THE CHEMISTRY AND MECHANICS OF PLOWING.*

THIS subject, if followed in all its ramifications, covers nearly the entire course in agricultural chemistry, as well as a short treatise upon simple mechanics. Even vegetable physiology must be partially noticed, since the grand and primary object of plowing is to produce such conditions in the soil as shall conduce to the most rapid development of the cultivated plants in a given time.

In the hour allotted, however, only a few salient points can be noted, and these will be reviewed with great haste. There are two series of ever active forces in nature, the one constructive, the other destructive. They operate alike upon the three great kingdoms, mineral, vegetable and animal. These forces are gravity, heat, water—alone, as a vapor, liquid or solid—water charged with carbonic acid, oxygen of the air, chemical affinity, vitality and ferments. The latter may be regarded as a low order of vitality.

These forces have produced all of the changes on the earth's surface, and are still acting with undiminished intensity, causing transformations in the natural spectacular drama daily unrolling before the gaze of observing humanity. The internal heat of the earth, the deposition by moving water of rock material, subsequently solidified or crystallized by pressure, and other causes are constantly engaged in the process of rock making. As soon as the rock appears, whether of igneous or aqueous origin, the destructive forces begin the work of disintegration, preparatory for the support of vegetable life. First a few lichens, then mosses, then grasses and weeds, and finally shrubs and trees. A more or less complete disintegration of the rock, as observed by the unaided eye, is finally presented to the envious inspection of the prospective settler. While this disintegration, in situ, is occurring, the falling rains and moving waters are busy in transporting, assorting and depositing much of this disintegrated material at lower levels, and finally we will have large areas of alluvial soils encroaching upon the ocean's domain, and enlarging the territory of cultivable soils. As soon as these layers of alluvial material are super-imposed the one above the other to produce sufficient pressure, rock making again begins, and if undisturbed, incipient shales, slates, sandstones, etc., will ultimately be produced. This transformation is first exemplified in the harpan which occurs underneath nearly every soil which is cultivated with shallow implements.

With these preliminary remarks it will doubtless be apparent to many of you that the first and primary object of breaking soil is to arrest this tendency to rock making, to open up the first twelve or eighteen inches of the soil to the disintegrating influences of air, water and vegetable matter. The character and size of the crops grown also determine the rate of disintegration, the larger and deeper the roots penetrate, the more effective they become in soil improvement. To secure the growth of plants with large and deep roots the soil must be deeply broken and stirred, for in this soil its roots must penetrate and live. It is their home, and easy permeability and a free access of air are absolutely essential for the full growth of roots of all kinds of plants. Again, the presence of air and the freedom of movement of water through the soil are also essential conditions for the elaboration of plant food from the rock dust which makes up the bulk of all soils. Here, too, we realize the presence of the ever acting forces of construction and destruction. "By ceaseless action all that is subsists," and the soluble plant food of to-day if not utilized at once by the growing plant is quickly resolved into insoluble forms or washed out by excessive rains. The amount of soluble food available at any one time is determined largely, as I will presently show, by "tilth."

Another object in breaking or inverting soil is to destroy weeds or grasses, and thus relieve it of the foulness which an excess of vegetable growth always produces. Breaking land is, therefore, a cleansing process. But another object in breaking land is to control moisture. If the lands are inclined to be water-sodden, they are usually thrown into high ridges, thus exposing the largest surface possible, with bare deep middles, insuring increased evaporation from lower depths and furnishing surface channels for the escape of flood water in times of excessive rains. Evaporation is a cooling process, and no soil can be made warm and fit for rapid growth of plants which contains an excess of moisture. Therefore, breaking is often resorted to to relieve the soil of abundant moisture, to produce heat and warmth necessary for plant vigor, and to permit the free circulation of air which is necessary for growth of roots and for the chemical reactions which must evolve soluble plant food. If, on the other hand, our lands are disposed to be droughty, barely affording enough water for a maximum crop, the reverse treatment is resorted to. The soil is now broken flat, each furrow is lapped upon the preceding one, forming a continuous blanket six or eight inches deep, so as to prevent the rapid evaporation which the nature of the soil would otherwise accomplish.

In this way such soils are kept moist. With soils of an intermediate character, such treatment should be given as will insure the most desirable quantities of moisture and heat needed for maximum growth. Soils vary largely in their capacity for moisture. The soils of Audubon Park, when saturated, will carry 51 per cent. of their weight in water without dripping; while those on this station (Calhoun) will barely hold 20 per cent. of their weight. It has been shown that the soils of the former are too dry to furnish the needed moisture to growing plants when they contain 12 per cent. of water; while the latter will successfully sustain plants down to $1\frac{1}{2}$ or 2 per cent. of their weight in water. These differences are due to the different percentages of clay, silt and sand which these soils contain. The larger the percentage of clay, the greater the capacity of holding water. Vice versa, the larger the proportion of sand, particularly coarse sand, the less its capacity for water. Since an excess as well as a deficiency of water is to be avoided, true loams (mixtures of sand and clay) are therefore better adapted to most of the crops grown. It has been found that 50 to 60

per cent. of the water holding capacity of every soil is the amount best adapted to rapid growth.

So much for the physics, the chemistry and the geology of breaking soils.

If this work has been intelligently performed, subsequent planting and cultivation are simple processes. If the process of breaking has been badly performed, then subsequent cultivation must be directed not only to cultivation proper, but to the securing of tilth; that is, obtaining the best conditions for the growth of crops.

Tilth, however, should be always obtained before planting, if possible, and then the after cultivation is purely one of culture, that is of the maintenance of tilth.

Unfortunately, such a happy condition does not often prevail with our farmers. It is too frequently the case that furrows hastily thrown together form the receptacle for our seed, and after the plant is up it is permitted to contend for mastery with weeds and grass until the latter promises success, when a desperate effort is made with turning plows, shovels and hoes to bury and annihilate the latter, and the cultivated plant, left alone in the occupation of the soil, is yet stunted, and surrounded by environments which will not conduce to the most rapid growth and development. Alas! cultivation is too often regarded as a process of destruction of weeds and grass, and is resorted to only for such purposes.

But cultivation should have no such object in view. It is true that our variable seasons will occasionally fill our fields with grass and weeds in spite of our efforts, and when filled must be removed by plow and hoe; yet it is the universal experience of every planter that the crop is never improved by such treatment. It is simply a necessary evil, often brought about by neglect or over cropping, but sometimes by such an extremely wet season as to defy human effort to prevent it. True cultivation should look only to the preservation of tilth which a proper preparation of the soil has established. It involves only two principles, the maintenance of the most rapid rate of nitrification and other chemical changes, and the conservation of the proper amount of moisture. Nitrogen is the most costly of the ingredients of plant food. It is also the most fugitive. It is derived chiefly from organic matter, which by a process of oxidation is converted into nitric acid. The salts of nitric acid are extremely soluble, and if not utilized at once by growing plants are washed out by heavy rains. Hence there is a gradual development of nitric acid during the period of growth of plants, and the process by which this oxidation of organic matter into nitric acid is accomplished is called nitrification.

This oxidation is going on in every fertile soil, and when stopped, even though the soil may be rich in vegetable matter containing nitrogen, the plants thereon must also stop their growth. What is necessary for nitrification?

(1) Organic matter containing nitrogen; (2) a certain amount of moisture; (3) a free access of air; (4) a certain temperature; (5) a mild alkali, with which the nitric acid can combine, when formed; (6) the presence of minute microscopic organisms or ferments.

With these conditions fully maintained nitrification is most rapid and effective, and the growth of plants is just in proportion to its rate. It can therefore be readily seen how cultivation tends to maintain the proper conditions for rapid nitrification. Many beneficial effects of cultivation can now be easily explained. We cultivate shallow, because such a process not only prevents destruction of roots of the plants, an evil always to be avoided, but also because nitrification takes place in the upper layers of the soil, and by the act of cultivation the ferment is well scattered. Again, the temperature at which fermentation is most active is about 90° to 110°, and this temperature obtains in the upper layers of the soil. The action of the ferment is suspended at or about 50° and 150°. It is destroyed by high heat and electricity; hence, when lightning strikes a soil, nothing will grow where it struck for some time afterward.

The presence in small quantities of lime highly favors nitrification. Moisture in excessive quantities excludes the air and suspends the vital activities of the ferment; hence the necessity of drainage. The absence of moisture is equally as objectionable, and here the second object of cultivation promotes the first.

From these considerations it will be seen that frequent cultivations, provided no roots are cut, are favorable to rapid nitrification. Soils cultivated daily produce better than the same soils cultivated weekly, and the latter better than those cultivated less frequently.

Besides the beneficial effects of rapid nitrification, other chemical changes of great practical value are induced by shallow and frequent cultivation. The soil is a great laboratory, and the chemical changes taking place there are complex and continuous, and frequent stirrings accelerate these changes and give increased available plant food. One practice must be emphasized here as both wise and expedient, i. e., of breaking the crust after every rain, to let in fresh portions of air and to aid nitrification, but under no circumstances should it be done while soil is wet, since this destroys rather than aids the ferment.

The second object in cultivation is to conserve the moisture. On the approach of a drought, cultivators should be run very shallow and almost continuously. In this way the thin layer of earth removed from the great mass of soil is laid as a mulch on the surface, and the continuous upward movement of the water through the soil into the air is checked just below the surface, and the roots of the plant can then appropriate it. The continuity of capillary pores is broken and the water heretofore passing into the air is arrested just below the surface, and is conserved for use of the plant. Hence cultivate continuously in dry weather. One other point—finely divided soils have the power (varying according to character from 15 to 23 per cent.) of absorbing hygroscopic moisture from the air, a not insignificant property in a prolonged drought with heavy dews at night. These are reasons why we plow. Now what do we do it with? All instruments used for working the ground and producing tilth, and classified as plows, may be divided into four classes: Plows proper, for breaking, inversion of soil, subsoiling, etc.; hand and horse hoes, for the destruction of grass and

weeds; cultivators, which simply stir the soil for nitrification or conservation of moisture; and fourth, harrows and rollers.

The plow is an ancient implement. The Egyptians had an iron pointed share, but no colter or wheels. The Greeks added wheels to their iron pointed shares. The early Saxons added the colter to the wheels and iron pointed shares, but it was not until the seventeenth century that the mould board was introduced, which remained of wood until 1760, when supplanted by iron ones. Wooden mould boards were used generally, however, until 1830. To-day we have every form of plow suitable for every operation of the farm, made of the best chilled iron and steel, with any part replaceable at will.

Of turn plows we have three general types:

1. A flat share and upright colter, cutting a rectangular furrow, and reversing, when it is used for sodding.
2. Crested or high cut plows, with share raised on the wing side, and an under cut colter throwing a furrow whose cross section is a trapezium, and is used for winter plowing, so as to expose the furrow to the largest influence of the freezes of winter.

3. Turn plows, which throw wide furrows up against each other at regular angles and are used for tilth.

Again, we have common plows which turn the soil; digging plows, like our scooters and straight shovels; swivel plows, which throw each furrow in same direction and are popular in hillside work; double mould board plows, which throw two furrows in opposite directions at the same time; subsoil plows, which stir the subsoil without bringing it to the surface, and special plows, like the potato plow, the beet plow, etc., used for harvesting root crops.

Even the shape of the share modifies the work performed. A slightly rounded, pointed share will perform square work in open land, and a flat share with short point is used in shaving land, and a long pointed share is used for breaking hard and stony land.

Cultivators may be arranged with grubbers; broad shares like your sweeps and scrapers and scarifiers, like our harrows and narrow bull tongues. Harrows are used to pulverize clods, smooth the surface and cover light and small seeds, and are a combination of plows. The roller is used to compact the earth and pulverize clods, and is a most useful instrument upon open soils.

In conclusion, permit a résumé:

All soils are comminuted rock particles and must be broken and exposed to the disintegrating agents, to prevent incipient rock making, to furnish easy permeability to roots, and to yield soluble food for the plant.

Thus breaking is done by turn plows, double mould board plows, subsoil plows, harrows, etc. If well done, an excellent tilth is established.

Cultivation should look only to the maintenance of tilth and moisture, and should be practiced frequently. The instruments to be used depend largely upon the character of soil.—The Southern Planter.

KASHMIR: ITS PEOPLE AND ITS PRODUCTS.

By WALTER R. LAWRENCE, I.C.S., C.I.E.

MY paper this evening is entitled "Kashmir: its People and its Products." I shall not dwell at any length on Kashmir's chief charm—its scenery; for at the close of the paper I propose to show you photographs which will depict more vividly than words the scenes which delight all visitors. These photographs are the result of the patient and laborious work of my friend Mr. Millais. I can vouch that they are accurate and instinct with the very spirit of the valley. Mr. Millais' name will be sufficient guarantee that the photographs are artistic.

I must, however, say a few words about the scenery and the configuration of the country. The beautiful valley is cradled in the Himalayas at an average height of 6,000 feet above the sea. North, east and west, it is shut off from the outer world by range after range of mighty mountains, while on the south it is separated from the British province of the Punjab by rocky barriers 50 to 75 miles in width.

The valley, that is the cultivated part, is 84 miles in length and 20 to 25 miles in breadth, and from the south to north and northwest it is traversed by the great river which we call the Jhelum, the Kashmiris call the Veth, and the ancients called the Hydaspes. The delta of the river in Kashmir is the Wular lake, a beautiful sheet of water covering some 80 square miles. In its course through the valley the river flows gently, and Horace's words, "lambit Hydaspes," are the best description of the smooth, easy current of Kashmir's great waterway. But when the river reaches Baranulla it leaves for ever the grassy banks of the valley, and hurries down its rocky, torrent course to the hot plains of the Punjab.

In the valley, wherever you look, you see mountains, ever varying in shape and color. There is the grim Haramak, which guards the entrance of the Sind Valley. It was my North Pole, to which we laid our maps when a compass was not handy. There are many legends clustering around Haramak, and the natives say that the presumptuous mountaineer who dared to scale the snow peak would meet with instant death. In the crest of the mountain there is said to be a vein of emerald which renders innocuous all snakes which lie within its ken. It is a curious fact that the poisonous snakes of Kashmir only occur in valleys which are hidden from the eye of Haramak. All around the valley are well-known peaks, all rich in legends, and above all towers the grand promontory of Nanga Parbat (26,600 feet). The sad fate of Mr. Mumery lends a painful interest to Nanga Parbat.

I suppose that all dwellers in a valley who watch great mountains, with their clouds and thunderstorms, are more prone to superstitions and legends than the people who live on the great plains of India; and I attribute much of the superstitious element in the Kashmir character to the daily contemplation of mountain scenery in its most finished form. The coloring of the mountains is exquisite. In early morning they are often a delicate, semi-transparent violet, relieved against a saffron sky, and with light vapors clinging around their crests. Then the rising sun deepens shadows, and produces sharp outlines and strong passages of purple and indigo in the deep ravines. Later on it is nearly all blue and lavender, with white snow

* A synopsis of a lecture delivered by request before the North Louisiana Agricultural Association, by Dr. Wm. C. Stubbs, Director of the Louisiana Experiment Station.

peaks and ridges, under a vertical sun; and as the afternoon wears on, these become richer violet and pale bronze, till the last rays of the sun have gone, leaving the mountains a ruddy crimson, with the snows showing a pale creamy green by contrast. You descend from the mountains, you leave the glaciers fringed with the useful birch tree, and descend to grassy glades surrounded by deep forests of pines and firs. Down through these forests fall streams white with foam, passing, in their course, through pools of the purest cobalt. Then you come to villages and terraced cultivation, and lastly to the level stretches of the varied colored rice. Everything in Kashmir is rich in contrasts. The East blends with the West. The delightful plane trees, the magnificent walnuts, the endless willows, the poplars and elms, the wealth of mulberries, and the countless orchards of apples, pears and apricots will remind you of a well-wooded English park. But the crops, the rice with blooms of art color, the sulphur petals of the cotton, fringed with the scarlet of the amaranth (our "love lies bleeding"), are of the East. The rounded forms of the trees, the rivers and streams with their banks of green turf and willows recall the West.

The very villages are almost English. Like our Saxon ancestors, as described by Tacitus, "suam quique domum spatio circumdat," and instead of the ineffably dreary and unvillagelike look of the Indian hamlet, we have in Kashmir the picturesque homesteads dotted about here and there. All have their little gardens and courtyards. Near the cottage is the wooden granary—not unlike a huge sentry box. In the courtyards the women are pounding the rice and maize, and the cotton wheel is for the time laid aside. Dogs are sleeping, and little children are rolling in the sun, while their elder brothers—also children—are away looking after the wild cows and cattle. Most villages have a delightful brook on which is a quaint looking bathing house, where the villager leisurely performs his ablutions. One of the prettiest objects in the village is the graveyard, shaded by the *Celtis Australis* and bright with iris—purple, white and yellow—which the people plant over their departed relatives.

Time will not allow me to describe the beautiful lakes or the mountain meadows, known as Margs, where English visitors live in pine-wood chalets on the fringe of the forest. The lawns and flowers which nature gives would make most gardeners pause. Nor can I tell you of that loveliest angle in the world—the Dal lake, with its beautiful parks and gardens, reminiscences of the Moghal times. All I can say is, that Kashmir can be reached in three weeks from London; that it has a most delightful and varied climate; and that for a holiday or change there can be no more restful and healthy life than a year or six months sojourn in the valley of Kashmir. The *Dolce far niente* existence in the house boats on the river and lakes, or, still better, the gypsy life in the tents would give a new lease of life to many. You will meet with the kindest welcome from the ruler of the country and his officials; and if you happen to have a medicine chest with you, you will be received with acclamation in the most secluded villages. I have often come across English ladies camping by themselves, which speaks well for the courtesy of the people and the safety of the country. Whatever your tastes are, you satisfy them in Kashmir. There is sport, excellent and varied; there is scenery, ah! such scenery, for the artist and the layman; mountains for the mountaineer; glaciers for the botanist; a vast field for the geologist; and magnificent scenes for the archaeologist; and you can live well in Kashmir on £200 per annum. Go, if you can, in the early spring, in order to see that marvel of colors, the blooms of the almond groves, and the pink and white promise of the orchards. To enjoy Kashmir, as indeed to enjoy anything in the East, you must enter into the spirit of the hemisphere; you must saunter, and ignore time. If you rush on, from one camping ground to another, you will miss many a point of natural character which might interest and amuse you. And I think the Kashmir people are worth some study.

Up to the end of the 14th century, Kashmir was the seat of a Hindoo kingdom strong enough to interfere in the politics of India. The old temples tell more vividly than words that these Hindoos were men of grand ideas. Then, by preaching or persecution, the people left their glorious temples and their picturesque religion for the poor and sullen compromise of Islam. At the end of the 16th century a further change awaited the Kashmiris. The beauty or rumored wealth of the valley attracted the adventurous Moghals, and after obstinate fighting in the difficult passes, Kashmir came under a foreign yoke. These grand Moghals loved the valley; they built "sunny pleasure domes," such as Coleridge dreamed of in "Kubla Khan," and they planted the noble plane tree. They have bequeathed to posterity the love stories of Selim and Naurmahal. On the whole, the lot of Kashmir was not unhappy in the Moghal times, and the people still speak with affection and admiration of the Emperor Jehangir and his lovely consort, the "Light of the World." But to the Moghals the brutal and oppressive Pathans succeeded. Give a Pathan a chance, and he is a bully and a fiend. He had his chance in Kashmir and he ruined the country and the people. The Pathan was driven out by the Sikhs. It was a change for the better, but the Sikhs left much to be desired. Moorcroft, who traveled in Kashmir in the Sikh times, tells us that the punishment for the murder of a Kashmiri by a Sikh was a fine of two rupees. Crossing a pass, he came upon a young man whose throat had just been cut, and saw three other corpses, "some of the followers of a native official who, to the number of forty-five, had perished in crossing the path lately in rough and cold weather against which they were ill defended by clothing or shelter. Some of the people accompanying us were seized by our Sikhs as unpaid porters, and were not only driven along the road by a cord tying them together by the arms, but their legs were bound by ropes at night to prevent their escape."

In 1846—just fifty years ago—we made over Kashmir to Maharaja Gulab Singh, chief of the warlike Dogras, a Hindoo. He was a stern, strong ruler; feared and respected by the Kashmiris. His methods were Oriental and effective. Kashmir was full of bandits, and Gulab Singh made up his mind to stamp out crime. He made each punishment an object lesson. I have

heard from eye witnesses many of Gulab Singh's endeavors to make punishment deterrent. A soldier had murdered a child for the sake of her jewelry—a common form of crime even now in India. Gulab Singh sentenced him to hard labor on the road. Months after, Gulab Singh happened to be walking along the road on which the criminal soldier was working. He asked him how he was progressing, and the man, encouraged by the affable manner of the Maharaja, said, "Don't you think I have been punished enough for my little offense?" "I quite forget what it was," said the Maharaja. On hearing what the offense was, the Maharaja mused, and then called to a carpenter who was working on a bridge. He then demanded a pen and ink, and removing the criminal's clothes, he carefully marked his body into four parts. "Now," said he to the carpenter, "saw him in four pieces, and send a piece to each of the districts. I will show the people that I do not consider child murder a little offense." These punishments have had their effect; crime is non-existent in Kashmir. Within the last ten years only one Kashmiri has suffered capital punishment. The people are afraid to commit crimes.

You will see that Kashmir has undergone many changes in its governors, and there is a deep-rooted disbelief in the continuity of affairs. The governors and their deputies have, unfortunately, felt no sympathy for the people, so that the Kashmiris are hopeless of benevolence or justice in their rulers. It has been the deliberate policy of the Brahman officials of Kashmir—known as the Panchits—to exaggerate the difficulties of administration in the valley. They excused their own corruption, cruelty, and ignorance by assuring their masters that the Kashmiris were lying, lazy, and dishonest. No dog has ever been given so bad a name as the Kashmiri serf, and I was solemnly assured when I began work in the valley, that fair and humane methods would lead to a revolution and to the depletion of the treasury.

Apart from the evil effect which cruel and unsympathetic governors have worked on the timid character of the Kashmiri, other causes have conspired to make him doubtful and hopeless. Kashmir is a country where nature rejoices in her strength. Earthquakes, floods, fires, cholera, and famine are familiar to every generation. Take one village as an example. In the village of Pattan there is a normal population of 165 families. In 1885, seventy persons perished in the earthquake. In 1892, fifty-five persons were carried off by cholera. This is enough to unsettle strong-minded Anglo-Saxons, and with the tyranny of man on the one hand, and the terrible vagaries of nature on the other, the Kashmiri has become incredulous of the existence of good in man or in nature. He always gives me the impression that he has just recovered from a fright, or that he is expecting some disaster. They have sad memories; their very songs are those that look back to a melancholy past and forward to a melancholy future. Hardly a day passes without mention of the great famine of 1877-79, when men turned cannibals, and three-fifths of the population is said to have perished. The Kashmiris sigh as they quote the proverb "Drag tsalih, tah dag tsalih na." The famine has gone, but its stains remain.

And though famine has gone, I hope and believe never to return, and though tyranny, torture, and the corvée have gone, their stains remain, and we must make allowances for faults in the Kashmiri character.

They are timid and somewhat effeminate. They wear a womanly dress. A kind of heavy woolen nightgown falling to the feet. Under this, if it be cold or wet, they insert a small earthen brazier of hot embers, known as the "kangar." This keeps them warm, but it has its drawbacks. They go to bed with their kangar, and set the house on fire, and it is said that the brazier is the fruitful source of cancer.

They are lazy when they have no interest in their work, but when they are working for themselves they are most energetic and efficient. Up to quite recent times no one ever knew that he was certain of reaping the fruits of his labors. Their simple proposition, "Yus karih gonglu sui karih karo," he who plows shall reap, was ignored at harvest time, and everybody took what he liked. Everything was taxed, and the farm of a tax often brought with it social distinction and sometimes wealth. It was part of my business to put down the soldiers of fortune roving, often without a commission, to collect taxes on violets, birch bark, or some medicinal herb. I explained to them that there was not room for them and for me, and that violets must bow to the land revenue. With officials plundering, and hordes of tax farmers, real and fictitious, with regiments of soldiers whose sole duty it was to assist in collection, it is no wonder that the Kashmiri took refuge in lying and subterfuge. When face to face with the Pandit officials the Kashmiri villager will urge his case with the fervor of St. Paul and the inaccuracy of Ananias; but remove the officials, and set him up before his fellow villagers, and the Kashmiri will speak the truth. It is a grave charge to bring against a nation to say that it is a nation of liars, and after six years' constant intercourse with the people of the villages, I can say that the charge is not true. All cases connected with land came under my jurisdiction, and it was my practice to hear these cases on the spot. The Kashmiri was ashamed to lie in the presence of his neighbors. If he did sometimes lie, there was a telegraph in the eyes of the men who stood around which gave a quick clew to the truth. The parish council of white bearded elders was to me a most useful institution. I do not say that the Kashmiris are an exemplary people, but I do say that they have many excellent qualities; and I maintain that, under a just and sympathetic government, they might grow into a fine, manly nation. They are intellectual, dexterous, and witty. They can turn their hands to anything. There is cultivation in Kashmir that would astonish Europeans; there are art wares in Srinagar that have astonished the world. The meanest peasant likes to display his wit, and every day I heard some shrewd, humorous remarks.

In their domestic life they are admirable. One never hears of scandals. Like the Irish they are kind to their children and the old folk. There are many points of resemblance between Kashmir and Ireland. Both are small countries, which have suffered or derived benefit from the rule and protection of more powerful nations, yet have never welcomed any change or improvement.

Both Kashmiris and Irish love a joke, are fond of harmless deceit, and are masters of a good humored blarney. Both have the same deep rooted objection to paying their rents.

The Kashmiris are a very gentle people. They quarrel but never go beyond invective or abuse. The sight of blood is dreadful to them, and in some villages if a fowl has to be killed for food the execution devolves on the village priest. But in invective they are past masters. You will hear two women quarreling from their respective boats. The men sit quietly enjoying the scene of the noise. For hours the shrill abuse continues, and when evening comes and the women are hoarse they rise and invert their rice baskets. This is the sign that the fight is over for the day, but at early morning the baskets are set up again, and the wordy war begins afresh. People talk of Billingsgate, but commend me to a Kashmiri virago. The Kashmiri is loud and voluble when he thinks that he has been injured by a man. A common expression is that he will make himself heard as far as London. Sometimes when I had the misfortune to give a decision regarding land against a man, who there and then lifted up his voice and said he would proclaim the injustice of my order as far as London, I have taken him aside to ask where London was. The inevitable answer was "London, as your honor knows well, lies beyond Sukkur Bukkur on the Indus." This was the ultimate of Kashmiri peasants' thought. They are a people of hyperbole and symbols.

Formerly, it was no doubt necessary to attract the attention of their rulers by some striking demonstration. Men who have a grievance will fling off their clothes and smear themselves with mud. The nakedness implies destitution; the mud signifies that they are reduced to the condition of a clod. Many a time I have seen a procession: one man wears a shirt of matting, another has a straw rope round his neck, with a brick pendant; another carries a pan of hot embers on his head, while in the rear comes a woman bearing a number of broken earthen pots. This was bad, but more inconvenient was the practice of casting a plow under my horse's feet as I rode along, in order to emphasize the fact that agriculture no longer possessed charms for the proprietor of the plow.

Once, as I was hearing petitions, I noticed an elderly Hindoo standing for at least five minutes on his head. No one took any notice of him. At last, fearing the old man might injure himself, I had him placed on his feet. When questioned as to his attitude, he said that, thanks to my arrangements, his affairs were so confused that he did not know whether he was standing on his head or his heels.

A man once came to me carrying the corpse of a child, and alleged that his enemies would not allow him even burying ground. He had a land suit in his village, and he wished to strengthen his case by arousing my indignation. Once a man appeared at Nagmarg, a place some 9,000 feet high; he was stark naked, and said that his uncle had turned him empty into the world. It was bitterly cold, and night had fallen, so I gave him a suit of old clothes, and, by way of jest, said that, as he was now dressed as an Englishman, he should assert his rights. He shambled down the mountains, and next day the uncle came into my camp, charging the nephew with an aggravated assault, and offering in his shattered appearance convincing proof. It is always dangerous to jest with Kashmiris.

The ruler of Kashmir is a Hindoo. Over 93 per cent. of his subjects are Mussulmans. The officials of the country for the most part belong to the rigid Brahman caste. But the oppression in Kashmir, which up to quite recent times formed the text of newspaper articles and books of travel, was entirely official, and did not arise from religious intolerance. There has of late arisen in India a spirit of revivalism in the two great religions of Brahminism and Islam. In Kashmir, however, Mussulmans and Hindoos live together in delightful amity. One reason of this charming tolerance is the fact that beef is never heard of, and kine killing is an offense punished most severely. But the chief reason is that the people of the valley, Mussulmans in name, are at heart Hindoos. The religion of Islam is too abstract to satisfy their superstitious cravings, and they turn from the mean priest and the mean mosque to the pretty shrines of carved wood and roof bright with the iris flowers, where the saints of past time lie buried. The Kashmiris are nicknamed in the East the "Pir Parast," or saint worshippers. They believe that "the saints will aid if men will call," and regard a dead saint as more efficacious than a living priest. All that there is of adoration and reverence in the Kashmiri character expends itself on shrine worship, and the poor priest and the ruinous mosque are neglected until cholera or some great calamity comes. Then Islam raises its dead; and in cholera time, I have heard the priest addressing the silent, frightened crowd as they sat helpless in the graveyard. He used King Solomon's very words at the dedication of the temple—

"If there be in the land famine, if there be pestilence,
Then hear thou in heaven thy dwelling place,
and forgive."

The voluble Kashmiri is silent when he knows that his troubles are not of human origin. I was in Srinagar, in 1892, when the daily death rate from cholera had risen to five hundred. I was struck by the hushed silence which had fallen on the famous City of the Sun. A native friend explained it. A Panditani had lost a son, and mourned loudly. A spirit appeared and taunted her with wailing for one son, adding that before night she should have real reason to mourn. Before night she had lost her husband and her two other sons. No one wailed after this. Kashmir is rich in superstitions, and lovers of the supernatural will find a grand field in the villages of the remoter valleys. Night after night as I sat by the camp fire I would hear the quaintest and most stirring legends. Demons on the mountain passes in the shape of fair women, dragons in the deep green lakes, which are found on the higher ranges—underground rivers and an underground world where the serpent gods hold sway, divining springs and trees of ordeal—and caverns where men controllers of the wind live their solitary responsible lives. The Brahman astrologers of Kashmir are famous in the East, and the wild sooth-

sayers of the valley have an immense reputation. It was curious to have daily business with clever, shrewd farmers and officials, all absolutely believing in these old world superstitions. But the things dreamed of in the Kashmir philosophy date back to the times of the old saints, and the Kashmir mind, keen and intellectual in mundane affairs, is in things spiritual slumbering in the beautiful old shrines.

I must now leave the people and say something of the products of the valleys. Agriculture was my chief pre-occupation, but it would not interest you to hear about our staple crop, the rice. It will be more interesting to know that almost all the vegetable products that exist in a temperate climate can be grown in the vale of Kashmir. It is my hope and ambition that Kashmir may become the California of India. Our fruit is magnificent, and it comes to us so easily. We have everywhere an endless supply of wild stock, and from our nurseries we give out thousands and thousands of trees grafted or budded with the best English and French varieties of apples and pears. A tinning industry was introduced two years ago, and is thriving. We have large vineyards, from which excellent wine—Medoc and Barsac—is made. We have recently replanted these vineyards with American stock in order to combat the phylloxera, which has penetrated even to remote Kashmir. We have made excellent cider, and the brandy which we distill from the wild apples and pears is pure and potent, and is the one spirit drunk by the natives of the city. We have succeeded admirably with hops, and the financial results would surprise Kentish growers.

But our great hope lies in sericulture. Silk is an ancient industry in Kashmir, and it is probable that the valley was a producer of the old Bactrian silk which found its way to Damascus and other centers of manufacture. But evil days befell silk, and in 1878, disease obliterated the industry. In 1889, when I first went to Kashmir, it was decided, on the advice of Sir Edward Buck, C.S.I., to rehabilitate sericulture, and to stamp out disease by following the Pasteur system of microscopical examination. For the first two years it was difficult and disappointing. A native with a microscope is a most uncertain combination. But eventually we succeeded, and a few weeks ago the first Kashmir silk found a sale in London. As regards its quality, experts can speak. I can only say that, being an amateur, I have advised the state not to incur expense on improved reeling appliances, and my object has been to make sericulture pay its expenses, and to demonstrate that good silk could be raised in Kashmir. I can give you no good idea of the wealth of mulberry trees that are wasting and waiting for the silkworm. I can only say that European capitalists will find in Kashmir the elements which contribute to successful sericulture. The Kashmiri house is eminently adapted for the rearing of silkworms; there is abundance of skilled labor in the presence of the "Kirm kash," or worm destroyers, families with an hereditary connection with silk; and, above all, there is an endless supply of mulberry leaf.

All that is wanted to realize my dream of an Indian California is European capital and European skill and energy. Already Europeans are carrying on a profitable business as manufacturers of carpets, and their capital and supervision have proved of great assistance to the unfortunate weavers of the old shawls for which Kashmir was once famous throughout the world. The French and German war destroyed the shawl trade, and the poor weavers, too soft and too sedentary for agriculture, would have perished had it not been for the carpet trade.

Everywhere we have splendid water power, and if capital were forthcoming, cotton mills might be erected which could supply Kashmir and Central Asia with cloth. Our local cotton is excellent in quality, and the cloth of the hand looms is preferred to the piece goods from India. It wears longer, and is better value for the money. Then the valley abounds in fibers. One of these is especially worthy of European notice; we call it Yechkar. This is the Abutilon avicennæ, and its fiber has been pronounced superior to Indian jute and finer than Manila hemp.

The people of Srinagar are born artisans, and the European capitalist will find apt men, of all handicrafts, ready to hand. Just as the Kashmiris prefer the home cotton cloth, made locally, from the native cotton, so they prefer the iron of Kashmir to the imported metal. It was described to me by an expert, who held most sanguine views as to the future of Kashmir iron, as being equal to mild steel. Many hold that the valley and the mountains which surround it are rich in minerals; and the chance discovery of the rich sapphire mine in 1882 suggests that organized exploration might result in further discoveries. As I have pointed out in my book on Kashmir, it is a mistake to suppose that the natives of the valley would be eager to disclose the existence of rich lodes. They are an agricultural or pastoral people, and their experience in the past teaches them that the discovery of mineral wealth is attended with drawbacks, in the shape of forced labor and of numerous officials who must be fed. I have often discussed the question of iron mining with the villagers who live near Sof, the chief iron field, and if their views on the subject of mineral wealth represent the general ideas of the people, it is no exaggeration to say that the Kashmiris detest the very name of mining.

Time will not allow me to tell you of the floating gardens of Kashmir, like the Chinampas of old Mexico; nor can I tell you of the saffron fields, for which the valley is renowned. The author of the "Ragatarangini," the famous Sanskrit history of Kashmir, who began to write in 1148 A. D., alludes to the saffron in his introduction:

"Kashmir is a country where the sun shines mildly, being the place created by Kashaypa as if for his glory. High school houses, the saffron, iced water and grapes, which are rare even in season, are common here. Kailasa is the best place in the three worlds; Himalaya the best part of Kailasa, and Kashmir the best place in Himalaya."

I agree with the old chronicler, and I think that any of you who can find the time to visit Kashmir will also agree that it is the best place in the world.—Journal of the Society of Arts.

THE first smelting furnace fired with coke used on the continent of Europe was erected by Wilkinson in Creuzot, France, in 1782.—Stahl und Eisen.

AN EXCURSION TO PAIOLIVE WOODS AND THE GORGES OF ARDECHE (FRANCE).

THE numerous tourists who travel over France in the fine season are now acquainted with the remarkable gorges of the Tarn, as well as with the picturesque rocks of Montpellier-le-Vieux and the stalactitic grottoes of Dargilan (Aveyron). It is a trip that has become an easy one, and the hotels at which one has to stop are comfortable. Unfortunately, such is not the case with a neighboring region, which, in my opinion, is still more interesting, and which I had the good fortune to visit last summer. There is nothing easier than to reach the wonderful localities in Ardeche, but it is impossible as yet to find desirable lodgings there, the inns

constructed, and the sixteenth century ruins of the ancient fortified castle of Ventadour. Upon continuing on a little further along the Ardeche River, we reach Thueyts, one of the most picturesque of villages, which contains a large number of curious houses of the time of Francis I. Everything here is primitive. The antique streets of the village are lighted at night only when the moon is pleased to make its appearance, so the belated traveler, after nightfall, meets only with rare peasants, provided with lanterns, and quite a large number of swine everywhere endeavoring to feed upon the garbage deposited by housewives in front of their dwellings. Nothing could be prettier than the immediate environs of Thueyts, where we find fields and orchards delightfully situated upon rising terraces formed

FIG. 1.—THE RAVINE OF GLEIZASSE—THE OBELISK AND KOLOET POINT IN PAIOLIVE WOODS (ARDECHE).

being passably primitive. The landscapes observed compensate, it is true, for such drawbacks, which every earnest tourist is capable of overlooking.

Upon leaving Lyons, the first stopping place of my excursion was the pretty station of Vals-les-Bains, which is very pleasantly situated upon the Volane River. The baths here are reckoned among the most celebrated of France, and yet they are not frequented by what is styled fashionable society. The patrons here seem to be of the simplest habits. They consist of invalids and of families whose members scarcely give a thought to sensational toilets. Pretty groves of verdure and charming sites are found everywhere at Vals; but this locality possesses in addition a very interesting commercial character, due to the extreme multiplicity of its beneficent springs.

The exportation of the mineral waters hence is quite extensive, and everywhere in the little streets of the town, or along the river, we see nothing but workmen occupied in packing bottles of the water that are to be distributed all over Europe. Not far from Vals-les-Bains are found some great natural curiosities that may be easily visited. These are the magnificent basaltic walls against which the village of Pont-de-la-Baume is

of the debris of volcanic rocks or scoria. We everywhere observe a shade thrown by mulberry trees, plum trees and grapevines, the branches of the latter forming flexible and graceful lianas in the boughs. Vegetables grow beneath the trees, and are thus protected against the burning rays of the sun. Thueyts is situated upon a high plain, skirted on one side by the torrent of Mederic. The water of the latter falls in cascades, from a total height of more than three hundred feet, into Ardeche River. The Devil's Bridge, formed of two superposed arches, extends across the principal fall. The village and its gardens are sustained by a high wall of volcanic rocks overlooking the left bank of the river.

Through a luxuriant verdure of boughs of aged chestnut trees we soon perceive, in following an abrupt foot-path, immense colonnades of basaltic rocks. It is these that sustain the above mentioned wall, which is nearly one hundred and ninety feet in height. These strange rock formations are called the Colonnades of the Giants. Through a narrow fissure in the basalt it is possible to ascend from the banks of the Ardeche to the level of the plain in climbing up the basaltic debris that forms a sort of stairway constructed by nature. In the di-

FIG. 2.—THE ARCH BRIDGE OVER THE ARDECHE RIVER—VIEW LOOKING UPSTREAM.