

Popular Geology.—No. 5.

BY PROF. J. H. PANTON, M. A., F. G. S.

Among the chief agents of denudation are: the atmosphere embracing the effect of oxygen, carbonic acid, wind and vapor; water as rain, river, lake, sea and ice; life as animals and plants. The result of one or more of these agents during long periods of time is very effective in breaking up rock and producing material for the formation of soil. We shall now consider how these forces act upon the earth's crust.

Oxygen.—The air contains twenty-one per cent. of oxygen, an element that has a very strong affinity for nearly all other elements, and especially for iron, a very common substance in rocks, notably igneous and metamorphic; with this it unites and forms a compound of iron of much importance in the soil for plants. The withdrawal of an element or compound from a rock immediately leads to its disintegration. Boulders by the wayside are often seen illustrating this silent change by the rusty streaks upon their surface. Where rocks show this presence of oxygen combining with iron, it is only a matter of time when the boulder will be a heap of loose material, serving as a contribution to the soil beneath it. Iron is one of the most susceptible elements in bringing about the disintegration of rocks, whether it be combined with oxygen as an oxide or with sulphur as a sulphide. Oxygen exists in the air, mixed with nitrogen, and not chemically combined, consequently it readily separates from it to unite with other elements.

Carbonic acid.—This is always in the air, and it, too, is a powerful disintegrating agent in the presence of moisture, especially upon rocks containing carbonate of lime, magnesia or iron. With these, insoluble in water, it combines and forms bi-carbonates, soluble in water; and thus, while breaking up the rocks, it at the same time supplies food in solution for plants.

This process is well illustrated by taking some clear lime water and passing carbonic acid into it (simply breathing into it through a tube will show it); the water becomes milk-like, and if allowed to stand a short time, a chalk-like sediment will form; this is carbonate of lime, insoluble in water. Now, if more gas is added, in a short time the sediment vanishes and the water clears up, because the insoluble carbonate of lime has changed to bi-carbonate of lime, soluble in water. There is just as much lime in the water as before, but it is now invisible. This change is going on constantly where carbonates are in the soil.

We observe how rapidly the inscriptions on marble tombstones become obscure; no doubt largely due to this solvent action of carbonic acid associated with rain.

It also has the power to remove from feldspars and other hard rocks some of the compounds of lime, soda and potash, forming carbonates, and leaving clay as a result from the rock disintegrated.

Hard as granite is, in time it falls to pieces before the decomposing power of carbonic acid. Even slate, in some cases, undergoes dissolution in a somewhat similar manner. In this compound we have not only a powerful agent in the destruction of rock, but also a great provider of soluble material suitable for plant food.

Wind.—The effect of wind is seen more especially in districts where sand is common, or along the seashore, where particles of sand blowing constantly against rock do in time beat holes in it, which enlarge and bring about results in rock destruction almost incredible, were they not borne out by actual facts. The shifting of the "sandhills" in Manitoba, near Brandon, and those of Prince Edward County, Ontario, are also illustrations of what wind may do as a denudating force.

Rain.—It is not difficult to understand how rain may be a powerful factor in grinding down rock, both as a mechanical and chemical force. Every rainstorm lays bare much surface, by simply washing away fine material from the hillsides to lower parts, and thus exposing fresh surfaces for further wear; then, by its solvent action, both as pure water and as water containing carbonic acid, its effects upon rock are very great. All rain contains more or less of this acid, derived, some from the air and some from the soil through which it passes.

Rivers.—The influence of rivers, as denudating agents, will depend upon their length, volume, slope and the nature of their bed and banks. They also act mechanically and chemically. In their course they form "valleys of denudation"; these have strata of the same character on opposite sides. A few rivers may be given here to illustrate what important agents they become in denudation:

Niagara River has cut its way through a bed of rock over 160 feet thick, a distance of seven miles. It is estimated that the falls recede three feet annually, and were at Lewiston 15,000 years ago.

The Mississippi deposits at its mouth annually 7,171,400,200 cubic feet; this is sometimes represented as equivalent to 50,000 acres of sediment three feet deep; the delta at its mouth contains 13,000 square miles, 528 feet deep. The Ganges has deposited a delta equivalent to 20,000 square miles. Egypt is the gift of the Nile, and Holland the contribution of the Rhine to Europe. The Colorado canyon is 300 miles long, 3,000 to 6,000 feet deep; that of the Yellowstone River, twelve miles long, 1,200 to 1,500 feet deep. The Mammoth cave, in Kentucky, with its 223 avenues, averaging twenty-one feet in height and width, representing 150 miles of underground passages, is largely the work of a subterranean river since Miocene days. To-day, after tread-

ing your way for nearly three miles, you come to the Echo River, upon which you can sail for a mile, and embarking, continue your journey for six miles further along these strange avenues, shrouded in eternal darkness and gloom.

By the action of this extinct river, five galleries have been worked out, equivalent to the removal of 12,000,000 cubic yards of limestone. Such examples at once impress us with the striking results effected by rivers in transporting sediment and disintegrating rock.

Lakes and Seas.—The effect of large bodies of water upon a rocky shore is seen by the formation of "outliers" and caves; the former result where the waves succeed in separating a portion of the main rock by cutting around it and causing it to appear like a detached rock in the water.

Caves may be formed in four ways: (a) By the elevation of rock, as in many parts of the Blue Mountains, Virginia; (b) along the shore, where a place is exposed to the action of the waves, as Tully's cave, Isle of Staffa; (c) by subterranean rivers, as the Mammoth Cave, Kentucky, or the Wyandot of Indiana; (d) sometimes beneath lava beds.

QUESTIONS AND ANSWERS.

[In order to make this department as useful as possible, parties enclosing stamped envelopes will receive answers by mail, in cases where early replies appear to us advisable; all enquiries, when of general interest, will be published in next succeeding issue, if received at this office in sufficient time. Enquirers must in all cases attach their name and address in full, though not necessarily for publication.]

Veterinary.

FAILURE IN MILK SECRETION.

W. B. BROWN, Tarbert:—"We have a very peculiar trouble with the cows in this neighborhood. There are a number which have no milk at the time of calving, though they have been well-wintered, some on hay and roots and others on hay and grain. The cows are in first-class order and seem healthy in every way save the fact that no milk can be obtained from cows which gave a large quantity last year. There is no inflammation of the udder or any apparent cause for the trouble."

Not being able to diagnose the case from the information given in the above letter, we wrote asking for a fuller description of the symptoms. In his reply Mr. Brown stated that the cows affected had been fairly well wintered on hay and roots, while others, on precisely the same feed, are doing well. The hay appeared to be all right; part of it was June grass and was cut on the ripe side. His letter was accompanied by the following communication to the ADVOCATE from his local veterinary adviser, Dr. Appleyard, of Grand Valley, Ont.:

"Agalactia, the name of the disease, or rather neurasthenia, first appeared in this neighborhood two years ago last spring, both mares, cows and ewes being affected, the former to such an extent that nine folds out of every ten born before the 15th of May died from the want of proper nourishment. This spring cows are affected most frequently. Almost every day somebody applies to me for medicine to cause the milk to flow. I am not able to give the causes of this trouble, as it affects cows in all conditions; those that have been well stabled all winter and are in good flesh have been troubled as frequently as those in more unfavorable condition. The breed appears to influence it very considerably, grade cows ranking first in the percentage of those attacked. I have never seen a Jersey cow affected, and Holstein and Durham cows appear to rank between the grades and Jerseys. This condition may be described as a neurasthenia, or a not to be explained condition of the nerve centre governing the mammary gland. During pregnancy the overplus of nourishment taken into the system by the cow is directed to the growth of the foetus. After calving this overplus is directed to the mammary glands to produce milk for the maintenance of the offspring.

I have not treated any of these cases further than advising to feed on bran mash and boiled oats, milk the cow three or four times a day and rub with brandy or some other stimulating liniment.

The only medicines indicated are nerve tonics, such as preparations of phosphorous, iron and strychnine.

Fresh grass is the best milk-producer at this time of the year, and is of more value than any medicine in cases in which there is no apparent disease.

E. APPLEYARD, V. S.

The disease which has been so very thoroughly described in the above letter is one about which very little is known, either as to cause or remedy. It was first noticed in this section about two or three years ago. I have been called upon to treat a large number of cases during the past season. The disease is supposed to be due to a fungus on the stalks and leaves of oats and grasses, especially June grass and coarse swamp grass. The presence of this fungus is shown by a slight roughness of the stalks, but in many cases this is so slight as to be invisible to the naked eye. There is no remedy known for either the fungus disease or its effects upon cows. In my practice, however, I have been very successful in giving doses of Epsom salts, which have a stimulating action upon all the glands of the body, the mammary glands included. Give from a pound to a pound and a half every three or four days, according to the size of the cow and the effect which it has. Care should be taken not to bring on too excessive purging. This

treatment should be persisted in until an improvement is noticed. It would be well to change the feed, giving as little of the June grass, swamp hay or oat straw as possible. In this district, when called upon to treat a cow for this disease, we almost invariably find that they have been fed upon oat straw.

J. H. TENNENT, V. S.
London, Ont.

INJURED HIPS.

TYSON BARNES, Hampton Station, N. B.:—"I have a Jersey heifer, 2-year-old, which calved about a fortnight ago. Since calving she seems to have lost the use of the left hind leg from hip down. She did not eat anything for two days after calving. She is swelled from left hip to root of tail. Have bathed her leg with turpentine. I feed her English hay and middlings."

Owing to the early age at which the heifer calved, the swelling and lameness is probably due to some injury to the hip bones at the time of calving. In the young animal the bones which form the pelvic arch are not completely ossified, being joined together by cartilage. In calving, this cartilage is liable to be torn or strained. The heifer will likely recover in a short time, but the hip-bone may be permanently lowered, or if a serious case, the leg may be dragged somewhat. Keep her as quiet as possible; foment with warm water and apply a good stimulating liniment to the hips. A good one may be composed of the following ingredients:—Ammonia, 8 drachms; turpentine, 2 drachms, and sweet oil, 8 ounces.

J. H. TENNENT, V. S.,
London, Ont.

PREVENTING THE GROWTH OF HORNS.

W. H. TEETER, Barrow Bay:—"Will you please send me the best and easiest method or receipt for stopping the growth of horns on calves?"

This question was fully answered in our issue of Sept. 1st, 1893, caustic potash being the remedy recommended.

SHEEP SWELLING UNDER THE JAW AND SWELLED LIPS.

R. H., Pender Island, B. C.:—"This winter I had a few of my sheep that had a soft swelling under the jaws, which caused them to fall away in their feeding and flesh; also during the past winter I had some sheep that swelled in the lips, and my neighbor's sheep took it in a much severer form; their lips festered and bled, but the disease went away just as suddenly as it came, leaving no visible effects. Please tell me the cause of both diseases and prevention remedies. I do not find in 'Randall's Practical Shepherd' a satisfactory explanation of either of these particular ailments."

Both the ailments are slightly epidemic, but, as was the case in this instance, not as a rule serious in their nature. For the lip trouble, applications of sulphur and lard or sulphur and tar are recommended, and for the swelling, hot fomentations. As soon as any cases are noticed separate the animals affected from the others, and treat as directed. Outbreaks of this kind have been noticed on returning from the fall exhibitions. If allowed to run on until lambing time, the results may be more serious.

A DEAF HORSE.

E. T. GORRELL, Pilot Mound, Man.:—"A week ago I went out shooting, driving a good six-year-old horse; only fired three shots; the last one appeared to frighten him very much, and next day he was so deaf he could not hear a person's voice unless close to his head, and that frightened him. Can anything be done to cure the deafness?"

If the deafness was caused by the discharge of firearms close to the ears, it will most likely only be of temporary duration, and no treatment, medical or otherwise, will be necessary.

W. A. DUNBAR, V. S., Winnipeg.

BROWN-COLORED MILK.

C. FIDLER, Reaburn, Man.:—"A cow just calved gives brown milk. It is her fourth calf; she eats and drinks all right, and is otherwise well."

We suppose you have made due allowance for the normal color of the first milk after calving (colostrum), which is of a deep yellow tinge. The brown color of the milk is due either to congestion, inflammation or some other abnormal condition of the lacteal system. If the milk does not become natural in color in four or five days after calving, the cow should be given the following purgative:—Epsom salts, one pound; nitrate of potassium and ground ginger, of each half an ounce; treacle, one pint; dissolve all in one quart of hot water and give in one dose. Follow this up by giving in bran mash every night for a week, bicarbonate of potassium, half an ounce.

W. A. DUNBAR.

HEAVES.

SUBSCRIBER:—"I have a colt three years old, which has had a cough about three months. It is very short of breath, and acts as if it had the heaves. What remedy would you advise?"

Give a ball composed of seven or eight drachms aloes, according to the size of the animal, and then give the following powder every night in his feed:

One drachm nitrate of potash, one drachm digitalis, pulverized, and half drachm tartarized antimony. If the animal is turned out on the fresh grass, it will probably relieve him greatly. Hay and bulky feed should be fed in small quantities, and care should be taken to see that it is clean, sweet and free from dust. It will be better to moisten the feed slightly.

J. H. TENNENT, V. S., London.