loose; that is, extremely sandy, precedent to the planting of the beets and preferably in the previous autumn, deep plowing and subsoiling are necessary to prepare the bed. This serves two purposes: It helps to take care of the water supply, and it gives opportunity for the taproot of the beet to enter the soil. This has a double advantage. In the first place, it promotes the growth of a beet of proper shape; and, in the second place, it gives a deeper layer of soil from which the beet may draw its nourishment.

Sugar Beets on Summer-fallow.

"Sugar beets can be well substituted for bare fallow," writes Dennis H. Stovall, in the Northwestern Agriculturalist. "It has been found in Europe and this country that it is much more profitable, as well as better for the land, to raise a crop of beets than to allow the ground to lie as idle fallow.

"The farmer can, by proper cultivation, devote one-fifth of his land to beet culture, and raise as much from the remainder of his land as though none of it was occupied by beets.

"The first plowing, which should be in the fall, should be followed by a spring plowing to a depth of not less than ten inches, and, if possible, subsoiled to a depth of fifteen inches. Shallow plowing will not do in the successful growing of sugar beets."

Mustard-spraying Demonstrations.

The work of giving demonstrations in mustard spraying in Ontario, which has hitherto been carried on by delegates from the Agricultural College, has been this year relegated to the Department of Agriculture, and will be carried on in connection with the Farmers' Institutes. Circulars calling for applications for demonstrations in infested districts have been issued by Mr. Geo. A. Putnam, Superintendent of Farmers' Institutes for Ontario, and steps are being taken for having object lessons in spraying given over an extensive ground. Without doubt, the work so acceptably done by the College in the past will be prosecuted with vigor by the new hands to whom it has fallen, and will be productive of much good in the Province, in ridding from it a pest which is obtaining only too strong a foothold in many parts of the country. Those who purpose having spraying done should bear in mind that the spray, in order to be effective, should be applied just before the plants bloom. Failure has almost invariably been due to the operation having been left off until the mustard had reached too late a stage of growth.

Pointers for Roadmakers.

Ontario Commissioner of Highways.

1. The steepness of hills should not exceed a rise of one foot in twelve.

2. The roadway graded for traffic should be in the center of the road allowance, and should have a uniform width of twenty-four feet between the inside of edges of the open ditches. The width of roadway on cuts and fills should not be less than eighteen feet.

3. Side slopes in cuts and fills should be one and one-half feet horizontal to one foot vertical.

4. The crown of the newly-finished roadway should be uniform, and have a rise of one inch to the foot from the edge of the ditch to the center of the road.

5. When gravel or broken stone is used it should be placed to a width and depth sufficient to form a serviceable road, having due regard to the character and extent of the traffic.

6. The gravel or broken stone used on the road should, preferably, be obtained in the vicinity of the road, but must be of good quality.

7. As a rule, the gravel or stone should not be of less width than eight feet, nor of a less depth in the center than nine inches.

8. Where roads have heretofore had gravel or broken stone placed on them, they should be repaired by cutting off shoulders, shaping with a grader, and adding a sufficient amount of gravel or broken stone to fill ruts, depressions, properly crown and make a road sufficiently strong to accommodate the travel.

9. The gravel or broken stone placed on any road should be thoroughly rolled, otherwise the grade should be maintained by careful raking or scraping until compacted by traffic.

10. An open drain should be made at each side of the road, and given a sufficient fall to free outlet.

11. Durable sluices and culverts should be built where necessary.

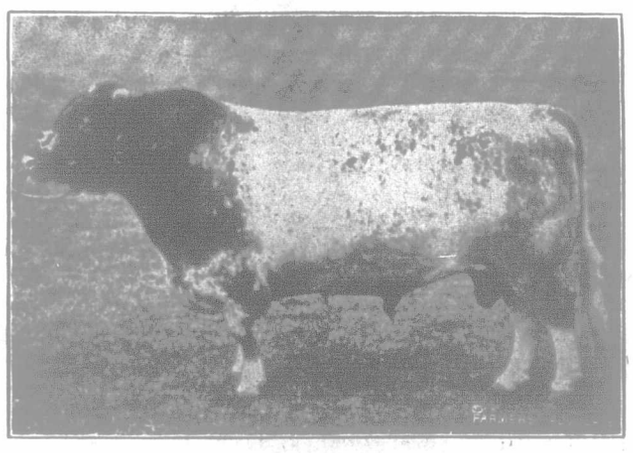
12. Tile underdrains should be laid, so as to carry away excessive subsoil water, lower the waterline, and secure a dry roadbed, wherever a moist, damp for springy condition of the subsoil exists.

13. Modern machinery and implements should be used as far as possible to secure the greatest results from the expenditure, and to provide the best work.

14. Where, owing to special local conditions, any departure from the foreging regulations may be desired, upon application of the council, an examination of the road or roads in question will be made, free of charge, by an engineer of the Public Works Department for the purpose of deciding upon a suitable plan.

Problems of the Soil: VI.—Cultivation and Plant Food.

It has long been noticed that cultivation has a very important effect in increasing the available plant-food in the soil, so that plants cultivated while growing, or plants on soil which has previously received prolonged and thorough cultivation, show, generally, a much better growth than those not so treated. Indeed, so great and noticeable is this fact that at one time many believed that "cultivation is manure," that all that



Shorthorn Bull, Royal Archer 82127.

Winner of championship medal, Dumfries Show, Scotland, 1903. Age three years and five months.

was necessary to secure perpetual crops was to cultivate the land properly. Scientific investigation and practical experience have since proved the incorrectness of this theory, but, nevertheless, it is generally recognized that cultivation does in a way greatly increase the available fertility of the land. It is important that we should clearly understand the manner in which this takes place, that we may use this action to the best advantage.

As we pointed out in our last article, the soil contains immense quantities of plant-food, which, however, is not immediately available to plants, because it is soluble neither in water nor in the juice of the plant roots. Of this food, the ash materials, potash and phosphoric acid, exist chiefly in the form of solid particles of undecomposed rock, or united with other elements of the soil in insoluble form. The action of air and water will cause hard rocks to decay and soften, resolving themselves into fine particles of sand, and setting free their fertilizing ingredients. In the same manner, the fine particles of rock in the soil are acted on by the air and made to yield up their fertility.

Collie Makes a Spring.

A favorite dog at the Maple Grove Farm, Rosser, Man

This action takes place continually, even where there is no cultivation, so that we must regard the soil as constantly going through a process by which the insoluble plant-food which it contains is being made fit for the use of plants. Under natural conditions, however, this is a very slow process. Where the soil is cultivated, the action is very greatly increased. The land is turned once and stirred, and lumps are broken up, the air is admitted freely to all parts of the soil, and acts on the compound of potash and phosphoric acid, making large quantities of these substances available. Under proper methods, this action should be a very important source of plant-food on every farm. It is to be remembered, too, in connection with these elements, that the action by which they are set free takes place almost as well in cold weather as in warm. So far as they are concerned, the most effective cultivation is that which thoroughly pulverizes the soil in the fall, and leaves it in a condition to benefit by the frosts of the winter.

Nitrogen, too, is made available by cultivation, but in a different way. As we have seen, it exists chiefly in the form of humus, or decayed vegetable matter. This, while available to some extent to plants, is insoluble in water. There is, however, a ferment in the soil, by means of which the humus is broken down, and the nitrogen which it contains is changed into the form of nitrate. in which it is soluble in water, and very available to plants. This ferment acts chiefly in warm weather, and is greatly stimulated by cultivation. Hence, summer cultivation has the effect of liberating large quantities of nitrogen, by changing it from insoluble humus to soluble nitrates. Where plants are present to use the food thus liberated, this action is beneficial, but where no plants are present, as in a bare fallow, the action may be very injurious, since the food thus liberated is liable to be washed out of the soil and lost.

It must be distinctly understood that cultivation adds nothing to the soil. Land when cultivated in the summer does not absorb fertility from the air, as some think. What does take place is the making available of food already in the soil. This is a valuable method of increasing fertility, but may be misused, as we shall endeavor to point out in our next article, in discussing the subject of summer-fallowing.

[NOTE.—In the issue of April 28th, a subscriber, under the head of "Deep vs. Shallow Spring Cultivation," instances a case in which shallow preparation of seed-bed failed to give good results. Here, in my opinion, the failure was not due to any fault in the condition of germination, but to the condition in which the young plants, after germination, found the land. The soil must be porous enough to allow plant roots to grow freely through it. Here the land, unplowed the fall before, and inclined to bake, was likely too hard for the roots to penetrate. Besides, I should expect a shallow preparation, on top of a hard soil, and rolled after seeding, to bake again at the first opportunity. Of all evils, choose the least, and in this case it was better to plow and loosen up the soil so that the roots might penetrate it, than to leave it hard, and pay attention only to the preparation of a seed-bed. The germination was all right, but the condition of the under soil was wrong.

The writer had a good illustration of the point in question on his own farm last summer. In 1902, we had a ten-acre field of roots. After the roots were harvested, we started to plow it, but had only half finished when a fall of snow stopped us. In the spring, a year ago, we finished the plowing, gave the whole field one stroke with the cultivator, harrowed, sowed with barley, and harrowed after the drill. Where the land had been fall-plowed and the seed-bed prepared shallowly, the germination was much better, and the grain showed the difference all through; so much so, that at harvest it was easy to see the exact line between the two preparations. In one case, where a land had been struck out and five or six yards plowed in the fall, the difference was so great that it appeared as a distinct streak across the field, the barley on the fall-plowed and shallowly-cultivated land being taller and better headed than that on either side, where there had been deep spring cultivation with the plow. The difference was even more marked in the clover, with which the land was seeded, showing that where a shallow seed-bed had been prepared, better conditions of moisture had been obtained. The soil was a heavy clay loam. If the land were hard, and had not been fall-plowed, I would use the plow, but I prefer fall plowing and shallow preparation in the spring.] D.

Counting the Cost.

Market conditions this spring are not of the most encouraging nature. Hogs and cheese, the two staples we have come to place so much dependence upon, seem to head the procession in the slump in values, while export cattle prices struggle in vain to rise above five cents per pound. A readjustment to suit conditions begins at once, but is difficult by reason of the firmness with which the bacon and dairy industries have been established.

There is not so much a tendency to launch upon new enterprises, but rather a lessening of the production of those commodities which now appear to be in excess of market demand. Cheese factories have been repaired and improved, and are now in full swing, but from nearly every quarter comes the report of slightly smaller supplies of milk than were coming forward at this time last year, when cheese was selling for more than twice the market price to-day. Factory men regard the short supplies and the low price as not an unmixed evil. Already there are too many small factories running, whose equipment is not modern and whose product is too small to be made economically, hence the presence of considerable inferior cheese, and the hampering of larger and better equipped factories. Lower prices and smaller supplies it is believed will close up some