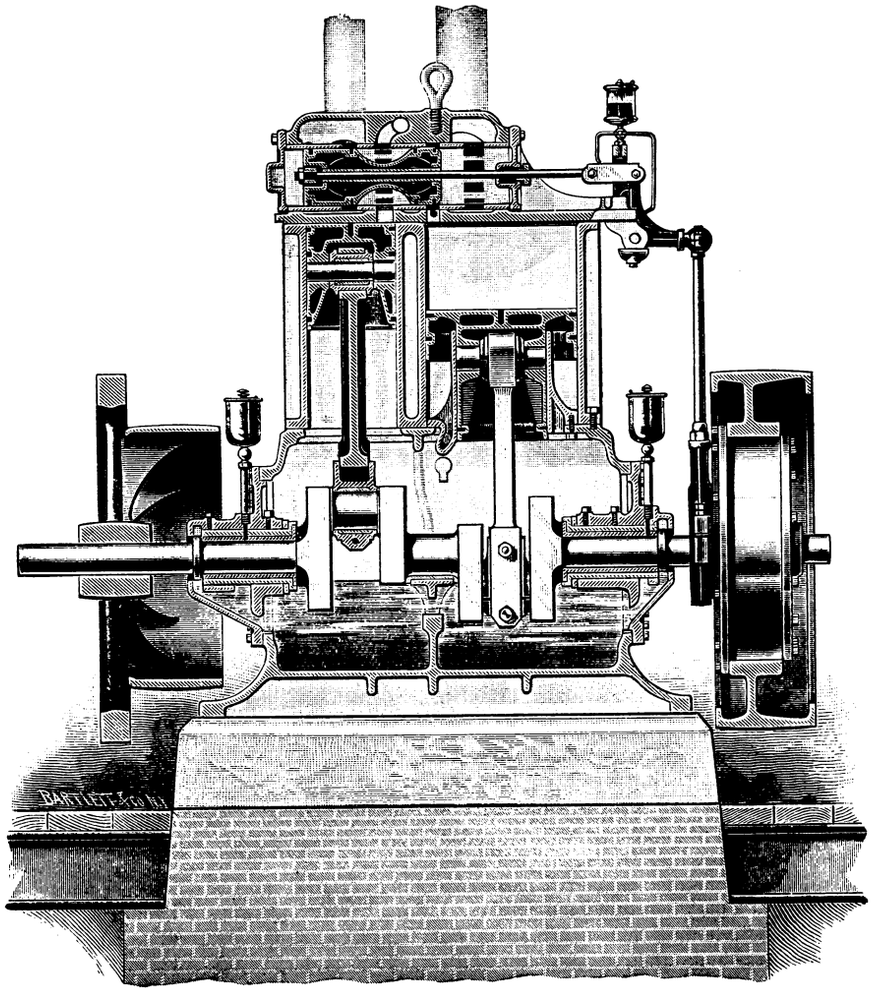
bushing is reamed out, and forced steam-tight into its bored seat. This form of construction has many advantages. The casting is greatly simplified, avoiding all chances of porousness, sand-holes, and other defects which are liable to cause concealed leaks. The valve-seat can be made perfect, and the parts registered exactly, on which latter fact depends the perfection of the steam-distribution, and the consequent economy of the engine; and, lastly, the valve-seat can be easily and cheaply renewed when worn.

The valve-chest also contains a small by-pass valve controlling a cored passage, by which live steam can be admitted to the low-pressure cylinder, to turn the engine over its centre when starting. The steam and exhaust connections are on the side of the valve-chest towards the back of the engine, bringing the throttle-valve



WESTINGHOUSE COMPOUND ENGINE, LONGITUDINAL SECTION.

into convenient position, and admitting of the ready removal of the valve-chest when desired.

NOTES AND NEWS.

F. M. WEBSTER, Purdue University, La Fayette, Ind., in a letter to the United States Entomological Bureau, Dec. 23, 1887, states that some two or three years previous samples of various substances used for insecticides were placed in the Agricultural Museum of Purdue University, at La Fayette, Ind. As the object was merely to display the substances, they were placed in glass flasks, such as are used for similar displays of seeds, the mouth being in the base when the flask is in an upright position. One of these flasks contained several ounces of powdered white hellebore, which, as it was never disturbed, had settled into a somewhat compact body. On removing this flask a few days later, the cork stopper was found to have been burrowed through, evidently from without, and the mass of powder was literally full of burrows and channels passing through it in all directions. On turning the powder out upon a table, and examining it carefully, two adult beetles of *Tenebrioides mauritanica* were found dead in the burrows in the powder. How long these beetles had remained in the powder alive, it is obviously impossible to state; but it would be safe to say that they entered it from motives of choice, and either subsisted upon it, or else did an incredible amount of tunnelling without sustenance. While at the time the beetles were removed from the powder the latter was not fresh, and did not retain its full strength, there still remained enough to impart a tingling, burning sensation to the nostrils when any of the powder was inhaled through the nose, yet not enough to set one to sneezing.

— In Germany, for some years past, according to the *Journal of the Society of Arts*, London, efforts have been made, and with considerable success, to acclimatize the oak silkworms of China and Japan (*Attacus Pernyi* and *Attacus Yama-mai*). They have been raised in the open air, protected from the attacks of birds by nets of gauze or wire, changed from place to place as the oak-leaves are consumed. Late frosts and excessively dry weather have been injurious in depriving the worms of food. In California a new wild silk-moth, before unknown, has been found thriving on the poisonous species of *Rhamnus Californicus* or *R. Purshianus*. It produces a silk as good as that of the domesticated *Bombyx*. Owing to the favorable nature of the climate, without the frosts or rains of China and Japan, great hopes are obtained of propagating this species. In Yucatan a wild moth has also been met with, somewhat allied to the mulberry-worm, which produces silk of a bluish tint; but the gum which envelops it is difficult to remove. Mr. John MacIntyre, a recent traveller in Manchuria, records having met with several new species of silkworm, which he describes in the *Chinese Times*. One wild worm feeds on the *Pinus chinensis*. It forms handsome cocoons, which yield a strong silk; but they are so mixed up with the needle-like leaves of the pine, that the

winding-off of the silk would be difficult. On the walnuts he found another, which forms a reticulated cocoon, like a Chinese lantern. He also met with two other species of mulberry-worms—one very hardy, which could be fed on lettuce or dandelion leaves, and remains stationary; and another which moves easily from branch to branch in search of food. The rearing of *Attacus orizaba* of Mexico is to be attempted in France.

— The United States Entomological Bureau announces that Brood VIII. of the periodical cicada, which is of the seventeen-year race, will appear this year through quite an extent of country. The region commences in south-eastern Massachusetts, extends south across Long Island and along the Atlantic coast of New Jersey, Delaware, and Maryland as far as Chesapeake Bay; then up the Susquehanna River in Pennsylvania to a point a little below Harrisburg; thence westward in Ohio, embracing the south-western corner of the State and the north-western portion of Kentucky; and then upward through south-western Indiana, ending in central Illinois. It is possible, also, that there is an eastward extension of the region from Kentucky into southern West Virginia, as cicadas occurred in 1855 in the Kanawha valley, and also in the counties of Buncombe and McDowell, in North Carolina; but, as these appearances were not verified in 1872, it is probable that they belong to Brood XVIII., which is of the thirteen-year race. The bureau will be glad to receive full accounts this year of all appearances from any of their correspondents, and from all others who will be kind enough to write them of occurrences in their vicinity. Accounts from North Carolina and West Virginia are especially desired, as these will tend to clear up any doubt remaining as to what brood occurred in those States in 1855.

— Professor H. B. Gale, in a paper on a new theory of chimney-draught and the design of brick and iron stacks, read before the St. Louis Engineers' Club, stated that he had made numerous experiments to determine the different factors which entered into the problem, and gave some formulæ in shape for convenient use. He showed, that, while the area of a stack could not be reduced below certain limits, it could be increased without affecting the efficiency of the stack.

— President Frederick Augustus Porter Barnard of Columbia College died April 27, aged eighty years. He was born May 5, 1809, at Sheffield, Berkshire County, Mass.

— A very curious race, possessing no little interest for students of natural history, and which is vouched for by our English contemporary *Knowledge*, was recently witnessed in Westphalia, the contest being between pigeons and a number of bees, the respective owners of which had wagered their favorites to win. The course was three miles and a half, that being the distance between the two villages of Rhynern and Hamme; and a dovecot which happened to be near a hive was selected as the winning-post. It was found no easy matter to mark the bees so as to make their identity unmistakable, but the difficulty was at last surmounted by rolling them in flour previous to starting them on their journey. This, while making them easily recognized on their arrival, probably retarded their flight; but nevertheless, and though the pigeons were looked upon by those interested as the most likely winners, the race resulted in a victory for the bees; the first bee arriving at the post twenty-five seconds before the first pigeon, and three other bees before the second.

— It is generally conceded that for best results in butter-making, where the milk is set in deep cans, the milk should be placed in the creamer as nearly as possible at the temperature at which it is drawn from the cow; there being a considerable loss of fat in skim-milk if the milk is allowed to cool to any great extent before being set. Of late there has been considerable controversy as to whether it is advisable under any conditions to warm the milk before setting, and as to the limit of temperature beyond which it is not safe to go. Mr. I. P. Roberts concludes, as the result of investigations at the College of Agriculture at Cornell University, that, first, there is a loss of butter when the milk is allowed to cool much below the normal heat of the cow before being put into the creamer; second, while there may not be any very great increase of butter when the milk is heated, there is no risk of injuring the quality of the butter by incorporating an excess of caseine, even when the milk is heated as high as 135°.

— At a meeting of the Massachusetts Classical and High School Teachers' Association, April 5–6, President Eliot suggested an argument against admission to college on teachers' certificates, that has the interest of novelty. A college that admits pupils from a number of schools on certificates puts all such schools on a level, and denies to them the opportunity of special distinction. A principal who knows that his school is superior to certain others cannot publish this fact, and win his due applause, unless his pupils come into competition with the pupils of the other schools in admission examinations. According to *The Academy*, President Eliot cited the instance of a high-school principal in New York, who, disheartened at his inability to show his public that his school was a superior one, gave up teaching and went into business.

— The removal of tattoo-marks is a matter of no little difficulty, says *Nature*, and many different methods have been tried, — blistering, suction, thermo-cautery, counter-tattooing with white powder or milk, etc. Criminals sometimes pour vitriol on their arms or hands, and, letting it act for a few seconds, plunge the limb in water. The following method is recommended by M. Variot, in the *Revue Scientifique*: The skin is first covered with a concentrated solution of tannin, and re-tattooed with this in the parts to be cleared. Then an ordinary nitrate of silver crayon is rubbed over these parts, which become black by formation of tannate of silver in the superficial layer of the dermis. Tannin-powder is sprinkled on the surface several times a day for some days to dry it. A dark crust forms, which loses color in three or four days, and in a fortnight or so comes away, leaving a reddish scar free of tattoo-marks, and in a few months little noticeable. It is well to do the work in patches about the size of a five-franc piece at a time. The person can then go on with his usual occupation.

— At a public meeting held at Channing Hall in Boston, Dec. 13, 1887, an association was formed for the purpose of assisting the Pundita Ramabai in her plans for the education of child-widows in India. The Pundita's purpose and her plans for the proposed school, told in her own simple manner, were listened to by a large and enthusiastic audience. Addresses were made by Rev. Dr. E. E. Hale, Rev. Dr. Phillips Brooks, Rev. George A. Gordon, and Rev. Dr. F. Courtney. They urged upon all to assist this unselfish woman, who is working for the uplifting of her unfortunate countrywomen. A constitution, embodying the methods of the association, was adopted, and officers were elected. Many present pledged the annual payment of sums varying from one to ten dollars, for ten years. Several scholarships, of one hundred dollars annually for ten years, have been secured, and donations for a building-fund are being received. It is estimated that $25,000 will be needed for purchasing and furnishing a suitable building to accommodate fifty pupils. The annual payment of $5,000 will meet the current expenses of the school, and contributions, however small, will be gratefully received. Choice English literature, with other instructive and useful books, for a school library, will be acceptable. In order to raise the funds needed for starting and sustaining the work suggested by Ramabai, her friends have organized in different places "Ramabai Circles," pledging themselves to give annually, for the space of ten years, a certain fixed sum of money. These circles will communicate with, and transmit their contributions to, The Ramabai Association of Boston. The trustees of the Ramabai Association will keep themselves informed of the progress and effectiveness of the work in India, and no steps will be taken or remittances made except subject to their judgment. A careful consideration of the difficulties of the situation in India has led to the conviction that a school-building is indispensable. In addition to the unjustly high rent that would be demanded for a building for a school for women, there may arise, through the prejudice of the Hindus against women's education, many other difficulties. The landlord may, at any time he pleases, ask the school to leave the place; and the disturbance of its daily routine, the inconvenience and loss caused by such moving about, would be incalculable. It is therefore best that it have a building of its own. Even the hire of a building, for such a purpose, must

in ten years cost at least $10,000: the sum of $25,000 will provide permanently a handsome building (furniture and all), which will accommodate about fifty persons. The Ramabai Association, with its headquarters in Boston, has the following officers: president, Rev. Edward E. Hale, D.D.; vice-presidents, Rev. Phillips Brooks, D.D., Rev. George A. Gordon, Miss Frances E. Willard, Mrs. Mary Hemenway, Dean Rachel L. Bodley, M.D.; treasurer, Mr. T. Jefferson Coolidge, jun.; advisory board of India, Dr. Ramakrishna G. Bhandarkar, Rao Bahadur M. Ranade, Rao Saheb Deshmukh; corresponding secretary, Miss A. P. Granger, Canandaigua, N.Y. At a meeting held March 14, 1888, The Ramabai Circle of New York was organized, with the following officers: president, Mrs. Courtlandt Palmer; secretary, Miss L. S. Chambers; treasurer, Mr. Richard A. Anthony.

— Hengst's powder, as we learn from the *Engineering and Mining Journal*, is manufactured from straw properly prepared and chemically treated, and finally converted into a gunpowder of granular form. Its special use lies in the direction of military and sporting purposes, although in its compressed form it will probably be found applicable to blasting operations, inasmuch as, weight for weight, it possesses about 150 per cent greater strength than gunpowder, and it appears to be impossible to explode it by concussion. Its action, however, is more rapid and local than that of gunpowder, so that a greatly reduced charge only is required to produce results equal to those produced by that explosive. But, notwithstanding the rapidity of its action, so far as present investigation has gone, it would appear to be peculiarly suitable for the two main purposes which Mr. Hengst had in view when inventing it; namely, military and sporting. In order to test the merits of the powder, a series of trials was recently carried out by Mr. Perry F. Nursey, C.E., at the testing ranges of Messrs. Cogswell & Harrison, at Harrow. The experiments were made comparative with black powder, and in the trials having reference to military use the government pattern Martini-Henry rifle and ammunition were used. The charge in the case of the black powder was 85 grains, as against 35 grains of Hengst's powder, all other details remaining the same. Considering that the latter powder was only produced experimentally and in small quantities, the results were very satisfactory. The velocities, which were taken by chronograph, appear to have been a little lower and a little less uniform than those of the black powder. As regards smokelessness, flamelessness, non-heating, and non-fouling with the Hengst powder, these points appear, says *Iron*, to have been set at rest by Mr. Nursey's experiments. Smoke there was none, says that gentleman's report; only a puff of light vapor (carbonic gas), which rapidly condensed and disappeared from sight. Flame there was none, so far as the eye could detect in a darkened rifle range, only a faint pale-blue glow being visible at each discharge. Fouling there was none, in the ordinary sense of the word, while a number of rounds fired in rapid succession failed to do more than warm the barrel. An equal number of rounds of black powder similarly fired from the same rifle, cold, heated it considerably. As regards the nature of the report, it appears that in every case there was distinctly less noise with the Hengst than with the black powder.

— The work of cutting through the Isthmus of Corinth is reported by *The Builder* to suffer under the same financial difficulties as the Panama Canal work. A German technical journal states that when the subscription was opened for the carrying-out of the scheme in 1882, estimated to cost thirty million francs, and to be finished in six years, the money was subscribed five times over. In 1887, however, this sum had been expended, and a further sum of thirty million francs was invited. However, up to the present, only a third of this sum has been obtained, and, if no further funds can be obtained, the work on the canal will soon have to be stopped. Hitherto about two-thirds of the earthworks have been executed, but there still remains a great deal to be done; and it is now stated, that, as the canal will cost twice as much as originally estimated, no profits can be anticipated.

— At the monthly meeting of the Royal Meteorological Society, on April 17, the following papers were read: "On the Deaths caused by Lightning in England and Wales from 1852 to 1880, as recorded in the Returns of the Registrar-General," by Inspector-Gen. R. Lawson, LL.D. The total number of deaths from lightning during the twenty-nine years amounted to 546, of which 442 were of males, and 104 of females. In consequence of their greater exposure, the inhabitants of rural districts suffer more from lightning than those of towns. It appears, also, that vicinity to the west and south coasts reduces the chances of injury by lightning, and that distance from the coast and high land seems to increase them. "The Diurnal Range of the Barometer in Great Britain and Ireland," by Mr. F. C. Bayard, F. R. Met. Soc. The author has reduced the hourly records of the barometer at the nine observatories, Aberdeen, Armagh, Bidston, Falmouth, Glasgow, Greenwich, Kew, Stonyhurst, and Valencia, during the years 1876–80. The curves of inland places are smoother than those of places on the seacoast, and the curves of places to the westward are more irregular than those of places to the eastward. As we go from south to north, the general tendency of the curve is to get flatter with a lessened diurnal range. "Note on a Working Model of the Gulf Stream," by Mr. R. W. Clayden, M.A., F. R. Met. Soc. The author showed this interesting model at work. It has been constructed to illustrate the formation of ocean-currents in general, and of the Gulf Stream in particular. "On the Rime Frost of Jan. 6 and 7, 1889," by Mr. C. B. Plowright, F.L.S. The author gives an account of the very heavy rime which occurred in the neighborhood of King's Lynn on these days, when the fringe of crystals upon twigs and branches of trees was about two inches in length. The weight was so great that nearly all the telegraph-wires were snapped, and an immense number of branches of trees broken off.

— We regret to have to record the death of Mr. Warren De la Rue, F.R.S. He was born in 1815, according to *Nature*, and died on Good Friday, after a short illness from pneumonia. Mr. De la Rue was a most devoted observer and munificent patron of astronomy, and in him and Balfour Stewart solar physics has lost its chief founders.

— During the past few years, much attention has been given to the subject of economy in heating greenhouses, and the manufacturers of steam-heating apparatus have made great efforts to supplant the long-established system of hot-water heating. In order to get some facts in regard to this subject, so important to the grower of plants under glass, and gain some positive knowledge as to the relative value of the two systems, two houses were constructed at the Massachusetts Agricultural College, Amherst, Mass., during the summer of 1888, 75 by 18 feet, as nearly alike as possible in every particular. Two boilers of the same pattern and make (F. W. Foster, manufacturer, 51 Charlestown Street, Boston, Mass.) were put in, — one fitted for steam, and one for hot water (the steam, for heating the east house; and hot water, for the west and most exposed one). The boilers were completed and ready for work in November, and were tested until Jan. 9, 1889, when these experiments began. Records of the temperature of each house were made at 7.30 and at 9 A.M., and 3, 6, and 9 P.M. Sufficient coal was weighed out each morning for the day's consumption, and the balance not consumed deducted the next morning. The two boilers and fittings were put in so as to cost the same sum, and were warranted to heat the rooms satisfactorily in the coldest weather. As far as could be determined by close examination and weighing, there was about the same proportion of unconsumed coal as of that consumed in the ashes from each boiler. The hot-water boiler consumed 720 pounds less coal than the steam-boiler in February, and 688 pounds less in January, — a saving of nearly 20 per cent. At the same time the temperature of the room heated by hot water averaged 1.7° higher than that heated by steam. The temperature was more even where heated by hot water, and consequently there was less danger from sudden cold weather. This was strikingly shown on the night of Feb. 22. The average outside temperature for the day was 34°. At 9 P.M. it was above 32°, and, proper precautions not having been taken for so sudden a change as followed, at 6 o'clock on the morning of the 23d the temperature of the room heated by steam was 29°, while in that heated by hot water it was 35°. While this test is conclusive for the two boilers employed in these two houses as constructed, and for this unusual winter, in a larger house, and in a

winter where the temperature runs lower and with greater extremes, different results might possibly be obtained; but this can only be settled by carefully made and accurately recorded tests, which it is hoped may be made another year.

— The death is announced in *Nature* of April 25, of Dr. Paul du Bois-Reymond, professor of mathematics at the Technical High School of Berlin, and formerly at the Universities of Freiburg and Tübingen. He was the author of two well-known mathematical works, and brother of the eminent physiologist of the same name. He was born on Dec. 2, 1831, and died at Freiburg in Baden on April 7.

— A Chinese native paper published recently, says *Nature*, a collection of some zoölogical myths of that country, a few of which are worth noting. In Shan-si there is a bird which can divest itself of its feathers and become a woman. At Twan-sin-chow dwells the Wan-mu Niao (mother of mosquitoes), a fish-eating bird, from whose mouth issue swarms of mosquitoes when it cries. Yung-chow has its stone-swallow, which flies during wind and rain, and in fine weather turns to stone again. Another bird when killed gives much oil to the hunter, and when the skin is thrown into the water it becomes a living bird again. With regard to animals, few are so useful as the "Jih-kih" ox, found in Kansuh, from which large pieces of flesh are cut for meat, and grow again in a single day. The merman of the Southern Seas can weave a kind of silky fabric which keeps a house cool in summer if hung up in one of the rooms. The tears of this merman are pearls. A large hermit-crab is attended by a little shrimp which lives in the stomach of its master. If the shrimp is successful in its depredations, the crab flourishes, but the latter dies if the shrimp does not return from his daily excursions. The "Ho-lo" is a fish having one head and ten bodies. The myths about snakes are the strangest of all. Thus the square snake of Kwangsi has the power of throwing an inky fluid when attacked, which kills its assailants at once. Another snake can divide itself up into twelve pieces; and each piece, if touched by a man, will instantly generate a head and fangs at each end. The calling-snake asks a traveller, "Where are you from, and whither are you bound?" If he answers, the snake follows him for miles, and, entering the hotel where he is sleeping, raises a fearful stench. The hotel proprietor, however, guards against this by putting a centipede in a box under the pillow; and, when the snake gives forth the evil odor, the centipede is let out, and, flying at the snake, instantly kills him with a bite. The fat of this snake, which grows to a great size, makes oil for lamps, and produces a flame which cannot be blown out. In Burmah and Cochin-China is a snake which has, in the female sex, a face like a pretty girl, with two feet growing under the neck, each with five fingers, exactly like the fingers of a human hand. The male is green in color, and has a long beard: it will kill a tiger, but a fox is more than a match for it.

— Besides the usual attractions for the spring and summer, the excursion committee of the Appalachian Club has arranged for a club camping trip for August. The camp will be on Student Island in Mooselucmaguntic Lake, the largest of the Rangeley chain. Capt. Fred C. Barker, who owns and runs the steamers on this lake and leases Student Island, will accommodate the party, engaging a man and his wife to have special charge of the camp and to do the cooking. The party will have the use of a frame cottage, in which a few persons can be accommodated; but, as the excursion is arranged to please people who love camping, it is expected that the majority will sleep in tents. Camp-life, boating, canoeing, bathing, fishing, steamer excursions on the lakes, tramps in the forest, and ascents of Bald and Deer Mountains, will be attractions. It will be possible for members to arrange small parties, engage special guides, and make trips to Parmachenee Lake, Aziscohos Mountain, or other points of interest in the Androscoggin region. The camp will be opened early in August, and continue open till the middle of September if desired.

— The Connecticut Agricultural Experiment Station calls attention of farmers and others to the fact that it has extended its field of investigation by the addition of a new department, for which a laboratory has been completed during the past winter, and equipped with the necessary books and apparatus for the study of fungi which are injurious to vegetation through the production of rusts, smuts, rots, mildews, blights, and similar diseases. A small greenhouse is attached to the building for winter experiments, which has been used since its completion for preliminary experiments to test the utility of certain methods of treating smut in onions, to which special attention will be given during the coming season. In order to obtain as much information as possible on this subject, questions have been prepared, and sent to numerous onion-growers; and any one who can give any information on the subject should send to Dr. Roland Thaxter, 27 Lincoln Street, New Haven, Conn., for a set of the questions.

— The director of the Hatch Experiment Station of the Massachusetts Agricultural College, Amherst, Mass., invites all who may have valuable or especially interesting new varieties of fruits, vegetables, trees, shrubs, or flowers, to send them to him, that they may be tested side by side, and under the same conditions, with other new and the standard older varieties. The situation of this experiment station is now such that the best of attention will be given to all such new varieties, and careful observation and unprejudiced reports made of their behavior and merits. He would urge that especial attention be given to promising local seedling apples that have not been propagated and disseminated. On almost every farm may be found numerous chance seedlings; and, as most of the standard varieties now in cultivation have originated in this way, all seedlings that have the valuable qualities of size, beauty, flavor, vigor, and freedom from disease, should be further tested.

— Attention is called by *Building* to the advantages of wire-wove waterproof roofing. The Architectural Building Trades Exhibition, just closed in London, offered an opportunity to show its numerous applications. It is intended mainly as a substitute for galvanized iron in building. The roofing sheets are less than half the weight of twenty-four gauge corrugated iron, and, being composed of stout papier-maché, with fine steel-wire foundations, they are excellent non-conductors of heat and cold. A settler's hut, 14 feet by 10 feet, weighing little over half a ton, was exhibited. It was a strong, and at the same time a picturesque building, with overhanging eaves, snow-white walls, and tile-red roof. Many of these huts have been sent to the South African gold-fields, and other places where portability is important.

— Clark University, Worcester, Mass., has issued a preliminary announcement of the work of the university, to begin in October next, in the departments of mathematics, physics, chemistry, biology, and psychology, with such additional facilities for the study of languages as scientific students may require. This preliminary limitation of the wide academic field indicates no bias and no restriction of ulterior plans, but is adopted in the interests of more effective organization. It is intended that these departments shall be gradually organized and sustained on the highest plane possible in existing conditions. No distinctively undergraduate classes will be formed, and no candidate for lower college classes will be received at first. While not declining to confer the degree of A. B., the university will, for the present, give special attention to qualifying for higher degrees. Ten fellowships of the first class of four hundred dollars each, ten fellowships of the second class of two hundred dollars each, and ten scholarships with free tuition, have been provided. The rate of tuition has been fixed at two hundred dollars a year, exclusive of laboratory fees. Applications can now be received, and should be accompanied by a statement of the course of study, and, if possible, by a specimen of work. A prospectus containing fuller announcements will soon be issued.

— At a meeting of the Physiological Society, Berlin, March 27, according to *Nature*, Dr. Klemperer spoke on the proteid needs of the animal economy in health and in certain pathological conditions. Voit's teaching, that the human body in health requires daily from 100 to 120 grams of proteid in order to supply its nitrogenous needs, has been recently contested from many sides; and, even if the experiments on which the attacks were based were not altogether free from some defects, they still sufficed to cast a good deal of doubt on Voit's theory. The speaker had endeavored, working from the clinical point of view, to decide the question whether an increased proteid metabolism can be prevented or

diminished by an increased ingestion of carbohydrates or fats. He carried out experiments on the nutrition of two healthy persons, in which the daily dose of proteids was very considerably diminished, even down to 40 grams; while, in compensation for the lessened proteids, larger quantities of fats, sugar, and easily absorbed and oxidizable alcohol, were administered. The nitrogen excreted in the urine was constantly less in amount than that taken in the food, thus showing that healthy, active men can be fed with largely diminished amounts of proteid without the occurrence of any destructive metabolism of their tissue-proteids. He next proceeded to investigate whether, in diseases which are characterized by an abnormally large breaking-down of tissue-proteids, this increased nitrogenous metabolism could be lessened by the ingestion of an increased quantity of non-nitrogenous food. An increased nitrogenous metabolism occurs in dyspnœa, fever, anæmia, cancer, tuberculosis, diabetes, and Addison's disease. For dyspnœa, experiments were made on animals; while for anæmia, cancer, diabetes, and Addison's disease, observations were made on the human subject, and results were obtained which corresponded to the supposition under which the experiments were started. A very considerable reduction of the nitrogen excreted in the urine was observed when only moderate quantities of proteid were given, while at the same time increased amounts of carbohydrates, fats, and alcohol, were administered. It is impossible to enter here into the interesting details of these experiments, which were all carried out by very precise methods, or into a discussion of the hypotheses which were advanced in explanation of the phenomena which had been observed.

— The following are the dates of some of the international exhibition congresses which are to be held in Paris: technical education, July 8 to 12; bibliography of the exact sciences, July 16 to 26; chemistry, July 29 to Aug. 3; ballooning, July 31 to Aug. 3; pigeons, July 31 to Aug. 3; hygiene, Aug. 4 to 11; higher education, Aug. 5 to 10; physiological psychology, Aug. 5 to 10; geography, Aug. 6 to 11; photography, Aug. 10 to 17; criminal anthropology, Aug. 10 to 17; primary education, Aug. 11 to 19; horticulture, Aug. 16 to 21; prehistoric man and remains, Aug. 19 to 26; electricity, Aug. 24 to 31; chronometry, Sept. 2 to 9; mines and metallurgy, Sept. 2 to 11; applied mechanics, Sept. 16 to 21; meteorology, Sept. 19 to 25; river utilization, Sept. 22 to 27; commerce and industry, Sept. 22 to 28; and hydrology and Climatology, Sept. 30 to Oct. 15.

— M. Berthelot, at a meeting of the Paris Academy of Sciences, April 8, read a paper on the fixation of nitrogen by vegetable soil with or without the aid of leguminous plants. The paper deals with a fresh series of sixty-four methodic experiments carried out during the year 1888, and fully described in the April number of the *Annales de Chimie et de Physique*. They form a sequel to the systematic researches begun by the author in 1883, and tend fully to confirm the views already announced by him on the fixation of free nitrogen in the ground, effected either with or without the co-operation of luzern, vetches, and other leguminous plants. He considers the fixation now fully established, and finds in this fact the true interpretation of a multitude of phenomena highly important to agriculture. At the same meeting, M. J. Reiset described some experiments on putrefaction and the formation of manures. The more recent of these fully confirm the results of those undertaken by the author so far back as 1854, and show, that, in the process of organic decomposition, nitrogen is not fixed, but liberated.

— According to *Nature*, a series of regulations with regard to patents and designs has just been issued in Japan. All inventors whose discoveries are beneficial, or are calculated to improve existing processes of manufacture, may apply for letters patent. No patents, however, will be granted in the case of articles of food or drink, or in case of medicines. Inventors who do not receive letters patent are powerless to sue in respect of piracy of their inventions. In order to register an invention, application must be made to the Patents Bureau, and, if the officials are satisfied as to the genuineness of the invention, it is registered, on certain forms being complied with, and certain fees paid. A curious omission occurs in the regulations, but it is not plain whether it is intentional or not. Nothing whatever is said as to the rights of a foreigner to patent an invention, but it is presumed that he will not be able to do so, nor has any provision been made for advertising applications for letters patent. The Patents Bureau is to be the sole judge of all cases submitted to it, and from its decision there is no appeal; but in certain cases two judges sit with the bureau, and assist in deciding whether a patent should be granted or not. The duration of a patent is to be five, ten, or fifteen years, according to the amount paid in fees. The patent, of course, passes by assignment *inter vivos*, or to the patentee's heir, but nothing is provided for the cases of bankruptcy or marriage.

— *Nature* states in a recent issue, that, from a report of the Belgian consul-general in the Kongo State, it appears that the efforts made to introduce European vegetables and fruits in that district have been rewarded with very great success. The government has imported tobacco-seed from Havana and Sumatra, which is cultivated in conjunction with native tobacco. The natives cultivate tobacco badly, but efforts are being made by the government to teach them better methods. The inhabitants of the Lower Kongo have been very successful in cultivating not only the usual African products, such as manioc, sweet-potato, etc., but also sorghum, maize, and the "wandu" haricot, called "boma" by the natives. The cotton-plant grows in its wild state, and the natives manufacture from it hats, wallets, etc. No effort has yet been made to cultivate it for trade purposes.

— A carbohydrate of the empirical composition $C_6H_{10}O_5$, and possessing properties very closely resembling those of the arabin of "gum-arabic," has been artificially prepared by Professor Ballo of Buda-Pesth. This achievement, we learn from *Nature*, is the outcome of an attempt to reproduce the conditions under which the acids of the vegetable world are reduced by chlorophyl. It was assumed that the iron of chlorophyl is present in the ferrous state, and tartaric was the acid upon which operations were commenced. About equal quantities of tartaric acid and ferrous sulphate were dissolved in a minimum bulk of water, and the solution was warmed upon a water-bath. In a short time a grayish-yellow pricipitate began to separate. The whole was then evaporated until it completely solidified on cooling. The cold mass was next extracted with alcohol, and the extract again evaporated. The residue thus left by volatilization of the alcohol was neutralized with milk of lime, and the filtered solution again placed on the water-bath. It was now noticed, that, as the water was gradually expelled, the contents of the evaporating-dish became more and more viscid, until finally a sticky mass was left, reminding one most forcibly of gum-arabic. Knowing that this familiar article of commerce chiefly consisted of the calcium and potassium compounds of arabin, the likeness was felt to be somewhat indicative of the formation of an arabin-like substance. On allowing the concentrated sirup to cool, a calcium salt readily crystallized out, yielding, on analysis, numbers pointing to the formula $(C_6H_9O_5)_2Ca + 9\,H_2O$. From this the free carbohydrate was obtained in one of two ways, — either by precipitation of the solution in water with lead acetate and subsequent decomposition of the lead salt with sulphuretted hydrogen, or by addition of the calculated quantity of oxalic acid. The sirup of "iso-arabin," as it is provisionally termed, was further purified by repeated treatment with alcohol and ether, and subsequent re-evaporation. It was then allowed to stand over sulphuric acid, — some specimens for a month, and others so long as a whole year. Each of these specimens, on combustion, yielded numbers indicating the empirical formula $C_6H_{10}O_5$. Iso-arabin is an almost colorless sirup, readily mixing with water. It does not reduce Fehling's solution, but rotates the plane of polarization to the right. It behaves, in short, exactly like the carbohydrates of the $(C_6H_{10}O_5)_n$ group. The potassium salt obtained by decomposing the calcium salt with potassium carbonate also crystallizes well in large anhydrous crystals. In addition to iso-arabin itself, a small quantity of its hydrate $(C_6H_{10}O_5 + H_2O)$ is also formed by the action of ferrous sulphate upon tartaric acid, and separates out in crystals from the alcoholic washings of the crude iso-arabin. Natural arabin itself forms a similar hydrate; the precipitate formed by addition of hydrochloric acid and alcohol to a solution of gum-arabic, when dried at 100° C., possessing this composition.