot was made I do not know, but I imagine that the engineer was attracted by the favourable surface configuration, and did not suspect that its weakness lay in its apparent strength. But it was not alone the selection of the site that was in fault. Had no other mistakes been made it is quite possible that the Reservoir might have done good service up to the present time, though there would always have been a danger of from leakage from the cause which I have described. The next mistake was the laying a line of iron pipes under an earthen embankment. This was quite a common practice at the time, as was shown at the inquiry held after the bursting of the Sheffield reservoir; but here the pipes were not only laid under the embankment, but they were supported by piers of masonry at intervals, which precipitated the inevitable disaster. The unequal pressure caused by the irregular settlement of the sand and clay after a time cracked the pipes, the fracture being only discovered by a leakage near the outlet at the bottom of the dam. Previously to this, as far as I can ascertain, the inner slope of the dam had been lined with a facing of large stones, and this facing, though intended for quite another purpose, aided materially in preventing any serious damage to the properties situated below the embankment when the final catastrophe took place.

The particulars of the last stage in the history of the reservoir, I have gathered from different sources, having had no personal knowledge of what was done until after the event. It seems that when the fracture of the outlet pipes was discovered, it was decided to make a drift-way or tunnel through the dam in order to discover and repair the breakage, and this drift-way was actually carried through the dam to within a few feet of its inner face. For some 40 feet, or thereabouts, from the entrance, it was lined with ashlar masonry, but the rest—the most dangerous part—was merely lined with sawn timber, placed at intervals to support the sides and roof. The result which followed was inevitable, though it might be delayed for a time. Gradually the water found its way either through cracks in the puddle wall, or along the line of piping, into the tunnel, carrying out in solution the clay and earth which intervened between the pressure and the point of least resistance, until the timbered end of the tunnel caved in, and allowed it a free exit. I have not been able to ascertain what depth of water there was in the reservoir at the time, but there was evidently a considerable pressure, and sufficient to have caused a destructive flood if it had not been for the stone lined portion of the tunnel, and the stone facing of the dam which I have referred to above. But for the latter, the water would probably have entered the tunnel in volume

sufficient to force an outlet outside the tunnel walls ; after which it would meet with no resistance.

The question of the repair of the dam, preserving the necessary outlet for the water, is emphatically one which only a skilled and experienced engineer should decide ; but it may be discussed from a non-professional point of view. When a similar, though less serious fracture occurred in the outlet pipe of the Yan Yean Reservoir, it was ingeniously repaired by introducing rings of boiler-plate securely connected with each other so as to form a continuous lining ; the large diameter of the pipes (nearly 3ft.), favouring the adoption of a plan which would have been otherwise impracticable. In the present case there seems to be no alternative but to make an open cutting through the dam along the line of the pipes, carrying it down until a solid bottom is reached. There would be considerable difficulty in filling in such a cutting so as to make the whole solid ; and the difficulty is, of course, much greater when an outlet for the water has to be retained. But the geological conditions do not greatly favour the construction of a new tunnel through the adjacent bank, and the practical inconvenience attending the working of a syphon puts that method of discharge out of the question. Supposing that a good bottom is reached, the next thing would be to put in a foundation of concrete, on which to build a strong culvert, extending from the base of the tower to the mouth of the present tunnel. This culvert, in which the pipes would be laid, should be built with wing walls or rings of solid masonry at intervals along its whole length, and there ought also to be deep lateral cuttings into the embankment on the right and left of the culvert for the same reason ; the object being to prevent the leakage of water, which always makes for the junction of old and new work or of two different materials. The filling in would be the most important part of the business, and would require the most careful oversight ; no contract work would be admissible.

Allowing that the dam thus repaired could never be quite safe under the full vertical pressure which was originally contemplated, it might yet be of considerable service. To relieve the pressure, and still make provision for the storage of a considerable body of water, it might be found desirable to form a second dam at the point where the reservoir begins to contract in width, provision being made for perfect control over the flow of water to the lower part of the reservoir. The upper part might be easily enlarged and improved to make up for the diminished vertical height of water contemplated to be allowed in the lower ; but these additions and extensions would entail considerable extra expense, and their discussion is somewhat outside the proposed limits of this paper.

In any case the old bye-wash would have to be greatly lowered, and precautions taken to prevent the scour which has been so destructive at its lower end, either by a series of steps, or by a paved channel at a steep gradient, the former being the preferable course. For such work only the hardest freestone should be employed : the mudstone, which has been much used in some parts of the works is quite unsuitable.

The chief point remaining for consideration is the filtering of the water. Fortunately the foreign elements are chiefly sand and mud, which only require repose to precipitate them, and this may be easily

effected in the upper part of the reservoir. A separate and shallow basin should be formed, with an accurately levelled weir over which all the water should pass in an almost imperceptible stream, and the filtering of the water might be further secured by a bank of gravel and broken stone along its whole length. It is hardly necessary to add that this scheme contemplates the passage of the whole water service through the reservoir, under ordinary circumstances. By no other means can the water be properly purified before it enters the town.