### Science Notes.

A bill to legalize the use of weights and measures of the metric system is now before the House of Commons.

Rhinometers are devices to measure the amount of air a man breathes through his nose, in order that his doctor may compare it to the amount he should take in that way.

Dr. Charcot's statue, by the sculptor Falguière, is nearly finished, and will soon be erected in the Salpetrière Hospital, where Charcot made his experiments on hysteria and hypnotism.

Newfoundland has issued a series of Cabot postage stamps to celebrate the four hundredth anniversary of his discovery. One of the designs used are portraits of Cabot and Henry VII and scenes of Newfoundland life.

Konakry, on the west coast of Africa, has been reached by a French expedition in three weeks from the Niger, for the second time. This establishes the advantage of the route by way of Fula-Djalon, and surveys for the road are being hastened.

A dispatch from Danes Island, dated June 28, announces that the filling of Prof. Andree's balloon was completed on June 22, and everything was ready to start in his attempt to cross the Arctic regions on July 1. The winds have been hitherto chiefly northerly.

Neapolitans have a bad reputation for ill treatment of animals, and the Naples S. P. C. A. seems to have plenty to do. During last year its agents stopped 44,321 carts for carrying too heavy loads, and in nearly one-half the cases had the load reduced; they confiscated 41,011 sticks used for beating animals and 887 spikes used on curb chains; 2,282 convictions for cruelty were obtained.

In connection with the "Diamond Jubilee," Mr. William Crookes and Dr. Gowers received knighthoods. The Order of the Bath was conferred on Mr. Wolfe Barry, President of the Institution of Civil Engineers, Dr. Frankland, Dr. Huggins, Mr. Norman Lockyer, Dr. Thorne Thorne and Admiral Wharton. Minor honors were conferred on a number of scientific men of the kingdom. The selection of Mr. Crookes for knighthood was very appropriate.

Mr. Frank M. Chapman, of the Museum of Natural History, compiled a list of the birds which he saw on the hats of women recently in New York City, during two afternoons. Forty species were represented. In all he saw 173 wild birds, or parts of them, on hats. Of these birds, at least thirty-two varieties are protected by law during all or a major portion of the year. A Boston court has just decided that it is unlawful to wear feathers of a bird that is protected by law, and a similar law exists in New York State.

In a recent number of the Gardeners' Chronicle, Mr. G. J. Burch contributes an interesting article, accompanied with figures, upon the use of the X rays for photographing flower and fruit buds. Mr. Burch and his assistants began by exposing plates of glass of different colors to the action of the rays. The violet glass showed itself much more opaque than that of other colors. It contained alumina and cobalt in addition to the ordinary elements. An experiment was afterward made with a violet-colored hyacinth, and, as had been anticipated, the flower gave different results from those given by the glass. It was much more transparent. The sensitized plate, after development, showed that the contour of the petals, the veins, and the internal form of the ovary were well represented. For taking such radiographs Mr. Burch advises the use of tubes that give very little light, and that, for example, would scarcely give the contour of the hard parts of the hand. The aeriferous tissues are very transparent to the X rays. The more water the tissues contain, the more opaque they are. Dry fruits and flower buds give excellent radiographs. The seeds are very distinctly seen, as are also the different parts of the flower.

In north latitude 70° 40′ 11·3″, where the most northerly town in the world, namely, Hammerfest, is situated, there is a monument which was visited by most of those who went to Norway to obtain a view of the total solar eclipse. This monument consists of a fine granite pedestal and pillar supporting a large terrestrial globe made of copper, and was placed there to commemorate the completion of a grand piece of surveying work. The primary object of this survey was, as Mr. Fowler writes in an interesting article in Knowledge (June), the measurement of the earth, and to provide a permanent mark in order that the measurements may be repeated at any future time if considered desirable. Without entering into the details of a trigonometrical survey, and how a triangulation is accomplished, we will limit ourselves to the inscription, written in Latin and Norwegian, on the pillar, referring the reader to the article in question for details: "The northern termination of the arc of meridian of 25° 20′ from the Arctic Ocean to the river Danube, through Norway, Sweden and Russia, which, according to the orders of His Majesty King Oscar I, and the Emperors Alexander I and Nicholas I, and by uninterrupted labors from 1816 to 1852, was measured by the geometers of the three nations."

## THE DENUDATION AND RECOVERY OF FARM LANDS.

One of the most useful of the Farmers' Bulletins issued under the administration of the present Secretary of the United States Department of Agriculture is that entitled "Washed Soils: How to Prevent and Reclaim Them." We reproduce in this impression three illustrations which accompany the paper, showing the effects of erosion and how to remedy them. The denudation or washing of lands in the higher levels of the earth's surface has been one of the most important factors in the geological changes which have so modified the surface of the earth. As a rule, this denudation is exceedingly slow, and the general level of large tracts of country is not lowered more than an inch or two in a hundred years; but when it is excessive, and more rapid than the natural decay of the subsoil material which is exposed, it may work serious injury to agricultural lands.

The excessive erosion or washing of lands may be prevented, the fields already cut up with gullies and watercourses may be recovered, and steep slopes may be held and prevented from washing by chemical means; by cultivation and under-drainage; by reforestation; and by grass and similar vegetation.

### I.—CHEMICAL RELATIONS OF THE SOIL TO SURFACE WASHING.

Surface erosion can be largely prevented by such a system of cultivation and cropping as will introduce as large a quantity of organic matter into the soil as possible. A very old method of recovering washed and gullied lands is to place straw in the furrows while plowing, the straw not only acting mechanically to hold the soil in place and prevent surface erosion, but also in a very efficient way to increase the quantity of humus, thus making the soil hold large quantities of water which otherwise would have passed off over the surface.

As soon as a sufficient supply of humus has been accumulated and the lands are brought up to an adequate condition of fertility, clover or grass should be seeded, if the land is at all suited to these crops, or rye, oats, or field pease should be sown to help hold the surface.

A soil containing a fair supply of lime is much less liable to wash than one similarly situated and exposed which is deficient in lime. Clays which are heavily impregnated with lime salts are in a flocculated state, the fine grains of clay being held together and in contact with the larger grains of sand. This flocculated mass quickly settles and is originally not so easily disturbed and carried off by moving water. A stiff clay soil is practically impervious to the penetration of surface water when it is delivered in such torrents as we are liable to have in our summer storms. A well limed soil, on the contrary, although it may contain as much clay but in which the particles are flocculated or drawn together, is much more pervious to water, and the amount of water which the soil will carry down through under-drainage is increased, and the excess which has to flow off over the surface is diminished.

### II.—WASHING OF LANDS MAY BE PREVENTED BY METHODS OF CULTIVATION AND UNDER-DRAINAGE.

A field in a condition of fine tilth and plowed to a depth of 10 inches will hold 2 inches of rainfall and absorb it very readily, and a soil in such a condition will suffer no surface washing from any ordinary rainfall. This will not only save the surface from being washed and gullied, but it will also increase the store of moisture held by the soil, which is of very great value in the time of drought.

It is important also for this, as for other reasons, that the soil be covered with vegetation as much as possible throughout the year, as the roots and organic matter serve to bind the grains of the soil together.

Another very effective method, when properly carried out, to prevent the washing of lands is to underdrain the soil with tile or other drains. These drains carry off quite rapidly an excess of moisture, so that much more of the rainfall is absorbed by the soil and carried off through the drains and less washes over the surface of the land.

In cases where these methods may not be sufficient it will be necessary to provide for a more uniform distribution of the flow over the surface, and to prevent any accumulation of water which would have the effect of a torrential stream. This is secured in a great measure in cultivating the soil by laying off the rows according to the contour of the surface, so that each row will have a very slight incline of not more than from 1 to 6 inches in 100 feet, in which the flow of water would be so slow that there would be little or no erosion.

To prevent an accumulation of water from breaking down the rows larger and more substantial ditches may be provided, following very nearly the contour of the field, so that there shall be a fall of from 1 to 6 inches in 100 feet. The distance apart of the ditches will depend upon the slope of the field; with a very steep slope they should be close together, often not over 6 to 10 feet apart; with a gentle slope they should be at intervals of 15 or 20 feet, or even farther apart, depending upon the texture of the soil and the contour of the surface.

These sidehill ditches are very easily constructed, being made almost entirely with the plow. It is well to get the bank forming the lower side of the ditch sodded with grass to help hold it and to lessen the danger of its giving way during a heavy rainfall. Unless these ditches are thoroughly constructed they are worse than useless; for if they break they concentrate a volume of water upon one point in the field which would otherwise have been distributed over the surface, and this often forms a torrent which does great damage. They should always be run with a level, of which there are several forms on the market suitable for this work.

A more efficient, but at the same time much more expensive, method of preventing the washing of lands where there is a considerable slope is to terrace the fields so that there shall be level steps upon which the water can rest for awhile and be absorbed.

### III.—RECOVERING GULLIED HILLSIDES BY REFORESTATION.

Forest ground is not subject to this erosive action of the rainfall, because in a forest a large part of the rainfall never reaches the soil, as 20 or 30 per cent is intercepted by the foliage and evaporated before it reaches the ground. The rainfall which reaches the surface is rapidly absorbed, as the soil is kept granular and loose and much more of the water is carried off by under-drainage rather than by surface drainage.

Just as deforestation of hillsides and hilltops is the first cause for inducing erosive action, so is reforestation the most effective means in curing the evil. This has been demonstrated in France, where the government and the farmers together have spent, during the last thirty years, over $40,000,000 and expect to expend three or four times that amount to reforest 1,000,000 acres of denuded mountainsides, the soil and debris from which has been carried by the torrents of water into the plain, covering over 8,000,000 acres of fertile ground and making it useless for agriculture. Sodding for pasture has been found mostly less effective and on the steeper slopes entirely ineffective.

Wherever the ground in the hill country is not fit for agricultural use it should be set and kept in forest, not only to make it produce a timber crop, but also to prevent the erosion which finally becomes dangerous to the lower valley lands. The forest should occupy all hilltops which, as a rule, have too thin a soil to allow profitable agricultural use; it should be kept growing on the steeper slopes where the water acquires the greatest momentum and the loosening of the soil by the plow furnishes a most favorable condition for erosive action; it should be placed on all rocky, uneven, agriculturally useless spots, because it will produce useful material even on such unfavorable situations, and, finally, forest belts should be maintained on long slopes alternately with fields and pastures, running along the brow of the slope of widths and at distances proportionate to the character of the land and the angle of the slope—on the steeper slopes closer together, on the gentler slopes further apart. In the deeply gullied hill lands, where plowing is impracticable, it is necessary to break the force of the water by constructing brush dams across the gullies, as shown in the second illustration, and roughly fill in the latter with stone, gravel, earth, etc., in front and rear if they are shallow, and at least in the rear if they are deeper. Where the ravines are especially deep and wide it may become necessary to supplement and strengthen the rough dam with a loose rubble embankment or a dry wall of stone. A simple and efficient method has been practiced in France, which consists in filling up the ravine with brush placed lengthwise and keeping this down by poles laid across and fastened in the sides of the ravine. The waters are thus allowed to drain off, while the soil carried by them is retained in and over the brush, and in a short time the gulley will fill up of its own accord. Then alders and willows are planted along the edge and soon finish the work of securing the ravine against washing. The means for thus breaking the force of the water in the gullies and changing it from a rushing torrent into a series of gentle falls, and in part from surface drainage into subterranean drainage, and of filling up the gullies themselves will have to be devised in every special case as circumstances permit and the ingenuity of the operator suggests. The brush dam is preferably made of willow, poplar, alder, or other readily sprouting material, which becomes alive and, by striking root, adds to the firmness of the dam.

### PLANTING.

To cover the soil as quickly as possible with a dense and permanent arborescent cover is the object to be attained. Where the soil has not been so far eroded that plowing could be done, it might be best for the first season to sow oats, field pease, or other crops that will readily grow and make a cover. The cheapest and most readily germinating tree seed should be looked for and the quantity used per acre should be lavish, to secure a dense stand from the first. The most readily available kinds are the silver or red maple, box elder, elms, ash, and black locust; and since for various reasons variety or mixed woods are preferable, it is advisable to use as many kinds as can be readily obtained.

Where the ground is too much cut up and too uneven

to permit of plowing, recourse must be had to sowing of seed in plats, or planting of seedlings or cuttings by hand. This is naturally much more expensive, and therefore should be done with greater care and foresight. Plats may be made by loosening the soil with a hoe or spade, and sowing the seed into these seed beds, covering the seed only slightly. The plats should be three to four feet apart to make sufficiently rapid cover.

The cheapest and most readily growing material for the general cover is furnished by the willows and poplars, to which may be added the box elder, the black locust, and the catalpa, while other more valuable kinds may be introduced, when the first cover has been established, by the planting of two or three year old plants in single specimens.

The first and principal object being to break the force of the surface waters, the arrangement in setting out the plants should be as nearly as possible in horizontal and parallel rows along the brow of the hill, following the contours. To get a full cover as soon as possible, the plants should be set not farther apart than three to four feet and even less, making from 5,000 to 7,000 per acre. If this is found too expensive, or for some reason impracticable to be done at once, the work may be reduced and divided into several seasons; the rows then may be made farther apart, say from six to sixteen feet, according to the slope, and the plants in the row two feet, when the number will be one-half, or less.

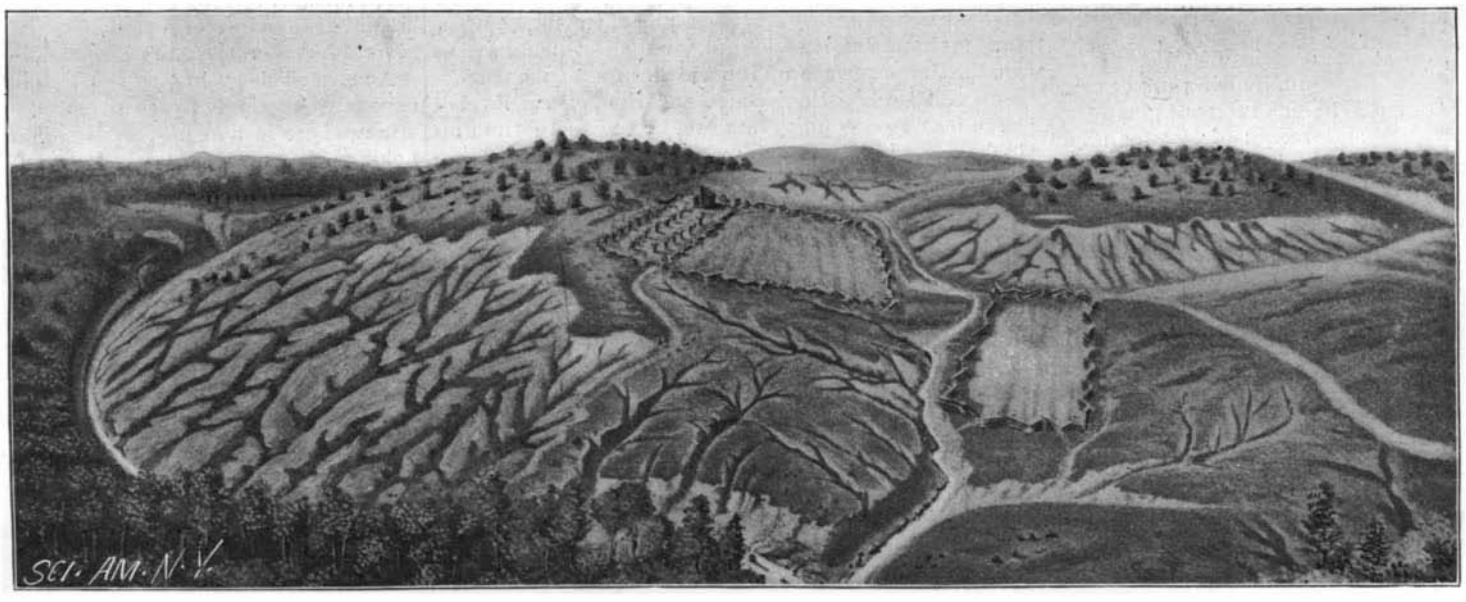


**Fig. 1.—HOW THE FARM IS LOST.**

Cutting off the timber allows surface water to rush rapidly over the ground, washing away soil and cutting surface into gullies.


**Fig. 2.—HOW THE FARM IS REGAINED.**

Replant the forest and woodlands; check rush of water by brush dams; control drainage by terracing, contour plowing, and ditching; restore organic matter by manuring and cultivation.

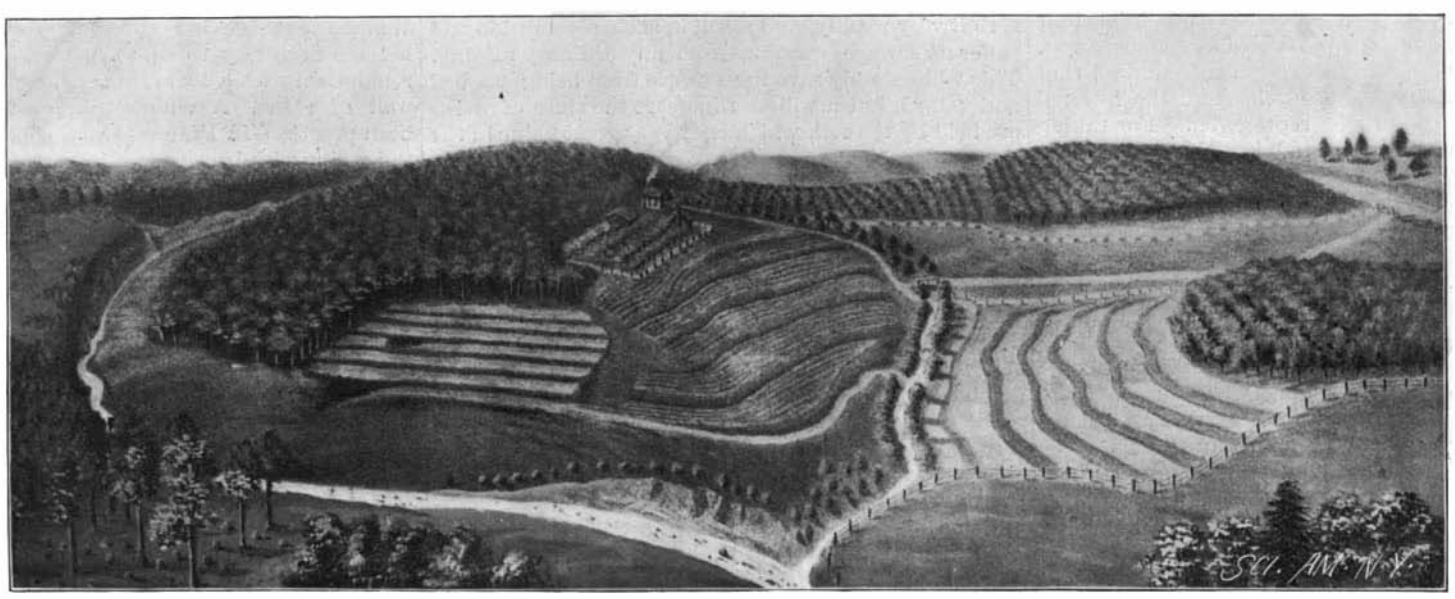


**Fig. 3.—HOW THE FARM IS RETAINED.**

Cut out the timber judiciously; preserve fringe of wood on banks of streams; divide farm into pasture and woodland; repair at once any damage by water.

IV.—GRASSES AND SIMILAR VEGETATION PREVENT EROSION AND WASHING OF AGRICULTURAL LANDS.

On gentle slopes a good turf of perennial pasture grasses, especially those with creeping rootstocks, prevents corrosion, or washing of lands, and short, steep embankments may also be protected with this same covering. On longer and steeper slopes, however, this method is not so effective as that of reforestation.

In enumerating the effects to be obtained by the growth of grasses and other herbaceous vegetation on washing lands, or lands liable to be eroded, it should be stated that such growths are calculated to break the force of the rainfall and prevent its packing the soil; to render the ground more porous through the root penetration into the subsoil; to make the soil more absorbent and more retentive of moisture through the addition of humus to the soil from the decay of the plants; to retard the rate with which the surface waters flow off; and lastly, to bind the particles of soil together, which is especially effective in the case of light, sandy lands and of newly formed embankments, whether of sand or clay.

THE odor of sweet peas, according to a contributor to the Medical Record, is so offensive to flies that it will drive them out of the sick room, though it is not usually in the slightest degree disagreeable to the patient.