Length of Whiffletrees

A horse cannot draw as well with a whiffletree twelve feet long as with one two feet six inches in length, because the line of draught is not in the proper direction to be most effective. Nor can two horses harnessed abreast, draw well with whiffletrees ten feet long, while their heads are coupled close together, because they must travel sidewise more or less, in which position no animal can exert all his strength to the best advantage in hauling a load.

Horses draw best with the double whiffletree just long enough to allow them to stand close to each other, having the single whiffletrees attached directly behind them, and just long enough to meet the middle. When the double-tree is very long, each horse must draw more or less sidewise is the coupling lines and the neck-yoke are not made long enough to allow them to move directly forward without having their heads turned toward each other.

In order to determine the correct length of whiffletrees, let two horses stand side by side, with their sides three inches apart, then measure from the centre of one horse to the other, on their backs This will give the length for a neck yoke, and the correct length for the double whiffletree between the joints where the single trees are to be attached When a neck yoke is only 18 inches long, and the double tree of the proper length, horses will be required to move more or less sidewise For the same reason oxen often get in the habit of hauling side wise, because the yoke is too short. Neither oxen nor horses can travel easily and freely when their heads are turned toward, and their butts from, each other.

Whiffletrees for ploughing should always be as short as they can be made, without bringing the traces against the legs of the team. A very long double whiffletree tends to make a plough take too wide a furrow slice If the clevis be adjusted to take a narrow furrow slice—when the double-tree is too long—the plow will not run at all satisfactorily. The horse in the furrow will not be able to walk squarely in his place, because the line of draught is such as to keep crowding his hind feet out of the furrow on the plowed ground. The length of the double whiffletree and the neck-yoke for a sleigh should be just as long as the sleigh is wide, from the centre of one runner to the other.—*Manufacturer and Builder.*

Pat's Welcome to the Reaping Machine.

Och, I'm sick of the sickle, Molly dear,
Av stoopin' so long and so low,
And it's little sorrow it gives me
To give the ould bother the go;
And when another harvest comes,
By the powers I'd like to see
The money or anything else that 'ud make
A reaping machine of me.

WAGGONS UPON RUNNERS.—There is seldom real necessity for putting a waggon upon runners, but if an occasion occurs, as when the snow is soft and deep, the labor is not much, and the relief to the team may be very great. Two stout hickory or ash saplings are taken, smoothed upon two sides, and the points marked where the wheel will rest when placed upon them, with the buts to the front. If the buts are not placed to the front the sticks must be squared throughout the whole length. When the places for the wheels are marked, grooves may be cut for them to stand in, and the poles may be shaved down in front so as to bend. The runners are fastened to the wheels by boring holes through them and winding stout iron wire many times around the fellies and through the holes in the runners, the bent ends being fastened in the same way. Runners which are narrower in front than behind are often very hard on the team, especially so when running in frozen sled tracks.—*Agriculturist.*

Agricultural Chemistry.

Nature's Laboratory.—(Continued.)

BY DR. C. M. SMITH, OWEN SOUND.

Germination.

The series of changes which occur during the development of the seed into the perfect plant, provided with root, stem and leaf, constitute the process of germination; and from their mysterious character have for many years engaged the attention of scientific enquirers. The following remarks will apply principally to the *mealy* or *farinaceous* seeds, as these are chiefly interesting to the agriculturist. The two principal classes of seeds included in the above division are the cereals, (wheat, oats, &c.) and the leguminous seeds, (peas, &c.) The chief constituent of cereal seeds are starch, vegetable, albumen fibrine and gluten; they also contain oily matter, sugar, earthy phosphates, woody matter and water Leguminous seeds are characterized by the presence of a peculiar substance called *vegetable caseine*, on account of its close relation to the caseine or curd of milk. The tough mass left after washing wheaten dough with water, consists of two portions, one soluble in alcohol, the other insoluble in this liquid the former is call *gluten*, the other *vegetable fibrine* Vegetable caseine is soluble in water, but does not coagulate or form a jelly on heating, like the substance termed vegetable albumen.

The proportions of these ingredients vary in the different kinds of cereals, and even in the same variety of seed when under different circumstances relating to climate, soil and situation. As raw gluten (fibrine and pure gluten) constitutes the most nutritious portion of these seeds, it may be interesting to lay before the reader the following table, showing the quantity contained in various grains under different circumstances. The authorities are Davy and Hermbstaedt:—

	Per cent
Wheat, Spring	19
" Mildewed	3·2
" Blighted	13
" N. American	22·5
" cultivated in soil manured with ox-blood	34·24
" from soil manured with human fœces	33·94
" from soil manured with human urine	35·1
" from soil manured with horse-dung	13·68
" from soil manured with cow-dung	11·96
" from soil not manured	9·2
Barley	6
Oats, from Scotland	8·7
Rye, from Yorkshire	10·9
Rice, Carolina	3·6
Maize	3
Beans, common	10·3
Peas	3·5

According to Sir H. Davy, the wheat of warm climates abounds in gluten, is harder and more difficult to grind than that of more northern countries. This property renders the wheat grown in the South of Europe more adapted for the manufacture of maccaroni, a large article of diet in Italy.

There are certain conditions necessary to the process of germination which will first be briefly stated before describing the changes which take place during its completion.

The seed must be in a state of maturity, must have been fecundated, must contain an embryo perfect in all its parts, and must not be too old. Some seeds, however, retain the germinating power for a great number of years, especially those of the leguminous class; but they must have been protected against the influence of air, light and moisture.

Water, heat and air are external agents essential to the act of germination. The water penetrates into the substance of the seed, causes the embryo to swell, softens its coverings and effects changes in the cotyledons or seed-lobes which render them capable of affording nutriment to the young plant. It also serves to convey the gaseous and solid substances required during the first stage of plant growth. This fluid, however, must not be in excess in the case of land plants, for, if so, the seed undergoes a sort of maceration and exhibits the phenomena of putrefaction rather than of germination. A certain degree of heat is always necessary during this process. A temperature not higher than from 75° F. to 85° F. favors germination, while one beyond this destroys the vital principle.

Air is also necessary to the development of the seed, as it is to the growth of animals. Everyone has known instances of seeds having been buried too deeply in the earth, and in consequence exhibiting no signs of life, but afterwards, from some cause, they have been brought nearer the surface and then germinated Pure oxygen is too stimulating to the seed, it soon exhausts its activity as in the case of animals confined in such gas. Thus, although azote or nitrogen in itself does not support germination, it becomes necessary on account of its moderating effect on former gas.

Light, although necessary in the succeeding stages of growth, retards germination. One of the chief chemical changes during the sprouting of the seed, is the union of oxygen gas with the excess of carbon of the embryo and the expulsion of carbonic acid. This change is contrary to that taking place in the plant when provided with leaves and subjected to the action of light.

At the same time the decomposing gluten of the seed acts as a ferment on the starch, converting it into a soluble substance, namely, sugar. The same principle is artificially exemplified in the act of malting grain.

The Root.

This portion of the plant may be said to act chiefly in a mechanical mode. Still it exerts a certain power of selection over the substance brought in contact with it by means of air and moisture. The fluid containing the various ingredients necessary for the nutrition of the plant ascends through the woody layers next the pith by means of the mutual action between fluids separated by membranes, termed *exosmose* and endosmose. Thus the root of the plant may be said to be homologous to the stomach, or rather the mouth of the animal. On reaching the green parts of the plant, or those exposed to the atmosphere, it is subjected to the action of evaporation thus losing hydrogen and oxygen (water,) and to the contact of carbonic acid and nitrogen. These elements combine variously to form woody fibre, &c., which are appropriated by the stem as the elaborated fluid passes downwards through the inner layer of the bark. But, although the root cannot be said to take part directly in the formation of woody fibre, it must not be forgotten that it possesses the additional power of excretion, as for instance the various medicinal and coloring substances contained therein. Some writers have attributed a share of the ill effects of a continued succession of the same crop on a soil, to the excretions of the roots, which, although beneficial to different plants, are hurtful to the variety affording such excretion.

The Bark.

The bark or outer layer of the stem may also be said to serve more of a mechanical purpose than chemical. It protects the delicate layer of cells which convey the sap downwards through the stem. It is generally slightly developed in the vegetation of equable climates, and in animals such as our various crops.

The Leaf.

The leaf is the grand agent in effecting chemical transformation. But besides it possesses in a most perfect degree the properties of absorption and exhalation. Here the crude sap is changed into a fluid holding in solution the various ingredients necessary