

at the bottom of a row of feeding stalls on the bank, which a deep water ditch protected from animals or passers by—for a public footpath was near. Every bit of ground, and every scrap of wall or house was planted with profitable trees, all grafted or grown and put in by the master and one other man besides the gardener, whom he had taught to prune also. The master said he always came through the garden from his farm, and could give five or ten minutes each time, and so do a great deal. And he taught his daughters gardening; and the interest and pleasure he has given us through life we shall never cease to thank him for. I believe no lady's education is complete without a knowledge how properly to manage a garden, and no farmer's till he is a good gardener as well as good field worker.

The men on this farm picked up knowledge of gardening and grafting and planting from their employer, so that when they got gardens of their own they could, and did, make the most of every corner by planting aright. Men were told off to manure and dig the ground in the garden perhaps only an hour at a time, as when rain stopped the carrying on of the hay or harvest work, the master always declaring whatever the weather it was good for something; and, thus, much of the garden work was done at these odd times.

I am now living in a purely agricultural village, where the cottagers are as a whole among the best gardeners I have yet seen among farm labourers. There has been much distress for want of work. Their case would be much worse if they had not a good stock of winter vegetables, good crops of parsnips, carrots, turnips, and above all onions and leeks. They grow the seeds for themselves, or one more careful can, for a few pennies, supply his neighbours of the surplus.

I have an old woman famous for her garden, who for two years has been my only gardener. We have long and interesting talks over our garden work. She gets a prize for the cultivation of her garden. Her husband works on the roads. He and she manage it; and she does mine, and I can show it for cultivation, for pruning, for every crop (she does it all, my health no longer allowing me), and she looks to the greenhouse fire, and has a passion for flowers. She brought me in the summer the most beautiful cactus I ever saw, it had twenty-three full blooms out at once! She had grown it from a leaf in her own cottage window, and it was never anywhere else; but then the mistress and woman gardener have both been taught how to do it, and to know the right season for everything in the garden to be planted. All may do the same if they will.—M. C. C.—*London Agricultural Gazette.*

OBSERVE AN OX in the pasture, field, or byre; notice the enormous quantity of food he hurriedly gathers up, and passes, with but little mastication, into the stomach; observe that when he has filled the large receptacle to repletion he seeks a retired spot, and leisurely proceeds to chew the cud,—in other words he, by a process known as rumination, returns the food into the mouth, and there submits it to a thorough mastication and incorporation with saliva, before its final deglutition.

The digestive organs are admirably arranged for the thorough digestion of the food, and, as we shall afterwards show, under favorable circumstances the whole nutriment of the food is extracted, and readily utilized by the body for the manufacture of flesh, fat or milk; and, under a wise Providence, man, by a study of animal physiology, has in a great measure succeeded in being able to direct the utilization of the food to the production of beef or milk at will, by systematic breeding, and a correct knowledge of the science of feeding, for a science it has come to be.

The gastric apparatus of the ox is remarkable for its enormous development, and its division into a true digestive stomach, and three preparatory compartments.

"These cavities represent a considerable mass that fills the greater part of the abdominal cavity, and the medium capacity of which is not less than fifty-five gallons; one of them, the rumen or paunch, into which the œsophagus (gullet) is inserted, constitutes nine-tenths of the entire mass." (*Chauveau.*)

The rumen or paunch, is a very large reservoir occupying about three-fourths of the abdominal cavity; it is lined by a rough membrane studded by numerous papillæ, and divided by strong muscular bands into compartments; into its upper end opens the gullet; by this opening the food enters, and, just below, and opposite this opening, is the opening into the second compartment.

The second compartment is called the *honey-comb*: this is the smallest of the four; its interior is lined by a membrane raised into ridges forming polyhedral cells, from which it receives the name of *honey-comb*. This sac communicates with the first, and opens into a groove, which is a continuation of the gullet, and by means of this groove communicates with the third compartment.

The third sac, called *many-plies* (*feuilletts*), from the very peculiar laminated arrangement of its interior, it being filled with the unequally developed leaves of its lining membrane, all of which are covered by papillæ. These leaves are attached by their convex border to the

walls of the sac, and their concave border is free; they are of different lengths, and between them there is always a quantity of finely divided food, sometimes soft or semifluid, at others dry and flakey.

The fourth sac, "*la caillette*," is the true digestive stomach, and corresponds, both in its structure and functions, to the single stomach of the omnivora and carnivora. It is in this stomach that the first real process of digestion takes place by the chemical action of the gastric juices.

The intestinal canal consists of a long cylindrical tube divided, by difference of calibre and disposition, into large and small intestines, averaging about 49 yards in length, folded and festooned in the cavity of the belly by means of a thin transparent membrane—the peritoneum.

The interior of the intestines is covered by numerous villousities and glandular orifices or follicles, the whole arranged so that, while the nutriment of the food has been prepared by digestion for absorption which takes place in the intestines, the indigestible matters and effete products are mixed with fluids poured on to the inner surface of the bowels, rendered soft, and the outward passage facilitated.

THE PROCESS OF RUMINATION.—The food being gathered by the lips and tongue, is roughly masticated and swallowed, passing in this bulky form into the paunch (*panse*), while, according to *Owen*, "water that may be drunk, finds its way mainly, as in the camel, into the cells of the second cavity."

The food is subjected to a rotatory or churning motion in the paunch, successively in its course to be moistened by the fluid of the reticulum.

When rumination commences, the coarse food in the paunch is brought within the grasp of the muscular walls of the œsophagean groove or canal where it is moulded into a bolus, and, by an antiperistaltic action of the œsophagus, it is carried upwards, and, by a motion partly voluntary and partly involuntary, it is thrown into the mouth, where it undergoes a longer and more thorough mastication, and a more complete incorporation with saliva, and is again swallowed. By contraction of the muscular walls of the groove the opening into the paunch and *honey-comb* closes, and the soft food is carried direct into the third or *many-plies*, the fluid portions passing direct into the fourth stomach.

The food, after having been compressed between the leaves of the *many-plies*, triturated, comminuted, and diluted by fluid, is passed on to the fourth or true digestive stomach, where it is subjected to the action of the gastric juices, and