eatable. All the old insect resisting sorts were universally boiled for an hour before they were fit for eating. This quality alone might, on enquiry, lead to further developments.

The entire subject is most interesting, and opens a widespread field of research to the enterprising agriculturist, who, at the same time that he raises the greatest quantity of grain and the largest quantity and number of sheep and cattle, does not think the pursuit beneath his attention. Mr. Goodrich has proved himself a benefactor to mankind, but he who can conduct us back to the kinds of potato which resisted all insect attack will confer a much greater benefit than even Mr. Goodrich.

VECTIS.

Practical Drainage.—III.

BY ALLAN MACDOUGALL, C. E.

The trenches or grips which are to form the drains being ready to be filled in, the next step is to determine what is the best adapted material to form the drain. Tiles are now considered to hold the first place for this purpose, but they cannot easily be obtained in all neighbourhoods, and the cost of bringing them to a locality may be so great as to deter a farmer from draining. A very good substitute can be obtained in stones. These can be picked up off the fields, and laid in heaps along the side of the drains during the summer. There are several ways of laying these drains—one, and the most frequently used, is to throw in loose stones to a depth of nine or twelve inches, and then fill in the earth. A second is to place two flat stones on edge, and place a third over them as a cover, and above the cover to throw in four or five inches of stone; or the bottom of the ditch may be filled by placing long flat stones on edge, side by side, and filling up above them with stones loosely thrown in. A third method is to place three stones in the form of a triangle, and fill in above them. The last plan is often carried out with pieces of wood instead of stone, and makes a good drain, as the wood will last for a long time under ground. This plan is very well adapted for draining peat or bog lands, or very wet soft clays and running sands, as the stones all round catch the silt which would otherwise choke up the drain. Any convenient scantling from six to nine inches broad by one inch thick, or even rough slabs, cut off the sides of logs, that can be easily obtained in the district, will do. They will last for a long time, but like all drains put into peat or wet sand, require a good deal of attention, and sometimes even to be taken out and relaid. Stone drains, when properly laid in, will last for a considerable time, and work well; but care must be taken in laying out these drains to see they are kept at a distance from trees, if it is not convenient to remove the trees, as these drains are liable to be injured by vegetation getting into them, which acts very injuriously in their working. A good plan to save them from danger of roots, &c., is to place a turf over the stones before the earth is filled in.

There is another material that may often be used when stones are not easily to be got in sufficient quantity, that is, brushwood: the small branches of shrubs, the tips of cedar, balsam, spruce fir, or birch branches, or charred branches, if they are not very large, broken into pieces about two feet long, and covered with straw. Care must be taken in laying in these materials that the branches are small, that they are laid on the top of each other regularly, so as to form a regular drain, and keep any earth from falling into the drain, making it shallower in one part than another. Drains of brushwood, if properly laid, will continue to work and keep for a long time in good order. The material does not decay under the surface of the ground. The branches ought to be laid to a depth of twelve inches, as the earth, when the drain is covered, will press them down.

The writer has seen drains, laid with cuttings of hedges, that had been in work for more than twenty years, when exposed in the laying in of tiles, still have the appearance of being laid only a few years. When side or arterial drains are laid in connection with main drains, it is not necessary to put in the stones or branches to a greater depth than six or eight inches, as that is quite ample to run off water with a main drain, so long as the side drains are not more than 200 yards long. Tiles are undoubtedly the best things that can be used for drainage purposes, and where they can conveniently be obtained ought always to be used. They will probably be more expensive than stones or brushwood, but they have the advantage of being free from many of the inconveniences of the other materials, and from their superior working will repay the extra primary cost.

The various descriptions of drains, and the distances and depths to which they ought to be set, being now laid before the farmer, he will be able to fix on the material best adapted to his circumstances. Every one is, doubtless, acquainted with the various tools necessary for cutting drains. An enumeration of them is not now necessary, though reference to a few of the leading ones may be made in some future article, if it be desired. Let us now proceed to the working operations.

The outfall drain is the first thing to be looked to. If a stream, or ditch alongside of a road exists, it ought to be cleaned out to a depth of three feet nine inches or four feet. It is not necessary to have a great fall on it, as water acts more freely than solid substances. Each particle looks out for itself, and seeks the lowest place it can find; and when confined in a drain, each particle trying to get to the lowest place, pushes on the particle next to it, until the drain is emptied. For an open outfall drain, three, or four feet to a mile is sufficient fall to allow a drain to discharge water freely, as long as the bottom and sides are kept clean and free from weeds, and for drains from a field, one foot on four chains, or half an inch on ten feet, is considered quite enough. The outfall is usually an open-cut ditch, made down the side of two fields, which is used for draining the fields on both sides, as well as being an outlet for other drains coming down from other fields. It should be carried up in the lowest place, so as to drain as many fields as possible, and be made about three feet six inches to four feet deep, according to the fall it has, about eighteen inches broad at the bottom and five feet wide at the top. Open cut outlet drains from other fields should be connected to it. They should be about one foot wide at bottom and four feet wide at top.

The trenches or grips in which the drains are to be laid ought to be commenced at the low end and carried up the field regularly, that is, after one has been cut fifty or eighty yards, the next must be brought up that distance, then the third, then the fourth, and so on, as this enables a grip to let away some of the water from the low end of the field before the water from the top is let into it, and also lets the air get into the land. For tile drains, it is not necessary to cut them more than twelve or fifteen inches wide at the top, sloping downwards to six inches at the bottom. For stone or brushwood, they would need to be cut nine or twelve inches broad at the bottom. Care should be taken in making these grips that the bottom has a regular slope, for if it has not, the water will be certain to lodge in the hollow, and derange the working of the drains. This is more particularly the case where the ground is very flat. Side drains ought never to join a main drain at right angles. They ought to have a bend at the end for ten or fifteen feet to run in the slope of the land, that the water coming from them may flow easily into the main drain. Were this not done, the two currents coming in contact, would cause back-water in the weaker stream, which would be the side drain, and this would keep the drain from being properly discharged, or, as frequently happens after heavy floods would cause the side drains to burst.

When drains come down the whole length of a field to the outfall drain, or the principal drain that is to carry off the water, they ought to join at a little higher level, so that the two streams may unite together without any back-water.

When the main drain happens to be an open ditch, as is usually the case, it is a good and safe plan to place a large stone below the last pipe, and another on the top of it to keep it from being washed away by floods; or in stone drains, to lay a large flat stone for the bed, and place two stones on edge, with a large one over them to cover them, which will protect the loose stones of which these drains are composed from being washed away.