

is quality and richness of the root in sugar, and where the yield of the root per acre is thought of far less importance. The American Government Commission appointed to enquire into the manufacture of beet root sugar, after repeated trials, and the special journey of a commissioner to Europe for that purpose, narrowed down their enquiries to the following sorts:—White Silesian Green Top, White Silesian Red Top, White Magdeburg, Improved White Imperial, Beta Imperialis Nos. 1 and 2, Vilinorius Improved White, and the Castelnauudy Yellow. The latest English writers also mention the Colet Rose as a great favourite.

It will thus be seen that there are plenty of kinds to choose from. No doubt, some will be found specially adapted to some soils and others to other soils; experiment alone can prove which is the best for each farmer, and each particular class of land. Persons going into the business should procure some seed of all the kinds, and then stick to that kind which they find best adapted for their own farm. After ascertaining this, they will, of course, raise their own seed, which is very easily done.

The land which is to grow beets should be summer-fallowed and manured *the year previous*, as our best farmers now do for turnips; the manure should be well disseminated through the soil, and have the previous autumn and winter in which to decay and impart its fertilizing qualities to the land.

The roots should be grown as quickly as possible to insure perfection; they should not be sown too early, and every precaution must be adopted against "second growth," whether in the field or in the root-house. Second growth is destructive to sugar. Otherwise, the preservation of the root may be the same as that of the ordinary mangel.

Having grown the roots to as near perfection as possible, the next process is the grating them down. Whichever process is used, they must be reduced to the finest possible pulp, and should be pressed as fast as ground; destruction of sugar commences with fermentation, and fermentation will commence in half a day, or even less. What you grind during the day must never stand over for a night.

From the mill or rasp, the juice must pass into the boiler or evaporator. If defecated with lime, that process (as already described) must take place. If the juice is to be "concreted" only, the addition of lime is not necessary in the evaporation. The evaporators can be either large vessels in which the juice is reduced by boiling, or by the "Concretor system" as before described; but whichever way is adopted, speed is everything, and delay is destruction to all success; if fermentation or souring set in, the whole product is destroyed as sugar. The presses will always admit of much discussion, but for ordinary use they must resolve them-

selves into one of two kinds, either the screw press, in one of its many various forms; or the lever press, in which the pressure is continuous; presses of the simplest construction of this kind are used for the manufacture of lard and other fat oils; they are very rough affairs, very easily made, of great effect, and continuous in their action. They will be separately described, and are as useful for cheese presses as for anything else.

People putting up presses must always bear in mind that effective pressure depends on the amount of surface to be pressed. An ordinary cider mill screw with pressing boards, of four feet superficies, will only give one-fourth of the effective pressure that the screw would give if the surface was reduced to one superficial foot; and the latter would only give the one hundred and forty-fourth part of the pressure that would be obtained if you reduced the surface to one superficial inch. An ordinary man pressing the heel of his boot in a small potato of one inch in diameter, exerts on that inch about 170 lbs., or fully twice the pressure of the steam in the boiler of an ordinary high pressure steam engine. The Hydraulic press is, of course, out of the reach of any farmer, and of most manufacturers on a small scale.

The concreting of the juice has already been fully described in No. 10, and need not here be further alluded to.

The final purification of the sugar into refined sugar, will, we fear, be too elaborate and difficult a process for ordinary persons, but as it will not be too difficult for all, we shall describe it in a future article.

### NO. XIII.

In Europe, where labour is cheap, and where individual labour or rather labourers can be depended on to remain with their employers without change, the beet root sugar manufacturer depends on the labourers or "hands," as they are called, to carry through each process, with as little machinery as possible. In Canada and America generally, the matter is reversed; here the successful manufacturer in any art is dependent on his machinery, which he can command, and he wants that machinery to be so arranged that he can proceed equally well with a change of labour as with the original hands; the *machinery* must do the work and the workpeople must attend on it; then if one man leaves his place, another can be obtained to take it without difficulty or delay. Besides this, it must be recollected that the machinery is not "paid by the day," and the man who attends on it is. Our object is, and must be, to reduce the wages to the lowest possible point, and therefore a beet root sugar factory, to be successful, must comply with the following conditions:—

The roots must be brought from the pit to the washer by hand, and then be cleansed by a continuous stream of water. From the

washer they must pass by the power used to the rasp, which reduces them to the finest possible division; then, after being pressed, the juice proceeds of itself to the evaporators, or to the concretor, and passes through its various stages—still without handling—until it is delivered into barrels in the form of syrup, or rather inspissated juice; there the first operation is ended; the remainder of it will rest with the refiner.

The pulp which passes from the presses—whether in one shape or another—is at once fit for cattle food, or it may be stored in pits covered with earth and keep good for years.

These operations ought to be, and must be done, by not more than three men, one to supply the roots, one to attend to the fires, and to see to the barrelling of the boiled juice or concrete, and one to attend to the press. The press, if of the best kind, should be continuous. All the rest of the work must be done by the machinery. This may be of the roughest kind, providing the foregoing essentials are borne in mind, but the results as indicated must be produced.

Where it can be had, steam power will of course be best, as not only can the waste heat of the chimney be used to advantage, but the entire of the waste steam.

Experience has proved, however, in France and Germany, that the animal power of the farm can be used with advantage. Hundreds of small beet root sugar factories are worked in that manner, but, in these cases, separate fires for the purpose of evaporation are, of course, necessary.

The concreting plan so simplifies the process that any person of moderate intelligence can carry it out, leaving the refining the concreted juice into sugar to others who may be more fitted for the intricacies of the business. There is ample profit for all who may engage in either branch.

To those who cannot incur the expense of grinding machinery the following suggestion is offered:—

Grow for your cattle the best kind of sugar beet, cut it up with a knife and lever or any other means at hand, as fine as possible, put up a boiler with a wooden cover and steam pipe, as described in the CANADA FARMER, Vol. II, page 132; place the cut up roots in a vessel with a false bottom, and turn on the steam. During the whole time the roots are cooking the condensed water of the steam will be extracting a good deal of the sugar and other soluble substances from the root, and come away in a pipe bent like an inverted syphon, in a thick sweet state. Boil this down to the thickness of molasses, then add powdered quick lime, and keep the mass stirred until the "sacrate of lime" forms. Dip it out, place it in a strainer and let the fluid drain back into the boiler; boil again until thick; add more lime until you find by the taste that you have extracted all or nearly all the best of the sugar; put the sacrate away by itself for future operation,