

NOTES AND NEWS.

A NEW stamp-cancelling machine is being tried in the Philadelphia post-office. It is operated by electricity, and is said to cancel the stamps on letters at the rate of 25,000 per hour, automatically registering the number cancelled.

— The death of Prof. Lorenzo Respighi, Director of the Osservatorio Campidoglio, Rome, which occurred on Dec. 10, is a great loss to science.

— Mr. Robert T. Hill has resigned the position of assistant professor of geology in the University of Texas, in order to devote his attention solely to geological investigations.

— An attempt is being made to secure the erection of an international monument to James Watt at Greenock, his birthplace. It is proposed that the memorial shall be a large and thoroughly equipped technical school.

— The *Detroit Journal* desires to receive, by postal card, the address of all living male and female descendants of Revolutionary officers and soldiers of 1776, and, when possible, the name and State of the ancestor.

— Dr. Sargent, Professor of Physical Culture at Harvard, utters a word of caution about over-exercise. He says, according to *The Medical and Surgical Reporter*, that those who have been most successful in heavy gymnastics are also subject to nervous complaints.

— The "Annual Catalogue" for 1889-90 is sent this year to every graduate of Harvard College whose address is known. The annual reports of the president and treasurer are sent regularly to every graduate who has informed the secretary of the university that he desires to receive them. Graduates are requested to advise the secretary of changes in their addresses.

— Test borings recently made on the line of the Nicaragua Canal show that the entire divide to be traversed by the deep cut consists of solid basalt, at least to a depth of 165 feet, as far as the borings extended. This is a most favorable showing for the construction company, as it settles at once the important question of slopes in the greater part of the cut.

— An article on the new plants introduced into cultivation during the year just past appears in *Garden and Forest* for January 8th, and in the same number Mr. Geo. Nicholson continues his description of the gardens of the Riviera. One phase of the national forest problem is discussed editorially, and a novel theory of the function of the so-called "knees" of the Bald Cypress is set forth in a communication from Dr. Robert H. Lamborn.

— At a recent meeting of the Photographic Society of Geneva, Switzerland, Professor H. Fol presented a paper on resemblances in married couples. According to the *British Journal of Photography*, he stated that, out of seventy-eight young couples photographed for the purpose of his investigations, he found that in twenty-four cases the resemblance in the personal appearance of the husband and wife was greater than that of brother and sister, in thirty cases it was equally great, and in only twenty-four was there a total absence of resemblance.

— The Meteorological Summary for the Year 1889, prepared by Professor F. H. Snow, of the University of Kansas, from observations taken at Lawrence, shows that the most notable meteorological features of the year 1889 were the remarkable absence of extremes of heat and cold, resulting in a very mild winter and a very cool summer; the abundant and well-distributed rainfall, making this one of the three wettest years on the twenty-two years record; the phenomenally warm December, whose mean temperature was six and one-half degrees above that of November; the low wind velocity; the small amount of snow; and the unusual number of fogs, averaging a little more than two per month.

— The attention of graduates of Harvard University is invited to the fact that for several years the secretary of the university has voluntarily acted as a medium of communication between persons seeking to secure educated young men to assist them in teaching, professional work, or business, and students or graduates of the university desirous of obtaining such employment. For this purpose the secretary keeps a list of graduates engaged in teaching,

another of students about to graduate who wish employment immediately thereafter, and a third of students who desire temporary work in summer vacations. The results have been satisfactory, except in respect to obtaining advantageous summer employment for students. From one to two hundred students apply for summer work each spring, but a comparatively small number obtain it through the secretary's aid. The co-operation of the alumni is invited in all three branches of this work.

— Dr. Hadjime Watanabe, an official of the Japanese agricultural service, delivered an interesting address on the chrysanthemum at the recent celebration in Berlin of the centennial of the plant's introduction into European cultivation. According to the report of his words published in *Garden and Forest*, the Japanese divide chrysanthemums into two groups, "nogiku" or wild single, and "niwagiku" or double cultivated flowers; and the latter are subdivided into four kinds — the ordinary autumn-blooming sorts, the summer-blooming, the winter-blooming, and those which bear flowers at all four seasons. The single flower is not neglected by the horticulturist, but is prized for its very simplicity, and is usually planted at the foot of rocks, intermingled with grasses, to give a landscape design a naturalistic air. In treating the double-flowered plant when it is desired to produce individual flowers of the largest possible size, then all the branches but one are gradually removed, and on this one only an isolated blossom is allowed to mature. On the other hand, when as many flowers as possible are sought without regard to conspicuous size, the main stem is brought to the greatest possible development, and all its branches are preserved until the blooming season arrives, when, if some show no buds, they are cut away. The sturdiest possible plants are chosen for this purpose, and the speaker referred to some upon which more than three hundred flowers had been counted. Two forms are in favor for these many-flowered "kikus," one of which gets its name from its resemblance to a thick broom, while the other is a more artificial, fan-like shape. A Japanese proverb says "it is easy to grow the flowers of the kiku, but difficult to grow its leaves," and the speaker declared that the plants are judged from this standpoint. The amateur's chrysanthemums are usually "very poor and faulty in foliage, although they may bear fine flowers; but those which one sees at an 'art-gardener's' are clothed from top to bottom with leaves regularly disposed and of a beautiful fresh color." The most common method of propagating the plant is by root-division, but several others are employed. In one, a single leaf with a bud at its base is plucked, lightly covered with earth and laid in a shady place, where it eventually takes root. Gardeners who own rare varieties therefore forbid the visitor a near approach to their plants, as it would be easy to pick a leaf of the proper kind and conceal it in the pocket for future planting.

— The question of the relative food value of dried corn fodder and of corn silage has been much discussed, and, judging from the fact that the discussion still continues, has not yet reached its final solution. One important element in determining this question is the relative percentage digestibility of the fodders, that is, the proportion of the ingredients of each one which the animal fed upon them is able to utilize. Some recent experiments conducted by H. P. Armsby and W. H. Caldwell at the Pennsylvania State College Agricultural Station are a contribution to this branch of the question. The material used in this experiment was ordinary field corn fed to two Devon steers. The corn was prepared in three different ways, — as rapid-filled silage, slow-filled silage, and field-cured fodder. As a result of the experiment, it was found that the dry matter of the field-cured fodder was more digestible than that of the rapid-filled silage, and this again was more digestible than that of the slow-filled silage. The digestibility of the albuminoids and of the total protein is very nearly the same in the fodder and the silage. These results do not show the effect of the process of ensilage upon the digestibility of green fodder, but only the difference in the final effects of two processes for preserving fodder. The digestibility of the green material was not determined, but in all similar investigations the digestibility of the freshly cut fodder has been invariably found to be greater than that of the same fodder after being subjected to the ordinary processes of curing. In all probability, therefore, the freshly cut corn fodder

would have proved more digestible than was either the silage or the fodder. The experiment shows merely that the process of ensilage lowered the digestibility of the material more than the process of field-curing. Furthermore, the relative digestibility of corn fodder and silage is but one element in determining their relative value. It would be a mistake to condemn silage because it appears to be slightly less digestible than the field-cured material. In forming a judgment of the comparative value of the two processes, account must be taken not only of the digestibility of the resulting fodder, but of the amount of material lost in the process, and of the nutritive value as well as the digestibility of the product; and also of its influence upon the health of the animals, and of the important practical questions of the relative convenience and economy of harvesting, storing, and handling.

— A few years ago some of the leading photographers in London went to the expense of equipping their establishments with engines and dynamos, so that, by means of the electric light, they might be to some extent independent of the sun in their work. The results were satisfactory though the cost of equipment and maintenance was high. Most of these photographers have now discarded their engines and dynamos, though still adhering to the electric light. They find it much less expensive and satisfactory to take their current from the street mains of the different electric light companies, paying only for the quantity consumed.

— In a recent lecture by Dr. A. W. Schüddekopf, on "Universities and University Life in Germany," after a short sketch of the history of German Universities, showing how they have gradually developed from the schools founded by the Church for the education of persons intending to enter its service, the lecturer explained the constitution of German Universities, their officials and teaching staff, with a digression illustrating the high social position of a German professor, despite the fact that his salary seldom exceeds \$1,500 or \$2,000 a year. The Lecture also explained at some length the position of a "privat-docent," a class of teachers peculiar to German Universities, who receive no salary for their work, but render their services gratis in the hope of being some day appointed to a professorship. He also reminded his audience of an important distinction made in Germany between the "professor ordinarius" who has a seat in the Senate of his University and is eligible for all the honorary offices—rectorship, deanship, etc.,—and the "professor extraordinarius," who does not enjoy these privileges. Dr. Schüddekopf then proceeded to describe the German Universities as teaching centres. He compared the English system of higher education with the German system, stating that Universities of an exclusively examining character do not exist in Germany; whereas, on the other hand, the educational feature of Oxford and Cambridge life is absent from German Universities. The latter are of a teaching and examining character at the same time. The lecturer next laid emphasis on the looseness of the discipline for the students, compared with that maintained in England, and explained the possibility of such laxness by the greater average age of the student—it being necessary for every person matriculating at a German University to have passed his "maturitätsexamen" at his gymnasium, which is rarely tried by persons under nineteen or twenty years of age. The German student is much less frequently examined than his English brother; but then what an ordeal when it comes! Unlike the English system there is little or no paper work, the candidate being examined *viva voce*, more importance being attached to the grasp he shows of his subject, and his manner of manipulating it, than to his knowledge of facts. Besides the *viva voce*, candidates have to write one or several "dissertations," which may take many months to prepare. Dr. Schüddekopf reminded his audience that, in Germany, University degrees are not considered to qualify candidates for master-ships, for a license to practice medicine, and other offices, except in the case of candidates for a University professorship; but that candidates for such offices must have passed the "staatsexamen," which in most cases is much more difficult than the degree examinations. Relating his own experiences in passing his "staats-examen," Dr. Schüddekopf caused a tremor to run through a sympathetic audience when he told that, after a year passed in writing "dissertations" on philological and philosophical subjects,

he underwent nine hours *viva voce* examination in one day by eight German professors in as many different subjects! The majority of German students—except in the faculty of medicine—do not take a degree at all, but only pass their "staatsexamen." It is the custom in Germany for a student to have been to several Universities before settling down at one for examination purposes—a system which the lecturer thought a very good one, on account of the facility it affords the student for becoming acquainted with the leading men in his subject.

— For the benefit of delegates and others attending the eleventh convention of the National Electric Light Association, to be held at Kansas City, Feb. 11–14, arrangements have been made with the Pennsylvania Railroad to provide a vestibule train to be known as the "Electric Limited," to be run through without change to Kansas City, via Chicago and the Chicago, Burlington, and Quincy Railroad. This train will leave Jersey City on Sunday, Feb. 9, at 9.45 A.M., arriving at Chicago, Monday morning, at 9 A.M. Monday will be spent in Chicago, the Chicago Electric Club having kindly invited the Eastern delegates to enjoy its hospitality during their stay in that city. The "Electric Limited" will leave Chicago on Monday evening at 5 o'clock, arriving at Kansas City early Tuesday morning. Passengers should be careful to take the ferry at foot of Cortlandt or Desbrosses Streets, New York, not later than 9.30 Sunday morning. No effort has been spared by the transportation committee in obtaining the very best equipment, and the committee is assured that this train will be the finest ever run out of New York. It will be composed of the latest Pullman vestibule sleeping cars, lighted by electricity, a dining car, composite car containing barber shop, bath room, card room, library, writing desk, smoking room, etc., and an observation car with a large open room luxuriously furnished, as well as an observation platform. The train will be supplied throughout with fixed and portable electric lamps. Special accommodations will be provided for members accompanied by their wives. The rate of fare going, including sleeping car accommodations, will be \$39.75, and inasmuch as it is necessary to guarantee a certain number of people in order to secure this superb train, it is important that those who propose attending the Convention notify, with remittance, as promptly as possible, C. E. Stump, chairman transportation committee, Times Building, New York. Extensive preparations have been made to render this one of the most interesting conventions ever held, and it is expected that members will do their utmost to induce as large an attendance as possible.

— In the town of St. Emilion, near Bordeaux, France, is a remarkable monolithic church, probably one of the most curious of its class. According to Mr. J. H. Parker, who describes it in a recent issue of the *American Architect*, it is cut entirely out of the solid rock, and is of early Romanesque character. The precise date is uncertain, but it appears most probable that the work was commenced in the eleventh century, and carried on through the whole of the twelfth. A fragment of an inscription remains, the characters of which agree with the eleventh century; but some of the French antiquaries attribute it to the ninth. Others consider it as merely the crypt of the church above on the top of the rock; but that church is of much later character, and it is much more probable that the subterranean church was first made, and the other built long afterwards, when the country was in a more settled state. This church is one hundred and fifteen feet long by eighty feet wide. It consists of three parallel aisles, or rather a nave and two aisles, with plain, barrel-shaped vaults; if they can be so called, with transverse vaults or openings, and round arches on massive square piers. The impostes are of the plain early Norman character, merely a square projection chamfered off on the under side, but one of them is enriched with the billet ornament. There are recesses for tombs down the sides, and a fourth aisle or passage has been cut out on the south side, apparently for tombs only, as it has recesses on both sides to receive the stone coffins. Still farther to the south, but connected by a passage, is a circular chamber in an unfinished state, with a domical vault, and an opening in the centre to a shaft which is carried up to the surface. Whether this was intended for a chapter-house, or for a sepulchral chapel in imitation of the Holy Sepulchre, is an undecided point. This sub-

terranean church or crypt is necessarily lighted from one end only, where it is flush with the face of the rock; and these openings are filled with flamboyant windows, which are very evident insertions. On the surface of the hill over this church, but with a large space of solid rock intervening, is the tower and spire belonging to it. The tower is of late Norman and transitional character surmounted by a flamboyant crocketed spire. There is a kind of well or flue cut through the rock under the tower into the church below, apparently for the bell-ropes. In the church are remains of early painting, and some shallow sculpture, the character of which appears to be of the twelfth century. Adjoining the church, on the south side, is a detached chapel of transition Norman work, with an apse vaulted with good ribs and vaulting shafts. A considerable part of the old painting is preserved. Some of the ribs are painted with zig-zags. Under this chapel is a crypt or cave cut out of the rock, called the Grotto of St. Emilion, with a spring of water in it. The work is of the same early character as the other vaults.

— A factory chimney, said to be the highest in the world, is now being erected at the Royal Smelting Works, near Freiburg, in Saxony. The horizontal flue from the works to the chimney is 1,093 yards long; it crosses the river Mulde, and then takes an upward course of 197 feet to the top of the hill upon which the chimney is being built. The base of the structure is thirty-nine feet square by thirty feet in height, on which is placed a short octagonal transition, from which the round shaft starts. This is 430 feet high, or together with the base, 460 feet high, with an inside diameter of twenty-three feet at the bottom, and sixteen feet and six inches at the top. It will take 1,500,000 bricks, and the cost is about thirty thousand dollars.

— Complaints of overpressure in schools are as numerous and universal in Sweden as in many other Continental countries. Sweden is, in fact, one of the countries where this fact has first roused the public interest, as has been proved by Professor Dr. Key several years ago, in a pamphlet full of trustworthy statistical information, and showing that anæmia, chlorosis, and other diseases are due to, or are at least greatly promoted by, the existing overwork in the schools. Another weighty charge against the present school-system is that it, to a great extent, promotes the ordinary contempt for manual work among the young, and tends to engender disinclination for the practical professions, handicrafts not being sufficiently "genteel." Complaints of a too great influx at the universities are, therefore, as common in Sweden as in Germany, and the other Scandinavian countries. These unhappy results of the secondary education are now acknowledged by nearly every body, but they were foreseen by some patriotic men, who, thirteen years ago, founded a school, which, after its headmaster, got the name of "Palmgren's Practical Work-School." However, one must not infer from the name that it gives instruction solely in manual work. It was also intended to give a liberal education, and has now gloriously proved its efficiency in that respect, as some of its pupils have, during the last two years, successfully obtained their matriculation degree. The school-lessons are here somewhat fewer than in ordinary schools, and instruction in manual work — Sloyd — is obligatory for all pupils. Moreover, children who do not attend the school-lessons are admitted to the Sloyd instruction at a very moderate fee. Instruction is also given to men and women in sewing, embroidering in gold and silver, lace-making, macramé, etc. Further in bookbinding, pasteboard-work, joinery and turning. There are also courses at the school, of three months each, for future male and female Sloyd-teachers. Besides instruction in Sloyd-work, these students have lessons in drawing and the pedagogics of Sloyd. They have also to instruct children in Sloyd for one to two hours a day, under the superintendence of their teachers. During the summer holidays a shorter course is given for ordinary teachers. To give the reader an adequate idea of the interest which nearly all classes in Sweden take in Sloyd, the Swedish correspondent of the *Journal of Education* mentions that Colonel Ankarcrona, Commander of the Royal Swedish Lifeguards, has ordered that Sloyd-instruction is to be given twice a week to the guardsmen, by experienced teachers from Mr. Palmgren's school. This step has been taken to give the soldiers some pleasant and useful recreation when they are off duty. Apart from the moral

influence it may exert, it will evidently be a great advantage for the soldiers to learn the rudiments of a trade in the barracks, which hitherto have not been a school for useful and profitable arts in Sweden any more than in other countries.

— The Standing Executive Committee of the Convention of American Instructors of the Deaf, of which Dr. E. M. Gallaudet Kendall Green, Washington, D.C., is chairman, have had under consideration the suggestions made in many quarters that, in view of the probability of a notable national celebration being held in 1892, in this country, the Convention, which would naturally meet in 1890, be postponed until the jubilee year. It is well known that an invitation to hold the next Convention at the New York Institution for the Deaf and Dumb was accepted some time ago, and that it was intended, through invitations to professional brethren in other countries, to give the Convention an international character. Since this plan was decided on it has become practically certain that there will be held, in 1892, one or more great exhibitions calculated to attract visitors even from foreign countries, and that, consequently, during that year, low rates of travel to and in our country will be offered, all of which would tend to induce a larger attendance at such a Convention from abroad, and probably from the States, than could be expected at any other time within the next decade. The influence of such a Convention, held when great numbers of people, both foreign and native, would be assembled at the place where the Convention would be likely to meet, would give its proceedings an influence and importance they could hardly have under other circumstances. The weight of these considerations has led the Committee to decide, unanimously, to postpone the meeting of the next Convention until 1892. The authorities of the New York Institution have kindly renewed their offer of hospitality, but the Committee are of opinion that it will be wise to defer their decision as to the place of holding the Convention until the plans for the national celebration are more fully developed than they now are.

— Life at Girton is described in *The Women's World* in this way: An early breakfast, served from eight to nine (some industrious students begin their day with a private breakfast party at five or six, and only partake of the college meal as an afterthought), is followed by a morning devoted, almost without exception, to private study, or to attendance at lectures given in college by the resident lecturers, or at the numerous courses in Cambridge now thrown open to women. The early hours of the afternoon, which by common agreement of the students are considered "noise-hours," are usually given to recreation, tennis being the most popular form of outdoor amusement, and pianos, with an occasional fiddle, having full swing indoors. After luncheon coffee-parties are also a common occurrence, the entertainment being of the most informal description, while the hostess seldom scruples to dismiss her guests or leave them to entertain themselves if she has work or lectures on hand. From three until the six o'clock dinner silence reigns again in the college. Many classical and mathematical lectures are given at this time by Cambridge lecturers, who come out to the college for the purpose, and the students who have not lectures usually, though not so universally as in the morning, devote a part or the whole of these hours to private study. After dinner again informal coffee or tea parties are frequent, and friends generally meet in a haphazard kind of way, which, perhaps, may be best described as "loafing" into each other's rooms. In the May term this "loafing" takes place round the grounds, and an interesting study of shawls might be made from the windows overlooking the lawn and tennis courts. The formal social duty of calling on freshers is performed in this after-dinner hour, most of the college business is transacted, meetings are held, and subscriptions to the various societies paid. In the May term it is the favorite hour for tennis, and in all three terms the fire-brigade has a fortnightly practice immediately after "hall." Some of the poorer specimens of Girtonians think this a little severe, as the practice often includes a double-quick march from end to end of the long corridors; but the officers are inexorable, and catalogue all who brave their scorn and fight shy of the brigade as "ill or lazy." From half-past seven to nine are "silence hours" again and then, or later in the evening, an hour or two's work is com-

monly done — freshers with “little-go” on the brain, are reported to get in four or five before retiring for the night, but they generally learn in a term or two that it does not pay. Nine P.M. is the orthodox hour for knocking off work, and for the more elaborate forms of social intercourse, club meetings, occasional dances, small debates, and so forth — above all, for the regulation formal tea-party. There are certain points about this entertainment peculiar to college life, if not to Girton, says the *Women's World*, notably the fact that the guests bring, not their own mugs merely, but a whole trayful of refreshments. The college custom is to send to all the rooms a tray, with a roll and butter, and the materials for whatever beverage — tea, coffee, cocoa, or plain milk — is preferred by each student, and this custom greatly facilitates the discharge of the social duty. For it is understood that when a student gives a nine-o'clock tea-party all the guests take their own trays, the hostess providing only the hot water, and such luxuries as cake and jam. Thus, at 9 P.M., in all the corridors, is presented the striking spectacle of students hurrying in all directions — sharp corners are very dangerous at this time — to their respective entertainments, balancing trays in one hand, and in the other, unless they are such old hands as to know the college blindfold and avoid all pitfalls of boots, water-cans, and unexpected angles, carrying candles in case the festivities should outlast the college lights. It is at these parties that new students are first initiated into college society, and so strong is the instinct of hospitality that the “freshman” must be of a remarkably gregarious disposition who does not find tea-parties, which she experiences in their most formal tedious aspect, grow decidedly monotonous after a few weeks.

— The high price of gum acacia has led Trojanowsky to seek for a substitute, says an exchange, and this he believes may be found in the mucilage of flaxseed. By boiling the seed with water and precipitating the strained decoction with twice its volume of alcohol, he obtained a substance which, after drying, consisted of opaque, yellowish-brown irregular fragments, somewhat brittle, but not easily reduced to powder, dissolving in water to a turbid mucilaginous solution; of this, five grains were sufficient to emulsionize an ounce of cod liver oil. The large quantity of alcohol, however, required for the precipitation, and the difficulty of drying the adhesive product being such serious objections, further experiments were made, and, by still employing flaxseed as the source of the mucilage, and treating with sulphuric acid, a gum more closely resembling acacia was obtained. His method is to boil one part of flaxseed with eight of dilute sulphuric acid and eight parts of water, until the mixture, which at first thickens, becomes quite fluid; this is then strained through muslin, and to the strained fluid is added four times its volume of strong alcohol, the precipitate being collected on a filter, washed with alcohol, and dried. The gum is in the form of translucent, grayish-brown, brittle fragments, easily pulverized, and without odor or taste, and thirty grains will emulsionize an ounce of cod liver oil.

— An insect destructive to wheat, but previously unknown in this country, has appeared in considerable numbers on the Cornell University farm at Ithaca. Mr. J. H. Comstock, professor of entomology at Cornell, who has been making a study of the insect, says that he does not know of its occurrence anywhere else in this State; but as it is extremely abundant on the University farm, it is doubtless spread over a considerable area. It was first observed there two years ago, by one of the students, the late Mr. S. H. Crossman, while making an investigation of wheat insects. On examining the stalks of wheat at harvest time by splitting them throughout their length, it was found that some of them had been tunneled by an insect larva. This larva had eaten a passage through each of the joints, so that it could pass freely from one end of the cavity of the straw to the other. In addition to tunneling the joints, they had also fed more or less on the inner surface of the straw between the joints. If infested straws be examined a week or ten days before the ripening of the wheat, the cause of this injury can be found at work within them. It is at that time a yellowish, milky-white worm, varying in size from one-fifth of an inch to half an inch in length. The smaller ones may not have bored through a single joint; while the larger ones will have tunneled all of them, except, perhaps, the one next to the ground.

As the grain becomes ripe the larva works its way toward the ground; and at the time of the harvest the greater number of them have penetrated to the root.

— The Boston correspondent of *The Book Buyer* quotes an amusing letter sent by Mr. Aldrich to Professor E. S. Morse, ex-president of the American Association for the Advancement of Science. Professor Morse, it should be said, has a handwriting quite indescribable in illegibility: “My Dear Mr. Morse: It was very pleasant to me to get a letter from you the other day. Perhaps I should have found it pleasanter if I had been able to decipher it. I don't think that I mastered anything beyond the date (which I knew) and the signature (which I guessed at). There's a singular and a perpetual charm in a letter of yours; it never grows old, it never loses its novelty. One can say to one's self every morning, ‘There's that letter of Morse's. I haven't read it yet. I think I'll take another shy at it to-day, and maybe I shall be able in the course of a few years to make out what he means by those t's that look like w's and those i's that haven't any eyebrows.’ Other letters are read and thrown away and forgotten, but yours are kept forever — unread. One of them will last a reasonable man a lifetime.”

— No subject can be of more vital importance to the farmers of Indiana than the economical utilization of their fodder crops, since their success with live stock and in the dairy must be directly proportional to the economy of this utilization and depend for success or failure on the skill exercised in feeding. Careful inquiry and observation extending over the entire State, by the State Agricultural Experiment Station, of which Dr. H. E. Stockbridge is the director, forces the inevitable conclusion that as much nutriment in the form of fodder is wasted every year as actually finds its way into the digestive systems of the farm animals of the State. The two great fodder crops necessarily considered in this connection are hay and corn stover. Though perhaps both are equally worthy of consideration, and the utilization of each equally capable of improvement, the December bulletin, by J. Troop, pertains only to the former. It is the intention of the station to devote special attention to the production, curing, and feeding of hay during the coming season. That the results of the work may be most effective, however, it seems necessary that a preliminary discussion of the grasses of the State is called for, and to meet this demand the present bulletin is issued. It does not purport to be a scientific treatise on the grasses of Indiana; its sole aim is to offer the farmers of the State the briefest possible description of every grass known to grow within its borders, together with the chief characteristics and relative value for feeding purposes of each, in the hope of placing the farmers in possession of such information as will enable them to determine for themselves the character and adaptations of grasses with which their experience may bring them in contact. Recognizing the fact that plant determination by mere description is necessarily attended by serious difficulties, a large number of illustrations have been utilized as conveying the most perfect impression possible of the actual appearance of the grasses discussed. So far as the actual importance of the work thus begun may become to the agricultural interests of Indiana, the relations existing between tilled land and grass land in the State must be pertinent. The area of tilled land in Indiana is 56.4 per cent of the area of the State, while the grass-land area is 11.8 per cent, the average for the entire United States being respectively 41.6 per cent and 11.5 per cent. The ratio existing between these two varieties of farm land is, for Indiana, as 1 of grass land to 5.4 of tilled land, and for the entire country, 1 of grass to 3.7 of tilled land, — figures showing conclusively that Indiana can lay small claims at present to either a grazing, stock, or dairy pre-eminence, and that she falls far short of producing her best proportion of the grass of the country, and fails in maintaining a just or most profitable relation between these two staple divisions of farm lands. Indeed, Indiana ranks in the second series of States in the production of grass, and in the third series in average value of milch cows and live stock, facts which must possess a definite relation to the proportion existing between grass product and area of tilled lands, and enforcing the proverb, “the more grass the more stock, the more stock the more manure, the more manure the more crops.”