# AGRICULTURAL PAPERS.

A SERIES PREPARED ESPECIALLY FOR THE "RECORD-UNION."

**Presenting Instruction Contained in Lectures from the Chair of Agriculture, State University.**

[THIRTEENTH PAPER.]

The wood of exogenous stems consists of four parts. These are the pith, medullary sheath, the layer of wood and the medullary rays. The first and last belong to the woody system of plants, and the second and third to the cellular system. The pith is too well known to need description. The medullary sheath consists of a system of spirally-coiled ducts, encircling the pith. These seem not to be special organs, but simply the vascular tissue in its early stages of development. The layer of wood consists of woody fiber, interspersed with vascular tissue. It is this vascular tissue which gives the peculiar dotted appearance to the ends or cross sections of some stems, especially those of the softer-wooded trees, and in which the vascular tissue is accumulated in the inner parts of each layer. In other trees, such as maple, plane tree, etc., the vascular tissues are so minute as to be invisible, and the wood presents a close, regular appearance. The medullar rays are the lines radiating from the center on the cross-section of the stem. They are evidently for the purpose of keeping up the communication between the pith and bark of the plant.

THE ACTUAL GROWTH

Of an exogenous plant takes place in the cambium layer. This is a more or less liquid layer situated between the wood and the bark, and consists of mucilaginous matter. This sap is made of organizable matter, in which new cells are constantly being formed, some of which go inward to form new wood, while others are deposited in the inner surface of the bark. There is always a connective tissue of thin and very delicate cells between the wood and bark, and in which the process of cell multiplication goes on most rapidly. It is by the annually renewed growth of the cambium layer that the growth of the exogenous stems is affected. The annual increase being deposited in cylindrical layers, a cross section of the stem shows more or less perfectly the wood deposited in concentric rings between the pith and the bark on trees growing in a climate where there is a marked difference between the temperature of different seasons; and where there is therefore a growing and a dormant season these concentric rings are most marked, and their number gives quite accurately the age of the tree. The stem not only serves to support the foliage of the tree, but it also serves as a channel through which the liquids derived from the soil are forced by the root up into the leaves and growing extremities of the tree. The stem also, through the medium of its tissues, allows the descent of the matter which has been accumulated from the atmosphere by the leaves.

LEAVES.

Leaves consist of a membrane of cells arranged on and supported by a framework of fibers and ducts. In the earliest stages they are imbricated or folded together in the buds, but with the growth of the plant they expand and immensely increase the lateral surface of the plant. Some plants, noticeably the cactus, seem to have no leaves, and the stem performing the function of the leaves. Johnson expresses their relation perfectly when he says "many of these plants above ground are in form all stem, while in structure and functions they are all leaf." The green color spoken of as being characteristic of the cellular layer of the outer bark is also invariably found in all vigorous and healthy leaves. This green color is due to the presence of chlorophyll, a substance which has already been described. In autumn, with the cessation of growth by deciduous trees, or at the maturity of the plant, as in the grains, the leaves lose their green tint and fade or altogether lose their color, the leaf stops performing its functions and soon after drops off. Although leaves differ greatly in form and appearance, yet their structure is essentially the same. The leaf, like the stem, is made up of two distinct parts—the cellular and the woody. The cellular part consists of the membrane and pulp of the leaf, and the woody part of the framework of fibers and ducts. It is this framework which gives strength to the leaf, and which forms the medium, or channels, through which the sap is conveyed and distributed to every part of the leaf. The subdivisions of the ribs and veins continue to ramify among the pulp and membranes, even after they are so small as to be insensible to the naked eye. The cellular portion of the leaf is made up of thin walled cells, containing grains of chlorophyll. Different parts of the leaf are made up by different arrangements of the cellular tissues. In leaves which habitually expand horizontally the unaided eye can detect a marked difference between the structure of the upper and lower surfaces of the leaves. The upper surface, after the thin epidermis which covers both sides of the leaf is removed, is made up of several layers of elongated cells, placed endwise and perpendicular to the surface of the leaf. These cohere compactly together and form a comparatively dense surface. The cells of the lower strata are very loosely and seemingly irregularly arranged, with numerous spaces between the cells. The cells, if elongated, are generally found lying parallel to the surface of the leaf. The more dense and compact nature of the upper surface of the leaf accounts for the darker shade of green than that on the lower surface of the leaf. All of the spaces between the cells are filled with air and communicate freely with one another and with the exterior air by means of openings in the epidermis, called stomata, which will be presently described. It may readily be seen that the structure of the leaf tends greatly to protect it from the too great heat of the sun, and from the too rapid loss of its water by evaporation.

THE LEAVES OF PLANTS

Which grow in arid regions are even better protected against the effects of the sun by having numerous layers of the elongated, densely packed cells, which were described as forming the upper surface of the leaf membrane. Leaves are still further protected by the peculiar construction of the epidermis. This covering is composed of from one to three layers of small, thick-sided cells, strongly cohering together so as to form a membrane, which may, in most cases, be stripped off from the pulp of the leaf. The cells of the epidermis are oftener more or less filled with matter deposited from liquids passing through them. The surface of the epidermis is generally covered with a thin coating of wax, or a white powder, which imparts the bloom to the leaf. This bloom is evidently intended to make the leaf capable of turning water. The stomata or breathing pores of the leaf which we alluded to are openings or valves, principally in the epidermis of the lower surface of the leaf, and which open into the air spaces between the cells constituting the pulp of the leaf. By this means all parts of the leaf are brought into direct communication with the air. In a moist atmosphere these stomata or valves remain open, leaving the water vapor to pass out unimpeded; but as the air becomes dryer the sides shorten up and gradually close the orifice, thus preventing the loss of further moisture for the time being. These stomata are found mostly on the under surface of leaves, for the reason that the strength of the direct sunlight will impair their effectiveness. Leaves which present their edges instead of surfaces to the sky and earth have the stomata equally numerous on both sides; while those leaves which live under water, where there can be no evaporation, are

DESTITUTE OF STOMATA

And oftentime of epidermis also. The number of these stomata varies from 800 to 170,000 to the square inch of surface. From their immense number we can realize what an effective check to undue evaporation nature has placed in the hands of the leaves. From the foregoing it will be seen that the extent of exhalation of vapor from the foliage of trees depends entirely upon the state of the atmosphere. The absolute amount of exhalation can be quite accurately determined by simply noting the loss of weight of the pot and plant during any given time. The exhalation of water by plants is not regular, but depends on numerous conditions. It is influenced by the dryness and temperature of the air, by the composition of the soil, its temperature and the amount of water in it, and by the different textural and structural conditions of the leaf. Exhalation is not detrimental to the plant, unless the loss exceeds the supply, nor is it essential to the plant. The exhalation of moisture takes place through the epidermis and stomata of the leaves. It is through the agency of the leaves that the atmospheric air and other gases find access to the interior of the plant, and it seems to be the principal function of the foliage to absorb atmospheric air with the gases it contains, assimilate the carbon and other elements wanted by the plant, and then to expel the free oxygen, which quickly unites with some inorganic substance, to form fresh material for plant food. It has been mentioned that all plants consist of

A FIXED AND A VOLATILE PART,

The first being the ash, and the last the matter which disappears in the form of gases on the plant. The foliage serves to put the plant in communication with the medium into which this volatile part of the previously existing plants has been diffused, while the roots, which have no visible pores, and which are not penetrated by air and vapors to such an extent as are leaves, serve to put the plant into direct communication with the soil, where the fixed part or ash of the decayed plants has remained, and to a very considerable extent in forms immediately available to the roots of growing plants. The function of these two classes of organs—foliage and roots—is literally to reconstruct the products of combustion into new vegetable matter. The roots gather the ash ingredients from the soil and transmit them, dissolved in the sap, up into the interior of the stem and leaves, where they are met by matter which has been gathered from the atmosphere by the leaves, and these two classes of substances are, by means of the vegetable organisms, transformed into materials for plant food. When it is remembered that the volatile part of a plant consists of from 70 to 98 per cent. of its whole weight, it will readily be seen that the foliage is called upon to supply much the largest part of the materials for plant growth. This fact accounts for the relatively great amount of surface exposed by the foliage of a plant.

THE FLOWER.

Little need here be said of the different organs of the flower and of their particular functions, for almost every observing agriculturist has at least a practical knowledge of the compositions and functions of the flower. With the putting forth of the terminal flower buds the plant intimates its intention of discontinuing its season's growth, and in many cases its individual life. The complete flower consists of four distinct sets of organs. Named from the exterior inwards they are: the calyx, made up of the sepals; corolla, composed of petals; stamens and pistils. The calyx is the outermost floral envelope; its color is almost always green, but it is in some flowers highly colored. It is the protecting envelope of the flower buds, and though in some cases adhering, after the flower has opened its presence is not necessary to the development of the seed. The calyx is made up of from one to numerous lobes, each of which is termed a sepal. Just inside of the calyx, in the perfect flower, is found the corolla, consisting of from one to several series of generally highly colored leaves. Generally these series are composed of one or more individual leaves or parts termed petals. The petals are of almost every describable form and color, and it is to them that most flowers owe their attractive appearance. As with the calyx, the presence of the corolla is not necessary to fructification. The stamens are generally slender, thread-like organs, terminating in an oblong sack. They are often numerous in number and sometimes highly colored. The oblong sack is called the anther, and in mature flowers is filled with a yellow powder, which is the pollen. The center of the perfect flower is occupied by the pistil, having at its base the ovaries or seed vessels of the flower, which contain the rudimentary seeds whereby the life of the species is to be perpetuated. The forms of the pistils in different flowers are exceedingly various, but all agree in having an exposed spot at the extremity where the epidermis is lacking. This naked spot is the stigma, upon which the pollen from the anthers is lodged, either by the mechanical action of the winds, by insects, or by artificial means. The contents of these grains of pollen find their way through the stigma and generally elongated pistil down to the ovules, and by this means the seed vessels are fertilized.

THE STAMENS AND PISTILS

Are the only really essential organs of the flower, and the flower is often made up of them alone. Some flowers even contain only one of these two essential organs. In such cases either the plant also contains flowers of the opposite sex, and is then said to be monœcious, or else the flowers of the opposite sex are borne by adjacent plants. Where the staminate and pistillate flowers do not both grow on the same stem, the plant is said to be diœcious. In such plants the fructification is brought about by fertilization between flowers of different trees. I should have said that the terms staminate and pistillate were used to designate flowers which had in the one case stamens but no pistils, and in the other the reverse. Such flowers have also been termed respectively male and female. As the union of sexes of different kinds of animals often produces hybrids, so also may the gardener practice hybridization among different kinds of flowers. It is, however, a well-established fact that hybridization can only take place between closely allied species in the vegetable as well as animal kingdom. The flower and its component parts may be considered as modified leaves. This seems to be the case from the fact that different conditions of growth influence the form of the product of the fundamental organ—the bud. Under the influence of the gardener's care the essential organs—stamens and pistils—are often partly or wholly replaced by purely structural organs—petals—and the flower becomes double. All stages of this transformation may be noticed, from that of the perfect petal to one of the unaltered pistil. In numerous cases it has been noticed that all of the floral organs of the flower reverted back to the primitive form, the green leaf. With these facts well authenticated, it cannot be doubted but that leaves and flowers are but modifications of one and the same fundamental organ, namely, the bud.

SEED.

It is impossible in the limited space at hand to speak of the different forms of seeds, with their manner of growth, dehiscence, etc. We will only say a few words of the parts of which they are composed that are of fundamental importance, and which compose the vital organs of the seed and are directly concerned with the perpetuation of the species. Saying nothing of the different coats of the seed, we come directly to the kernel, which is really the seed proper. It often consist simply of the rudimentary plant or embryo, but in the larger number of cases contains besides this a supply of food, comprised in what has been termed the endosperm, and the contents of which are drawn upon by the young plant, and afford it sustenance until its roots are sufficiently developed to perform their nutritive functions. The endosperm, with its supply of food, is not an infallible constituent of seeds, but is often entirely lacking. The embryo, which is in fact a miniature plant, with rudimentary organs, is the one essential and most important part of the seed. In dry seeds it is generally hard to distinguish the embryo, but if the seeds be soaked it can be easily removed from the endosperm and the seed coats. If we examine the embryo of a seed (one containing a large embryo, as the pumpkin or squash seed, is best), three parts will readily be distinguished. The lower part, or what seems to be the beginning of the stem, and from which the roots descend, is called the radicle. The ascending axis of the stem, and which is surrounded by a more or less perfectly developed bud, forms

THE PLUMULE.

This is the part of the seed from which grows the stem of the plant with its appendages. The plumule is clasped and more or less inclosed by one or two rudimental leaves. These are the cotyledons of the endosperm, and are in structure perfect leaves, whose tissues are generally filled with food for the young plant. These cotyledons often remain under ground, and thus can perform none of the functions of leaves. In others they are lifted out of the ground by the ascending plumule. In such cases, although they may sometimes imperfectly perform the functions of leaves, they generally, after their contents have been appropriated by the young plant, become effete. There is no reason why seeds, if protected from oxygen, moisture and insects, should not retain their vitality for an indefinite period. But owing to the impossibility of practically fulfilling these conditions, all seeds may be said to have a comparatively short period of vitality. In general, the newer the seed the more likely will it be to grow, and the larger they are the longer they will retain their vitality. Also, as a general thing, the newer a seed and the more mature it is, the more vigorous will be the growth of the plant; but with this increased vigor of growth there is a longer period of growth and often a decreased yield of seed. This fact is taken advantage of by the gardener and florist, who respectively produces larger yields of vegetables and new varieties of flowers by planting old, and hence weak seeds. Plants develop from these, which, instead of having a vigorous growth, spend a comparatively larger part of their substance in fruiting and flowering. The degree of maturity of a seed also sensibly effects its offspring. If plants—wheat for instance—be cut before the seeds are ripe, and even just before the starch is formed, the seeds will ripen on the stalks, providing that they are not dried too suddenly, and will be

CAPABLE OF GERMINATING.

As would be supposed, the proportion of seeds ripened under such circumstances, which would grow, would be less than if they had ripened on the roots. Such seeds also produce weaker plants, and in poor soils often light crops. In rich soils, on the contrary, they will generally give as large a yield as any other seed, and will in addition ripen their seed in from one to several weeks earlier than plants from fully matured seed. That is to say, the maturity of the seed being forced by separating it from the parent root, it will in turn, half intuitively, force its offspring to an early maturity, seemingly so that it will be matured before the remorseless farmer will think of cutting it. The fact that immaturely cut seeds do ripen crops earlier than other seed is of much more importance than is generally supposed. It deserves much more attention from the practical farmer than has heretofore been bestowed upon it, and especially is this so in California, where oftentimes if ten days could be gained by the earlier ripening of the grain the farmer could succeed in harvesting grain which might otherwise be shriveled up and almost ruined by an untimely north wind. If a farmer can by reaping a few acres of grain before it is fit to head, and leaving it on the ground to ripen, procure seed which will mature his crop even a week sooner the next season, it would most certainly pay him much more than the extra cost of reaping, etc. Johnson says of wheat, that the seeds retain their vitality for from three to seven years. In speaking of the relation between the density of the seed and that of the product he says: "(1) That seed wheat of the greatest density produces the densest seed. (2) That seed wheat of the greatest density yields the greatest amount of dressed grain. (3) That seed wheat of medium density generally gives the largest number of ears, but the ears are poorer than those of the densest seed. (4) The seed wheat of medium density generally produces the largest number of fruiting plants. (5) The seed wheats which sink in water but float in a liquid having a specific gravity of 1 247 are of very low value, yielding, on an average, but 34.4 pounds of dressed grain for every 100 yielded by the densest seed."

GERMINATION.

Almost everyone is familiar with the general processes and conditions of germination. These consist of burying the seed a few inches below the surface of the soil, when, if it meets the right conditions of moisture and temperature, it will soon sprout and begin to grow. It will be profitable for us to notice a little more closely the processes and condition of germination. If placed in a medium where they can be examined at fixed intervals, and under the requisite conditions of moisture and heat, the first change noticed will be the swelling up of the seed from its absorption of water. The germ enlarges and finally breaks the seed-coats. The radicle first forces its way out, and is soon followed by the plumule. The tendency of the one is to bury itself in the soil, hence it grows downward, while that of the other is to grow up into the atmospheric light. The endosperm, as we said before, sometimes remains below the surface, and in other plants rises above it and becomes the first pair of leaves. The growth of the plant takes place by the growing and branching of the plumule, to form the trunk, and the division and sub-division of the radicle to form the roots. In order that a seed may germinate three physical conditions must be fulfilled: (1) The temperature must be sufficiently high, and not too high; (2) there must be a certain amount of moisture available to the seed, in order that the contents of the germ cells may be set in motion—this is, brought about by the absorption of water by the seed, which starts the desired motion in the germ cells; (3) the seed must be in contact with free oxygen. The atmospheric air contains free oxygen, hence we may say that the medium in which the seed is planted must be pervious to the atmospheric air. The range of temperature at which all seeds germinate is by no means constant. For agricultural seeds the lowest range is from 40 to 45 degrees Fahrenheit, the highest from 102 to 120 degrees, and germination takes place most rapidly at about the mean between these two extreme range, that is from 71 to 93 degrees. Seeds retain their vitality at temperatures below the minimum, but lose it at temperatures higher than the maximum. As would be supposed, seeds from tropical climates require and will stand a much higher temperature, even if transported to a more northern country, than will the native seeds of that country. In fact

THE MAXIMUM AND MINIMUM TEMPERATURES

Are much higher in tropical countries and lower in frigid zones than those given above. It is almost certain that some seeds of the polar regions sprout at a temperature almost as low at 32°—the freezing point—and seeds in the tropic will sprout in a temperature as high as 120°. The degree of moisture which different seeds require is almost as various as the range of temperature. While as a general thing land plants will not, if an excess of moisture is present, yet they do sometimes germinate when immersed in water. Water is the natural medium for the germination of all aquatic seeds, and hence the presence of an excess of water is needful instead of injurious to them. It was for a time thought that it was necessary to exclude the light from germinating seeds, and that it was for this reason that they were buried in the earth. It is now generally conceded that this is not the case. The soil is utilized as a medium for the seeds to germinate in, most probably on account of its ability to retain a more or less fixed physical condition of temperature and moisture. It is a well-known fact that the less the moisture the deeper the seed should be sown; also, in moist, warm weather small seeds do best when sown broadcast, and simply smoothed over with a roller; also, that in spring, when the ground is saturated, it is necessary that the seeds be sown shallow, so that they will get the greatest possible benefit from the heat of the sun. In moist and warm tropical climates the surface of the ground is often covered with vigorously germinating seeds, which are only protected from the direct sunlight by the foliage of the trees. Any practical gardener knows that various kinds of flower seeds germinate sooner and surer when uncovered. There is no doubt at the present time but that the

PRINCIPAL FUNCTION OF THE SOIL

With reference to the seed is to maintain those physical conditions best suited to germination. The time required by seeds to germinate is no more definitely fixed than are the physical conditions. It may be said very generally that the time of germination, when the physical conditions are perfect, depends largely on the size of the seed. Some small seeds begin to germinate within a few hours after reaching the soil. Wild seeds begin to sprout within twelve hours after they fall, while the seeds of most of our grains and clovers require from three to five days. Fruit and nut seeds take from three weeks to two years, but the last is an extreme case. The temperature being the same, the time of complete germination, i. e., when the nutritive matter of the parent seed has been all absorbed by the young plant, depends upon the size of the seed and the amount of food it contained. Johnson says that wheat and barley seed, at a temperature of 41° to 55°, complete their germination in forty to forty five days, and at 90° to 100° the same kinds of seeds take only 10 to 12 days to abstract all of the substance from the parent seed. At a temperature of 55° to 60° he gives 30 to 40 days as the time required by beans to complete their germination, 30 to 35 days for Indian corn, 20 to 25 days for wheat and 8 to 10 days for clover. The depth of sowing depends on the nature of the soil, its physical conditions, the temperature of the atmosphere and the seed itself. This being the case it will be folly for any one to lay down definite rules to govern the depth of sowing. The practical farmer, who is acquainted with the conditions of most vigorous germination, can alone judge of the proper depth of sowing by the season, condition of his soil, state of the atmosphere, temperature and the requirements of the seed. All other conditions being favorable, agricultural seeds will germinate most quickly and surely when sowed at a depth not exceeding one-half inch. Seeds *will* germinate when sowed as deep as 14 to 18 inches. In such cases it is only by going so deep that the conditions of germination can be fulfilled. The soil is loose and pervious to the atmospheric air, but the climate is hot and the moisture does not rise to the surface or near it, hence the seed must be planted down to the moisture.

THE CHEMICAL PHYSIOLOGY OF GERMINATION.

During its early stages of growth the young plant is entirely dependent for its sustenance upon the material stored up in the parent seed. In this particular it is in an exactly similar condition as the suckling young of most animals. There are three distinct processes of nutrition, viz: (1) Solution of the nutrive matters of the endosperm or cotyledons. (2) Transfer of the same from the seed to the young seedling plant. (3) The assimilation by the young plant of this transferred nuritive matter. The soluble amyloids and albuminoids—gum, dextrine, sugar, albumen and caseine—are readily dissolved by the water the seed absorbs during the first stages of germination to the extent of from 25 to 125 per cent. of its own weight. The insoluble material of the seed—starch, fats, etc.—are dissolved by chemical changes induced during the germination of the seed. It has been noticed that in seeds containing much of the fats and oils and little or no starch, sugar or dextrine, under the influence of germination the oils and fats are, to a large extent, by some chemical process displaced by starch and often by sugar. This starch, and that already existing in the seeds, are converted into dextrine, and lastly into sugar, both of which are soluble in water. The remaining insoluble albuminoids of the seed are gradually changed into soluble modifications. The preparation and properties of malt illustrate some of the chemical changes induced by germinating seeds. Malt is manufactured by soaking grain—generally barley—until it is readily compressed between the fingers. The water is then drawn off and the grain is thrown up into heaps. These heaps soon dry, and the grain becomes heated and begins to sprout. The grain is now spread out over the floor so that the temperature will not rise too high and cause the pile to "heat." After the sprouts have grown to about one and one-half inches in length, the germination is suddenly stopped by the application of dry heat; the sprouts are rubbed off, and the residue forms the malt of the brewery. Chemically it consists of starchy seeds, the germination of which has been checked in its early stages.

IN CHEMICAL COMPOSITION,

Malt does not differ very materially from the original grain. A small part of the insoluble materials of the grain has been changed into soluble forms; otherwise the composition has not been altered, so that practically they are chemically almost identical. But they differ most essentially in some of their properties. The value of malt arises from the peculiar property it has of inducing or causing the albuminoids and other insoluble substances to dissolve. The starch which is contained in the malt, and which under ordinary circumstances is insoluble, is changed into sugar and dextrine, which dissolve readily in water. This solution of the malt constitutes the wort. If this wort be heated to boiling a quantity of albumen coagulates and separates out. The albumen has come from the transformation of the insoluble albuminoids of the grain. Not only will malt itself dissolve completely, but if mixed with starch it will cause from two to three times its own bulk of starch to dissolve with it. The agency by which these originally insoluble materials are caused to dissolve has been ascribed to a substance called diastase. It seems to be a nitrogenous product of germination, and it is capable of transforming 2,000 times its own weight of starch into dextrine and sugar. Other albuminoid products have been found to exercise this soluble property to some extent; but in order that they may have this property, they must be modified and become what is termed ferments. It is thought that fermentation is caused by the action of oxygen, in the presence of water and at a certain temperature, upon the albuminoids. Although this may be an important function of oxygen, its chief function is in bringing about chemical changes in the soluble nu ritive matter which is absorbed by the young plant from the seed. It seems very evident that during some stages of germination starch is transformed directly into a soluble form, as well as into dextrine and sugar. The heat which is developed by germination, although unappreciable in a single seed, is undoubtedly of considerable

BENEFIT TO THE YOUNG PLANT.

The transfer of these soluble bodies is effected mainly by the water which all seeds absorb so largely. This water penetrates the cells and distributes the liquid matter, first to the descending radicle, then to all parts of the miniature plant as needed. The last process of germination, namely, the assimilation by the young plant of the nutritive matter presented to it, is divided into two stages—one a chemical, and the other a structural change. In general the chemical changes during assimilation by the young plant are just the reverse of those that took place during the solution of the material of the seed. The soluble and structureless matters are transformed into soluble and organized ones, and they are then deposited and help make up the organism of the plant. For instance, the soluble amyloids (dextrine, sugar, etc.), are transformed into cellulose mainly, and the soluble albuminoids into insoluble ones. Cells of embryotic plants have been examined under the microscope, and the loss of starch and gain of cellulose have been distinctly noticed. The access of free oxygen to the growing plants has been found to be necessary to the full development of the seedling. This can be accounted for by the fact that by its presence chemical reactions are brought about in the young plant, which changes the soluble material into insoluble and fixed forms, and thus directly aids in the assimilation. After the process of assimilation has gone on until all of the nutritive matter of the reed has been extracted, the seedling is cast upon its own resources, and begins an independent life of its own, derives its nourishment from external bodies, and becomes in the most general sense a true individual.

## THE FAN.

Behind her fan of downy fluff,
Sewed on soft saffron satin stuff,
Wite peacock feathers, purple eyed,
Caught daintily on either side,
The gay coquette displays a puff;

Two blue eyes peep above the buff;
Two pinky, pouting lips——enough!
That cough means surely come and hide
Behind her fan.

The bark of Hope is trim and tough,
So out I venture on the rough,
Uncertain sea of girlish pride.
A breeze! I tack against the tide,
Capture a kiss and catch a cuff,
Behind her fan.

## CHURCHES AND MINISTERS.

The Reformed (Dutch) Church at Leeds, N. Y., has just celebrated its one hundred and fiftieth anniversary.

The Berkeley Divinity School (Episcopal), at Middletown, Conn., receives $100,000 from the Sheffield estate, New Haven.

The Southern Baptist Convention, representing fifteen or more States, will meet in Greenville, S. C., in May next. A large attendance is expected.

At the annual meeting of Mr. Spurgeon's church it was reported that 70 members died during the year, and 67 were received. The whole number is now 5,310.

Bishop Whipple (Protestant Episcopal) has announced his intention of licensing two women as lay readers in Glencoe in the Diocese of Minnesota, because he cannot find men for the work.

A case involving the ownership of The Dalles, Oregon, by the Methodist Missionary Society, will be argued this month before the United States Supreme Court by Judge Fancher for the Society.

The Young Men's Christian Association of the State of New York reports 84 associations with 15,068 members and 15 reading-rooms. Sixteen associations are working specially among railroad men, and 15 among boys.

In August next the Moravian Brethren will celebrate the third jubilee of their mission among the heathen, 1782 being the year in which Leopold and Dober set sail for St. Thomas and the West Indies.

The Presbyterian synods now conform to State lines. That of Pennsylvania heads the list with 131,054 communications; that of New York has 130,374; Ohio has 68,326; New Jersey, 45,957; Illinois, 42,286; Indiana, 27,678; Iowa, 20,812.

Lord Radstock, who is working as an evangelist in France, writes of successful meetings in Lineux. He says from 100 to 200 Catholics attend the services every night, and he thinks half of France has given up Catholicism.

The Rev. Francis James Holland has been appointed by the Queen Canon of Canterbury. Mr. Holland is a graduate of Trinity College, Cambridge, about 50 years of age, and was nominated one of the "six preachers of Canterbury" in 1859.

In the first decade of the Methodist Episcopal Church there was one minister to every 190 members; in the fifth decade the proportion was one to 284. The present proportion is one minister to 147 members, against 142 in the ninth and tenth decades.

## AMONG THE RIFLE-PITS.

Fifty yards in front of the abatis the pickets were stationed. When first the siege began, picketing was dangerous business. Both armies were bent on fight, and picketing meant simply sharp-shooting. As a consequence, at first the pickets were posted only at night, so that from midnight to midnight the poor fellows lay in their rifle-pits under a broiling July sun, with no protection from the intolerable heat, excepting the scanty shade of a little pine-brush erected overhead, or in front of the pit as a screen. There the picket lay, flat on his face, picking off the enemy's men whenever he could catch sight of a head or even so much as a hand; and right glad would he be if, when the long-awaited relief came at length, he had no wounds to show.

But later on, as the siege progressed, this murderous state of affairs gradually disappeared. Neither side found it pleasant nor profitable, and nothing was gained by it. It decided nothing, and only wasted powder and ball. And so, gradually, the pickets on both sides begun to be on quite friendly terms. It was no unusual thing to see a Johnny picket—who would be posted scarcely a hundred yards away, so near were the lines—lay down his gun, wave a piece of white paper as a signal of truce, walk out into the neutral ground between the picket-lines, and meet one of our own pickets, who, also dropping his gun, would go out to inquire what Johnny might want to-day.

"Well, Yank, I want some coffee, and I'll trade tobacco for it."

"Has any of you fellows back there some coffee to trade for tobacco? 'Johnny Picket,' here, wants some coffee."

Or, may be he wanted to trade papers, a Richmond *Enquirer* for a New York *Herald* or *Tribune*, "even up and no odds." Or, he only wanted to talk about the news of the day—how "we 'uns whipped you 'uns up the valley the other day;" or how "if we had Stonewall Jackson yet, we'd be in Washington before winter;" or may be he only wished to have a friendly game of cards!

There was a certain chivalrous etiquette developed through this social intercourse of deadly foemen, and it was really admirable. Seldom was there breach of confidence on either side. It would have gone hard with the comrade who should have ventured to shoot down a man in gray who had left his gun and come out of his pit under the sacred protection of a piece of white paper. If disagreement ever occurred in bartering, or high words arose in discussion, shots were never fired until due notice had been given. And I find mentioned in one of my old army letters that a general fire along our entire front grew out of some disagreement on the picket-line about trading coffee for tobacco.

Nevada potatoes are being shipped from Reno to Colfax and Dutch Flat.

KIDNEY-WORT has cured thousands. Try it and you will add one more to their number.

# AT THE EAST.

BOSTON, THE INTERESTING—ITS NEW FACE—THE NECK.

**The Helps and Influences of Boston's Story—Her Streets and Historic Places—Faneuil Hall.**

BOSTON, March 31, 1882.

If the writer, who has wandered east, and wandered west, and sojourned in widely sundered places, and is consequently by no means of opinion that this is the only white man's country, were required to name the city where, in these United States, life for personal comfort is best worth living, Philadelphia would come trippingly off the tongue; but if it were asked which of New World cities is most interesting, of most characteristic flavor, surely it is Boston—Boston, not forgetting either Quebec or New Orleans. A city that in spite of a circumscribed area of swamp and sharp hill, of a perilous water approach, an abominable climate, no errors on the side of humility and suavity, and little love from its neighbors, could grow and make itself materially and morally as Boston has done, must have had from the start a tremendous vitality.

THE MOST ENGLISH

Of all American cities, say our British cousins. That means that the city is very largely built of red brick, which in the older parts has taken on a genuine English dinginess of hue; that there are miles of swell front houses, such as one meets nowhere else in America, but sees everywhere in England; that the streets of old Boston, what is now the business district, are absurdly crooked, narrow, with endless *cul-de-sac* lanes, dark closes, and alleys the width of a pocket handkerchief; that the men are the most English-looking of Americans, and the women have a solidity of character which is English, and crops out into undismayed originalities of garb, manner and speech decidedly an inheritance from the "Old Home." And the bumptiousness is John Bull's own. The *Journal* the other day gave a deliciously naive, youthful specimen of this Boston quality. A young gentleman born here was graduated last summer from one of the leading colleges in the State. In the course of his commencement oration, the reverend gray-headed President and professors about him, he sweetly said: "Although we may not agree with all that has been taught us in the recitation room, we accept its aim and acknowledge its suggestiveness!" Could a college faculty desire a more touching recognition? Boston has almost gotten itself

A NEW FACE

In the last decade. "The Neck"—is there a schoolboy on this continent who doesn't know all about Boston Neck as it was in revolutionary days?—is gone. The tidal flats have been robbed from the sea; the house where this is written stands where salt water ebbed and flowed but a few years ago; and a British army now deployed in battle here might march in through stately avenues lined with superb residences, and that great feature of Boston to-day, the apartment hotels, where once was the narrow isthmus not fifty yards across, and on either side marshes and sad sea waves.

But the change that stirs one most is the "burnt district." Boston always seems the most intensely busy of all cities, probably because of the great variety of its industries and their condensation into too scant space. But the condensation is at its greatest in the burnt district, where land is almost fabulous in value, and where city and United States buildings, bankers and brokers, most of the great wholesale houses, the transportation companies, the printers and newspapers are crowded. The streets are declared to be less devious than before the fire, but they are still labyrinthine, barely wide enough for the turning of a carriage, and with the skimpiest of sidewalks. But what a tide of life surges and jostles through these narrow, blind ways!—real canyons, for the buildings have climbed dizzy story after story skyward after the expansion denied laterally, and heaven's vault, to the strugglers through these canyons, dwindles to faint threads of mist or blue. One thinks in the

HIGH PRESSURE ATMOSPHERE

Of this region, of William Black's description of the turbulent waters of the Whinch—the Atlantic forced through the neck of a bottle. It must be the influence of these narrow streets upon Bostonians that makes them seem so intolerably rude to women who come here from other cities. A woman must be born here not to feel fury in her heart when men drive wagons over her, splash her, jostle her, hustle her bodily aside, grip her shoulder to steady themselves in a hazardous vault past her, let doors that weigh a ton bang in her face, or, when she has just dragged or pushed one open with the expenditure of all her force, and the ruin of a perfect pair of gloves, insolently dodge past her through the opening she has painfully made for herself. There is really the sincerest kindness and obligingness manifested to strangers here, but what a Californian woman newly come to St. Botolph's town would say of these masculine "manners of the road" is scorening to imagine, for Californian women, of all women what and where soever, are the most petted, exacting, pouting—dare one add spoiled? Spoiled or not, it would be in the interests of civilization if these headlong scramblers could be handed over to be dealt with by their sense of the fit and decent.

The tight fit that Boston is in its space has some compensations: its head, heart and hands can't be far aloof from each other. As "Heaven lies about us in our infancy," so do

THE HELPS AND INFLUENCES

Of Boston's story; classic places, art, science, philantropy and culture lie close alongside its roughest labor, its keenest devotion to Mammon. Here, for instance, is the prosiest of busy streets, the boot and shoe kingdom, wherein "there's nothing like leather," but in two or three minutes we escape into the stirring memories of Faneuil Hall or of State street, or stand on the sunny side of the old South Church and gaze, and if we be book-lovers, with tender eyes across at that quaint corner book-store that for years and years was our portal into so much that was best of our own literature and that of other lands. The procession of famous people that has gone in and out of that low-browed door! And to the wiser generation, will any American publishers' imprint ever promise and fulfill quite so much as did that of "Ticknor & Fields?"

Turning out of Washington street at this old corner bookstore, a climb through a narrow street for two minutes brings us to old King's Chapel and an embarrassment of riches. Beacon Hill is in front of us, and shall we climb up to the State House, or to where the old Hancock house stood, or Prescott's still remains; or shall we turn into the most interesting of Boston's cemeteries, the old Granary burying ground, busy Tremont street traversing it on one side? A whole letter might be filled with mere mention of noted folk who lie here. But among them are Samuel Adams, Hancock, Paul Revere, Judge Sewall, Peter Faneuil, and a crowd of Governors and doctors of divinity. Just below this old burial ground lie Boston Common and the public gardens. For all its nursing,

THE GREAT ELM.

Has gone at last, and two young ones are hurrying—as elms hurry—to commemorate the place. But the Frog Pond remains, and the malls, and the velvet sward, and the fine overarching old trees, and no team may ever venture within these precincts, and charming ghosts no coward will ever wish to "lay" flit in all the shadows. Two of the most modern ones are the *Autocrat of the Breakfast Table* and his little schoolmistress. Theirs is a certain diagonal across the common—"we call it the long path," he says, "and we are very fond of it." On a certain morning he asked her to walk with him, having first secured a provisional *solus* passage to Europe. He goes on: "I felt very weak indeed (though of a tolerably robust habit) as we came opposite the head of the path on that morning. I think I tried to speak twice without making myself distinctly audible. At last I got out the question, 'Will you take the long path with me?' 'Certainly,' said the schoolmistress, 'with much pleasure.' 'Think,' I said, 'before you answer. If you take the long path with me now I shall interpret it that we are to part no more.' The schoolmistress stepped back with a sudden movement, as if an arrow had struck her. One of the long granite blocks used as seats was hard by—the one you may still see close by the Ginko tree. 'Pray sit down,' I said. 'No, no,' she answered softly. 'I will walk the long path with you.'" And there they walk still!

THE CITY CHARTER,

Which makes wonderfully few restrictions upon the city government, has imposed two wise ones. The City Fathers may never alienate any portion of this homely but delightful common, and they may never sell or lease the Cradle of Liberty, Faneuil Hall. Whenever a sufficient number of persons, following certain regulations, ask to have the hall used, they may have it without price. The great hall is essentially a man's place, and is only suited to great popular meetings. It has fine acoustic qualities, but no seats. When women get the franchise, there'll have to be a new hall for the mass meetings, for what political eloquence would ever entice women to a spot where they must stand in a jam three or four hours at a stretch? A stand-up party is barbaric enough, but a stand-up political meeting! Women'll never be educated up to that. The Hon. Oakes Ames left in his will a bequest of $50,000 for the benefit of the children of North Easton, in this State. It has lately become available, and from it are to be given able scientific and descriptive lectures weekly. Probably the lectures are not amiss; at any rate perhaps the future American citizen cannot be too early wonted to his country's scourge; but the world does move, for a really enchanting thing has come out of that fund.

SOME INFLUENTIAL TRUSTEE

Either remembers how it was himself, or has put himself in the children's place and imagined what, being there, he would like. The result is that a copy of a children's magazine, "St. Nicholas," or "Our Little Ones," is to go into every family of school-children in the village. One hundred and eighty-eight families get the "St. Nicholas," and as the subscription was only this month sent, and was to date back to November, 940 numbers were delivered at once at North Easton. Do you suppose there'll ever be such another mail distribution to those happy children?

"The good that men do lives after them." If the evil's equally tenacious, let us down with it from mention and memory, and exalt the good. Another bit of that good is that Mr. Ames' son promises to do, in this matter of magazines, for all the children in Easton town what is done from the legacy for those of North Easton village.

Gloomy days of March wind and snow-squall. But it is the time of openings and

BOSTON WOMEN

Are by no means too intellectual to crowd streets and shops in defiance of east wind and pasty streets. The sunflower's rampart. That poor stork might rest himself by standing on two legs for a bit, for all eyes now are not fixed on him. Despite the sunflower, and esthetic tea-gowns, and Oscar Wilde's recognition, Boston's yet a long way behind the esthetes of London. But here, if anywhere in America, the new cult will flourish.

Miss Kate Field says that because of the new meaning put into costume, English women now dress better than American women. That is no doubt true of the esthetes, and those who follow them timidly in coloring, and so on. And nowhere on earth did women need more a new gospel of dress than in England. The cut, the colors dragged together, the dowdyishness, the betrimmedness of English feminine costume in pre-esthetic days no tongue or pen could adequately describe. Lilies and sunflowers, peacock's feathers and artistic lines, are not the end of existence, but estheticism will do its work. If that were no other than to make the world forget aniline dyes, it would be something to be thankful for. MISTRESS MAYFLOWER.


## FRUITS, SEEDS AND PRODUCE.

**W. R. STRONG & CO.,**

**Wholesale Commission Merchants**

AND DEALERS IN ALL KINDS OF

CALIFORNIA GREEN AND DRIED FRUITS

NUTS, HONEY, SEED

And General Merchandise.

All orders promptly attended to. Address: W. R. STRONG & CO.,
a8-1plm Nos. 6, 8 and 10 J street, Sacramento.

A. MOOSER. S. GERSON.

**S. GERSON & CO.,**

GENERAL COMMISSION MERCHANTS, AND Dealers in

Imported and Domestic Fruits, Vegetables, Nuts, Etc.

No. 220 J street, between Second and Third, Sacramento. a2-1m

D. DEBERNARDI. JAS. GARIOLI.

**D. DEBERNARDI & CO.,**

WHOLESALE COMMISSION DEALERS IN

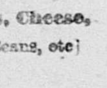
Butter, Eggs, Poultry, Vegetables,

Fruit, Fish and General Produce.
m27-1plm

**LONGTON & MAY,**

WHOLESALE DEALERS IN

Poultry, Fish, Game, Butter,



EGGS and MARKET PRODUCE.

Country orders a specialty.

FULTON MARKET, FIFTH AND K STS.
m25-1plm

**LYON & BARNES,**

COMMISSION MERCHANTS AND DEALERS IN

Produce, Vegetables, Butter, Eggs, Cheese,

Poultry, Green and Dry Fruits, Honey, Beans, etc

ALFALFA SEED.

Potatoes in car-load lots or less.
m23-1ptf Nos. 21 and 23 J street.

**FRUIT DEALERS,**

**ATTENTION!**

HAVING REMOVED TO MORE COMMODIOUS premises, we have enlarged our stock. We offer you choice Apples, free from worms, Lemons, Limes, Oranges, Dried Fruits, Nuts, Dates, Canned Goods, etc., at very low prices.
M. T. BREWER & CO.,
1006 to 1010 Second street, between J and K, Sacramento. fe22-1f

EUGENE J. GREGORY. FRANK GREGORY.
CHARLES F. DILLMAN.

**GREGORY & CO.**

(Successors to J. Gregory),

WHOLESALE DEALERS IN CALIFORNIA Produce and Fruit.
fe21-1ptf Nos. 126 and 128 J Street.

**PIONEER LIVERY STABLE.**

T. D. SCRIVER..........Proprietor

HACKS ON CALL AT ANY HOUR, day or night. Coupes, Phaetons, Rockaways, Barouches, Buggies, with the best roadsters to be found in any livery stable on the coast, for hire. Horses kept in livery at reasonable rates. Livery Stables on Fourth street, between I and J.