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ELECTRO-HORTICULTURE.

It has often been remarked by Arctic explorers that plants which require several months to ripen their fruit in temperate climates complete the same round of budding, blooming, and maturing in a few weeks under the continuous sunshine of the Arctic summer.

A species of corn which flourishes in Canada failed to ripen in Kentucky, though the warm season there is some weeks longer than in Canada. The superior rapidity with which vegetation pushes forward during periods of full moon and light nights has also been widely noticed; these facts of general observation, with others of a more experimental character, going to show that many of the plants of our temperate climate thrive in proportion to the duration of the daily (direct or indirect) sunshine they enjoy, rather than according to the temperature of the air.

A curious confirmation and extension of these observations in regard to the influence of light upon vegetation is furnished by the recent experiments of Dr. C. W. Siemens, testing the influence of the electric light upon certain plants. These experiments were described by Dr. Siemens at considerable length at a late meeting of the Royal Society in London. According to the report of the London Times the method pursued by Dr. Siemens was to plant quick-growing seeds and plants, such as mustard, carrots, ruta-bagas, beans, cucumbers, and melons in pots, dividing the pots into four groups, one of which was kept entirely in the dark, one was exposed to the influence of the electric light only, one to the influence of daylight only, and one to daylight and electric light in succession.

The electric light was applied for six hours each evening—from 5 to 11—and the plants were then left in darkness during the remainder of the night. The general result was that the plants kept entirely in the dark soon died; those exposed to the electric light only or to daylight only thrived about equally; and those exposed to both day and electric light thrived far better than either, the specimens of mustard and of carrots exhibited to the society showing this difference in a very remarkable way. Dr. Siemens considers himself as yet only on the threshold of the investigation, but thinks the experiments already made are sufficient to justify the following conclusions: 1. That electric light is efficacious in producing chlorophyll in the leaves of plants, and in promoting growth.

2. That an electric center of light equal to 1,400 candles placed at a distance of two meters from growing plants appeared to be equal in effect to average daylight at this season of the year; but that more economical effects can be obtained by more powerful light centers. 3. That the carbonic acid and nitrogenous compounds generated in diminutive quantities in the electric arc produce no sensible deleterious effects upon plants inclosed in the same space. 4. That plants do not appear to require a period of rest during the twenty-four hours of the day, but make increased and vigorous progress if subjected during daytime to sunlight and during the night to electric light.

THE MIGRATION OF THE GREAT AMERICAN DESERT.

The irrepressible conflict between herders and farmers along the Kansas and Nebraska frontier is steadily growing in magnitude, and on its issue depends the future of the great tract of country between the 100th meridian and the Rocky Mountains. The stock raisers and government surveyors pronounce the region fit only for pasturage lands, and ask that it be leased in large tracts to herders; the farmers claim, on the other hand, that the region embraces some of the finest farm lands in the country, and insist that it shall be held subject to homestead pre-emption and timber claim entry.

As spokesman for the latter party, Professor C. D. Wilber, of Wilber, Saline County, Nebraska, has been giving a correspondent of the Inter-Ocean a history of the controversy, and no end of evidence that the desert makers are wholly and designedly in the wrong. The desert country reported as lying west of the 100th meridian has, he maintains, no real existence. The entire region west of the Missouri River was formerly held under the same reproach. Now the country

bears magnificent crops of corn, wheat, rye, oats, barley, in many instances exceeding in productive capacity the famous valleys of the Mohawk, the Genessee, the Muskingum, and the Miami.

Touching the agricultural value of this region and the recent change of opinion regarding it by those who have learned its value, Prof. Wilber said:

"Only eight years ago, being one of an excursion party—chiefly the pioneers of the M., K. and T. R. R. from New York city, I made an extended tour over the plains toward the Colorado line. Mayor Opdyke said: 'The country is, indeed, beautiful; but what a pity it is so worthless. Is there not some way to overcome this desert condition? It must remain a waste thousands of years. The Indians are welcome to it, if only they will keep it.' Messrs. Skiddy, Schell, Parsons, Dickinson, and other men of great wealth, returned from the Sahara confirmed in their traditions, saying, 'It will never be worth a dime per acre.'

"To-day, ten years later, the New York capitalists are pushing railway lines and branches with unparalleled rapidity, eager to be first in possession of the same country, no longer a desert, dry, sterile, worthless, but, as they now know it to be, the best portion of the continent.

"The Boston capitalists were quite as the New Yorkers. Twelve years ago the wise men of the 'Hub' projected their first Nebraska railroad, from Plattsmouth to Fort Kearney, nearly 200 miles, based upon the usual land grant of 12,800 acres per mile of track. But in this desert Nebraska, as they judged, the less land the better. In the bill conveying the grant it needed only five or ten lines, or a score of words, to have secured gratis the entire route through the great Republican valley, with the accompanying grant of over 4,000,000 acres of the richest lands in America, but by them, at that time, not considered worth asking for. And now, after ten years, the aforesaid wise men of Boston, in the autumn of 1879, passed over the same route with a corps of engineers to choose the route, purchase the right of way, and make ready to spend \$10,000,000. They knew the country west of Kearney would never be habitable except by Indians, gophers, and owls."

The government experts who have described the country as fit only for pastoral uses, have done so, Prof. Wilber claims, without actual study of the plains they have condemned:

"Whatever they have put on record in their reports mostly concerns the mountainous regions of Wyoming, Colorado, Utah, and New Mexico.

"The plains or middle country of Dakota, Nebraska, Kansas, Eastern Colorado, and Wyoming, have either been wholly neglected or dismissed after hasty visits, with a brief report made up of most superficial and erroneous observations.

"What apology can either Prof. Hayden or Major Powell offer for their notes on the region just referred to?"

"Speaking of Nebraska, Hayden says: "'For 150 to 200 miles west of Omaha the soil is very fertile and can hardly be surpassed, but beyond that there is an absence of both wood and water, which will render it impossible to cultivate the western half of the State of Nebraska successfully.'

"Major Powell, of the United States Geological Corps, says: 'There is not of available land belonging to the United States enough left to make an average county in Wisconsin.'

"There are to-day in Western Nebraska and Kansas; far beyond the 100th meridian, many thousand prosperous farmers, whose full granaries give the lie to the statements of the government explorers, Hayden and Powell."

Last year the acreage of new farms all along the western border of the settlements was enormous, bringing under cultivation a strip ten miles wide, extending north and south through Dakota, Nebraska, and Kansas. Previously the country was barren, but rain follows the plow, as it has heretofore, across a belt 350 miles wide.

"The first settlers, twenty-five years ago, placed the desert limits just west of the Missouri River counties. These being occupied, the desert line was established on the Big Blue, 70 miles beyond. But the farmer invaded the Big Blue Valley, and the desert line was established near Kearney, 190 miles west of Omaha. But the irrepressible plow broke the barrier in so many places that the desert makers fled with their line to the 100th meridian, determined to have and enjoy a desert. But herds of farmers have gone far beyond and secured farms whose products equal those of Iowa or Illinois."

The desert was a reality; but agriculture has practically abolished it.

"The owners of the great herds of cattle are constantly obliged to retreat before the immense army of emigration from the Canadas, the Eastern and Middle States, and especially from Wisconsin, Illinois, Iowa, and Minnesota.

"Coming with their families and their farming outfit, generally without previous inspection, they become squatters upon any lands not taken at the Land Office. As the land laws are impartial, who comes first is first served, and the herd owner, though a millionaire, as someone is, much to his disgust, forced further out on the plains.

"The reactions that follow are obvious. The ranchmen or herders insist that the country will never raise grain, is only fit for cattle and sheep, is a desert, without water for irrigation, and insufficient rain. It is by nature's law the herdsman's country, and the national law must be made to coincide. To bring these laws into effect is the animus of

the present land movement, and to prepare the way for it is the object of the Public Land Commission sent out by the last Congress, with Messrs. Hayden, Powell, and Clarence King in charge. These gentlemen have made their preliminary report, full of desert as usual. The two former are professional desert makers, and Clarence King is a member of the firm of Davis & King, who have a herd of over 20,000 cattle in this desert—"the herdsman's paradise." The report to Congress was, of course, a foregone conclusion."

The prize in this contest is the control of nearly 500,000 acres of land, which the herdsmen want to have divided into large tracts and leased at low rates for grazing; while their opponents, who last year carved 100,000 new farms out of the desert, are equally anxious that the present quarter-section system shall be preserved.

The top soil of the larger part of the disputed region is identical with the loess of the Rhine Valley and of the most fertile parts of China, and lies from two to five feet deep, slightly colored with burnt or decayed vegetation. The subsoil is the same in composition but uncolored, showing its original light brownish-yellow hues. During the present year the pioneer farmers promise to exceed the work of last year in winning over a broad belt of the "desert" by covering the ground with crops and making way for a still further advance of rainfall.

#### THE MINING DEBRIS PROBLEM IN CALIFORNIA.

A recent report to the U. S. Chief of Engineers, by Lieutenant-Colonel G. H. Mendell, reviews at considerable length the changes wrought in the Sacramento River and its tributaries by placer and hydraulic mining, and proposes a system of dams for arresting the destruction of those streams and the progressive covering of their valleys with mining debris. Already the alluvial lands thus buried are estimated at 14,600 acres; and the river beds have been raised so high that they are constantly making new channels, causing heavy losses to farmers and the apprehensions of graver disasters in the future. The chief source of the trouble at present is hydraulic mining, placer mining having for the most become a thing of the past, and quartz mining adding but little to the debris. On this point Lieutenant-Colonel Mendell says:

"Although the hydraulic miner is now unquestionably responsible for the continual accretions that raise the levels of the beds of the watercourses year by year, yet the history of these deposits show that he is not responsible for all that is past. Hydraulic mining, in the effective form it now presents, is of quite modern growth. The earlier mining done from 1848 to 1860 was done by manual labor. Water was used to work out the gold, but was not used to excavate to any great extent. The water was not used under pressure. During these years, and especially during the first five or six years, counting from 1848, many thousands of men were employed in placer mining all through the gold districts. During all these years there was no great flood. The winter of 1861-62 was the occasion of the severest flood California has known since 1848. This flood found all the little gulches and the beds of larger streams stored with the material resulting from ten years' mining. This freshet brought the sand and gravel down in immense quantities. Whatever filling of the channel may have taken place previous to this time, it appears to have escaped notice. The winter of 1865, which gave high water, increased the evil. The placer mining had been nearly if not entirely exhausted by this time. Each successive flood has made things worse and worse."

The quantity of earth washed into the rivers by hydraulic mining is shown in the following estimates:

An inch of water running for 24 hours is taken to be 2,230 cubic feet. On the San Juan ridge, between the South and Middle Yuba, the State Engineer reports that in the year beginning November, 1878, 2,819,317 inches of water were used, while the quantity ascertained to have been used during the same time in the drainage basin of the Yuba is 5,893,962 inches.

An inch of water will excavate at all rates from 1 to 7 or 8 cubic yards of earth. The Spring Valley mines at Cherokee have been excavated to the extent of 23,000,000 cubic yard in 7 years, with an average quantity of 2,250 inches. Allowing 310 days to the year, the daily excavation for an inch of water is about 4 yards. The material here is very light, mostly sand, fine gravel, and clay in cliffs 400 feet high. The grades of the sluice is perhaps an average, being 1 foot in 24.

It would, perhaps, be an excessive allowance to apply this rate of excavation to the Yubas. It is, however, within the probable limits of truth to place the amount of material excavated in the basin of the Yuba at  $2\frac{1}{2}$  yards to the inch. This allowance makes their early amount placed in the stream and its tributaries at 14,000,000 or 15,000,000 cubic yards. On the other mining streams, the Feather, Bear, and American, there is no reliable information as to the amount excavated and deposited in the streams.

The attempt has been made to estimate the quantity of material in the Yuba and Bear rivers that has not yet reached the navigation lines, but which lies in the path of the floods, and is, therefore, liable to be washed farther and farther in greater or less degree, by every freshet. These deposits are the result of past mining. If no more were added, they are yet capable of doing a great injury to the water courses below.

The amount lying in the bed of the main Yuba and its branches, above the Yuba mill, is 49,263,200 cubic yards. The amount below the Yuba mill as far as Marysville, 14,600

acres covered, average depth assumed to be 4 feet, is 94,288,664. Total, 143,551,864.

On the Bear River the estimate is 148,248,000, of which 62,088,000 lies in the plains, and 86,160,000 cubic yards are in the bed of the stream above the foothills. This estimate makes the total amount in the two streams to be 291,799,864 cubic yards. It is not pretended that this estimate is accurate. It could not be so without boring the deposits in thousands of places. It is made from the best information available. Its use, in its imperfect accuracy, is to convey to those who have not the opportunity of seeing it some conception of the enormous dimensions of the phenomenon.

The character of this deposit has already been defined. It is sand, gravel, "slickens" (fine sand and clay), and stones.

The part that has reached the plains to this time is sand, gravel, and slickens. The layer of gravel and cobbles remain, as yet, in the foothills. There is some coarse gravel in the Yuba, four or five miles below the Yuba mills.

The Yuba having been filled 125 feet at Smartsville, and perhaps 15 feet at Marysville, the slope of the river between these points, a distance of 18 miles, has been increased 110 feet, which is about 6 feet per mile. This about doubles the original slope.

This tendency to increase the slope of this part of the river brings the gravel lower and lower. This is counteracted, to some extent, by the great breadth of the stream in the plains at high water. Small gravel is, however, found now in small quantities within three or four miles of Marysville. With the increase of slope under the influence of freshets we must expect this gravel to reach first the Feather, and in due time the Sacramento. Once in either of these streams in considerable quantities, it cannot be expected to move under the influence of the current, or if it did, the effect would be to transfer it to a more objectionable place. In the Feather the pools that formerly alternated with ripples have been filled. It is estimated by the State Engineer Department that there is a deposit in the Feather River of 40,000,000 cubic yards, and in the Sacramento below the mouth of the Feather something like 100,000,000 cubic yards.

Great as are the quantities of sand and gravel already washed into the streams, the remaining gold-bearing gravel ranges contain vastly more, which future mining is sure to displace. It thus becomes a matter of vital importance to arrest the flow of detritus into and upon the river valleys, which can be done only by storing it in places where it can do little harm. To this end storage reservoirs are proposed in the foothills of the Sierra Nevadas, to be formed by throwing dams, or more correctly rip-rap obstructions, across the streams into which the material is discharged from them. The stones required are found abundantly in the foothills, and they have only to be loosely piled together, the slopes of the mass to depend upon the size of the material.

The construction of dams of this sort is inexpensive, involving no skilled labor. It is estimated that in the first three dams of the Yuba River 1 cubic yard of stone will impound 242 cubic yards of detritus. For the other dams, six or more in number, 1 cubic yard of stone will impound about 580 yards. The estimated average cost of the first three dams is put at \$1.50 per yard; for the remaining dams \$2.50 a yard. For the lower dams the total average cost will be about three-fifths of a cent for each cubic yard of detritus stored. For the upper dams, the bed of the stream having been brought to a slope of 10 feet to the mile, the expense of storage will be reduced to less than half a cent a yard. No calculation has been made for the American or the Bear River, but the cost for these is thought to be less, for the reason that the amount of mining on them is less than on the Yuba.

For the further protection of the Sacramento River the filling up of one of the low districts between the Feather and the American river by its conversion into a storage basin, is suggested. Some parts of this land are represented to lie as much as 20 feet below the banks. The average depth has been estimated at 12 feet. The area is said to be in the neighborhood of 60 square miles. Admitting these statements to be exact, the storage capacity of this basin, filled to the banks, will be about 700,000,000 cubic yards.

It is believed to be practicable to turn the Feather and American rivers into this basin, and make them deposit therein the sands which they bring down. No objection is now seen to turning the American in this way. It is not navigable. The diversion could not fail to be beneficial to the Sacramento.

The Feather differs from the Sacramento in being a larger stream, and consequently likely to be more expensive to divert, and also in being navigable. It is now the outlet for a certain district of country and maintains a small commerce.

It is recommended that a full investigation of this problem be made as soon as possible for future guidance.

The only alternative to these works for arresting the flow of mining debris is the entire cessation of hydraulic mining; and even with that heroic remedy it would still be necessary to restrain the many millions of cubic yards of detritus already lying in the path of freshets, which year by year bear down vast quantities of sand and gravel to the destruction of the lower valleys.

#### Sudden Death from Electric Shock.

A serious illustration of the risk attending electric shocks, even when apparently slight, occurred recently in New Haven, Conn. A gentleman was induced to try a shock "just for fun," from the machine of an itinerant peddler of

electricity. He turned away, but had not gone far when he was seen to stagger and fall. He was picked up unconscious, and remained so until he died, two days after. The physicians pronounced it a case of apoplexy, superinduced by the electric shock.

#### Those Dreadful Moles.

On a visit to the country, a few miles from the city, the other day, we crossed a lawn perforated with holes, and the entire surface so ridged by moles that in walking over it the foot sank deep into the sod at every step. We have never before known these pests to pursue their digging operations through the winter, in this region, and are led to inquire if it is owing to the open winter, or to an increase in the number of these rodents, which has caused the apparent destruction of a cherished lawn. It is discouraging enough to have to contend with these pestiferous diggers from May till November, but now to find them burrowing along the surface in midwinter is an annoyance only the best of natures can cheerfully endure.

Many agricultural writers contend that moles are beneficial to the farm and garden. They may be, but their usefulness is a subject we are not disposed to discuss at this time; but what we would like to know is, what better methods there are for producing mortality among them than the various kinds of traps and other appliances which have been described in these columns. Inventors will find mole annihilators a profitable field for their genius.

#### Artesian Well at the Fifth Avenue Hotel, New York.

For some time past a drill has been gradually working its way down toward the center of the earth from the basement of the Fifth Avenue Hotel, whose proprietors hope to reach a supply of fresh water for that establishment and avoid having to pay the tax for croton. The well has already reached a depth of more than 1,000 feet, and is deepening at the rate of about 20 feet per day. A *Tribune* reporter called to see the drilling recently, and gives the following account:

Passing through the wide entrance on Twenty-fourth street, where the marketing of the hotel is delivered, and picking his way through a labyrinth of wagons laden with dressed meats, fowls, vegetables, etc., the reporter found himself in front of a partially inclosed space in which the engine, steam pump, and drill were at work. The drill proper, as the engineer explained, consists of a steel pipe,  $\frac{1}{4}$  inch in thickness,  $2\frac{1}{2}$  inches in diameter, and about 11 feet long, in the cutting end of which are set fifteen diamonds, ranging in size from one to three and one-half carats. These cut a circle down into the rock, of which the "core" goes into the pipe—to be drawn up when the section is filled. The drill has section after section screwed to it as the depth of the well increases; it is forced downward by hydraulic pressure, and is turned by the engine. Whenever the drill requires examination, or the removal of the core, each section must be unscrewed as it is brought up, and joined again, piece by piece, when the drill is to be lowered for further work. The diamonds become blunted after a certain amount of cutting, and must either be reset or replaced. The durability of the drill varies with the character of the rock which it penetrates. In this well the average wear has been 110 feet, though in one passage of 137 feet, through almost pure quartz, it had to be withdrawn and renewed for every 8 feet passed through. In sandstone the same drill would have endured through about 900 feet.

The core which has been taken from the drill shows the strata of the island; thus far it has been principally of granite and gneiss, with the stratum of quartz referred to. At its present depth the rock is more broken and pebbly, and recently several narrow veins of sandstone have been encountered, so that the immediate prospect seems encouraging.

"There is water down there somewhere," said the engineer in charge, and we intend to keep on down until we reach it, no matter how far we must continue." He then referred to a well in Chicago in which the boring had been continued more than 2,000 feet, and the result had been gratifying.

#### A Large Block of Sandstone.

At the Dark Hollow stone quarry, near Bedford, O., one of the largest stones ever blasted in this country was "lifted" a week or two ago. The stone is 40 by 50 feet square and about 30 feet thick, and it required 185 slip wedges to make a successful blast. When cut up into pieces it will make nearly 300 car loads of building stone. Immense blocks of stone are frequently taken out of the quarries here which would make the stones in Solomon's Temple mere pebbles in comparison. Its weight was estimated to be about 6,000,000 pounds.

#### Petroleum for Coughs.

Dr. Moubre, writing to the *Gazette des Hopitaux*, gives his experience of petroleum capsules in simple and chronic bronchitis. This balsamic had been brought before the Therapeutic Society by Dr. Blache a year ago, at the suggestion of a Paris chemist, who named it Gabian oil, in order to prevent public prejudice. Each capsule contains 25 centigrammes of pure petroleum, the ordinary oil not being used, as it has to be distilled in contact with sulphuric acid to render it fit for lighting purposes. At the Hospital Beaujon, where these capsules have been freely ordered for chronic bronchitis, a rapid diminution of the secretion and fits of coughing were observed. In tuberculosis this medicine gave encouraging results.