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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 359,

For the Week ending November 18, 1882.

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THE TRANSIT OF VENUS.

One of the greatest astronomical epochs of the century will occur on Wednesday, the 6th of December. The planet Venus will then make her way across the sun's disk, and American observers are this time on the right side of the earth to behold the rare phenomenon. The actual sight of the transit, except for its bearing on science, possesses no special interest. It is not a glorious spectacle, like a total solar eclipse, nor a weird combination of celestial beauty, like a total lunar eclipse, nor an awe-inspiring exhibition of omnipotent power, like a grand aurora, nor a startling display of celestial pyrotechnics, like a downfall of meteors, nor a sudden apparition of a great comet sweeping the skies with its gossamer tail.

A tiny black spot will cut sharply into the sun's border, move slowly over his disk, and, after a passage of nearly six hours, will suddenly disappear. This is all that will be perceptible to the naked-eye observer. But to the astronomer and the telescopist the event is full of the deepest significance. Through its instrumentality a solution is sought of one of the noblest problems ever elaborated by the highest exercise of human reason. To measure the unapproachable, is the point at issue, and never, in any previous combat with immensity, have astronomers had at their command such resources for becoming victors in the contest. The labor demanded is of the most severe and delicate nature, even when assisted by the most perfect instruments that have been invented. The utmost accuracy is required, or the result will be a failure. Measurements must be accumulated like grains of sand upon the seashore. Thousands of observations are often required in correcting an infinitesimal error. The grand object for which nearly one hundred transit expeditions have been organized, is to acquire the right of adding or subtracting less than one-tenth of a second to the solar parallax, from which the sun's distance from the earth is deduced.

It is a work of exceeding difficulty to determine the parallax of the sun, on account of its minuteness. The problem has not yet been accurately solved, after the incalculable labor bestowed upon it; the sun's distance is far from being a certainty. The best authorities give the parallax as less than 9″, almost certainly between 8·75″ and 8·85″. But this tenth of a second that is considered doubtful, is more than a hundredth part of the whole, although, says Professor Young, it is no more than the angle subtended by a single hair at a distance of 800 feet. If we accept 8·80″ as the parallax, an estimate probably nearer the truth than any other, the sun's distance, expressed in miles, will be 92,885,000, while the variation of one-twentieth of a second will change the result either way a half million miles. The most sanguine observers will feel that they have accomplished all they expect if the uncertainty is reduced to a quarter of a million miles.

If eyes were perfect and instruments were perfect, there would still be great difficulty in obtaining the exact parallax of the sun, but the problem is complicated by the imperfection of human vision and the imperfection of astronomical instruments. Three methods of observation are employed by transit observers: the direct observation of contacts, the photographic method, and the micrometric method, which all have their special advocates. The direct observation of ingress and egress is the most simple, and is chiefly relied on by English and some French astronomers. It needs only a good telescope, two eyes that know how to observe, and a chronometer. Of the three elements, the one that is seldom found, and is the most difficult to be acquired, is the clear-sighted, practiced eye. Hence many discrepancies are found in the contact method, which, from the organization of the eye, seem to be without remedy. A practiced observer can do more with a poor instrument than a novice with the most perfect instrument science can furnish.

The photographic method was devised to make up for the inaccuracy of the eye. This forms the means of attack of American observers, although it is coming into favor with astronomers of other nations. The object is to take as many photographs of the sun with Venus on his disk as possible during the continuation of the transit, and to aim at perfection in the execution of the work. The photographs can be taken home, compared, and measured at leisure. The trouble here lies in getting pictures free from distortion, and in the accurate determination of the scale of the pictures taken by different observers.

The micrometric method is the one adopted by the Germans, and requires the use of the heliometer. But the heliometer is a difficult and complicated instrument, and will only give satisfactory results in the hands of exceptionally skillful observers.

Thus it will be seen that each method of attacking Venus during her passage across the sun is beset with difficulties, and thus sympathy cannot fail to be roused for the zealous laborers in the field, who have traveled thousands of miles to reach their stations, transported cumbrous instruments to aid in the combat, and are now hard at work in preparing for the coming of an event that may crown their undertaking with some degree of success, or that in at least half the cases will be hid from view by an overcast sky. In southern stations, where it is now midsummer, a clear sky may be anticipated at about half the observing localities. In northern stations, where it is midwinter, the average chances for clear weather are only about one in fifty. For this reason, almost all the observing parties have chosen southern stations.

The problem of the sun's distance is of paramount importance, and fully justifies the outlay of brain, labor, and money lavished on this uncertain means of reaching its solution. It is the unit or yardstick of celestial measurement, the standard by which everything outside of the earth in the material universe is measured, excepting the distance of the moon. A mistake here makes all celestial computation inaccurate, the diameter of every planet, the radius of every orbit, the distance of every star. Thus the nearest fixed star in the northern hemisphere is 61 Cygni. Its distance is estimated at about 366,000 times the sun's distance or earth's radius. This means 366,000 times 92,885,000 miles. If there be an error of half a million miles in this estimate of the sun's distance, it will readily be seen that the error in the star's distance takes on gigantic proportions.

The 6th of December will therefore be a great day on the annals of the nineteenth century. Transit observers will do their utmost to obtain a more accurate determination of the sun's distance. If they do not reach perfect success, and there is little hope of such a result, they will have the satisfaction of feeling that they are laboring in a noble cause. For the observations made during the transit of 1882 will be a rich legacy to aid the astronomers who, 122 years hence, will observe the next transit in 2004.

We can only wish for good weather and good luck to the brave adventurers, and join in the prayer of the great astronomer, Halley, who, from an observation of the transit of Mercury in 1677, at St. Helena, was the first to discover the scientific import of transits. In recommending to future astronomers a careful observation of the transit of 1761, he says, in closing:

"May Heaven favor their observations with the most perfect weather. And when they shall have attained their object, and determined as well as they can our distance from the sun, let them remember that it was an Englishman who first conceived this fortunate idea."

RURAL VIEWS OF PATENTS AND PATENT RIGHTS.

To persons unfamiliar with the natural history of the industrial arts, who know little or nothing of the incessantly varying needs of our multiplying industries; nothing of the numberless lines of progress, each impinging somewhere upon the unknown, baffled for the moment, but certain sooner or later to shoot forward the instant the needed invention or discovery is made; and whose vision of the future is clouded by ignorance made denser by prejudice and professional bias—to such persons it naturally seems impossible for the human mind to find out much more that is new. The unoccupied field of invention, which to the intelligent is boundless and barely entered upon, is to them inconceivable; at best they can figure it only as a narrow circuit in which the future must endlessly tread upon the heels of the past. A charming example of this perverted and fallacious thinking—perverted by prejudice and fallacious through almost incredible unfamiliarity with the facts involved—appears in a recent issue of the *Western Rural*. The editor, discussing "Patents and Agriculture," makes the astonishing yet characteristic assertion that "it is pretty safe to say that nine-tenths of the things patented are worth less, and equally as safe to say that three-quarters of them are unpatentable because of prior use. Judging from the number of patents in existence, it is the easiest thing in the world to discover something new. On the contrary it is one of the most difficult things. The world makes mighty slow progress. It lives itself over and over again. It adopts new methods and forgets old ones. Then somebody, following the natural bent of the human mind, happens to stumble upon some of these obsolete methods, concludes he has found something new, and applies for a patent. The lost arts will be gradually revived, as the human mind becomes tired of what it knows and seeks for something else. The mind runs too much in one groove to make it possible for all our patents to represent something new. Discoveries of new forces and principles and the invention of new applications of forces and principles are rare exceptions, and we can almost count all the prominent ones that have been made in the whole of the world's history upon the ends of our fingers, and some of these have been found to be literal imitations of what at the time was unknown in nature. We are not nearly so fertile in inventive genius as the records of the Patent Office would appear to indicate.

"But original or otherwise, patentable or not, when anything is covered by a patent it becomes a source of a world of trouble, under our patent laws, to the people."

It may be safe enough for the *Rural* to say that nine tenths of patented things are worthless, or that all of them are. It probably knows its own constituency, and there is no penalty for talking nonsense save loss of favor among one's friends. To say it, however, betrays a recklessness with respect to truth or an ignorance of the actual outcome of inventions that we should not have believed possible in these days of general popular intelligence. And each and every one of the dozen or more assertions in the rest of the paragraph we have quoted is equally wide of the truth—flagrantly and ridiculously wide of the truth. One and all, they betray a perversion of view, a misreading of the plain evidences of fact, a misunderstanding of the conditions of invention, a misstatement of the effects of patented inventions upon public peace and wellbeing, that cannot be attributed solely to prejudice and misinformation.

The little world the *Rural* writer lives in must certainly make "mighty slow progress;" but how it is kept from touching at some points upon the real world that does move, and move rapidly, is a mystery which we will not attempt

to solve. To those that are intellectually alive and actively engaged in the affairs of men, the world does not live itself over and over again. Every new day brings a new life with new needs, new inventions to meet them, and new problems for coming days to solve. A large part of all the inventions made are intended merely to improve, to simplify, to cheapen the means and processes of established arts. Others are absolute advances opening up new regions of research, discovery, and invention. The former, in helping to perfect a single art or process, so far help to improve the general conditions of living; and the smallest are often the basis of a competence for the inventor. The latter are germinal, creative; like the steam engine, the telegraph, and numberless other new departures, they open up ever widening spheres of human knowledge and activity; and at every advance an increasing number of newer departures and still newer improvements are called into existence. That portion of the human mind not represented by the *Rural* does not "run in one groove," to anything like the degree the *Rural* imagines. And to one standing where there is a clear view of any portion of human activity—however limited—the marvel is not that inventions are so many and novel, but that they are comparatively so few; that so many inviting fields are wholly or to a *great* extent unworked; that so few men and women are educated to perceive the urgent necessities of the arts in every direction, or trained in the constructive arts whereby the world's needs in such directions are to be met.

The greatest bars to useful invention are the mistaken notions which papers like the *Rural* take pains to foster—that there is no great need of new inventions, and that few patents are of value to their owners. Both are radically false, as false as the assertion that patented inventions are burdens upon the public and sources of trouble; or that any considerable portions of the patents issued by the Patent Office are, or should be, "unpatentable" for lack of novelty. To argue against such assertions is like bringing evidence to prove that strawberries do not grow on cucumber vines, or wheat on apple trees.

Yet it is well for inventors to know that such absurdities have currency in certain quarters, and that people who listen to such teachings have representatives in Congress who may cater to *Rural* ignorance and prejudice for purposes of their own.

RECENT PROGRESS IN OYSTER FARMING.

BY H. C. HOVEY.

The modern oyster-farm is essentially a Connecticut idea. The laws of other States do not yet make it a possibility elsewhere. In Rhode Island the oyster-grounds are rented at $10 an acre for a period of ten years, but those who wish to cultivate farms have no guarantee that they can reap the final results of their best endeavors. The law in Maryland and Virginia is that a man having riparian rights, can stake out and have a life-interest in one acre contiguous to his own shore property, not for cultivating, but simply for planting. All else is public property. In Connecticut, however, while the "natural oyster-beds" remain free to all comers, the remainder may be sold to private individuals.

An oyster commission is appointed to hold office for four years, or longer on reappointment, whose duties are of a very general nature, but sufficiently clear on the main points. At the present time these commissioners are Messrs. Wm. B. Hudson, Robert G. Pyke, and G. M. Woodruff. They have drawn a shore-line from point to point, within which all is the property of the several towns along the shore of Long Island Sound. Each town has its own oyster-ground committee, with whose management we need not now concern ourselves. Outside the shore line, and as far as the lately defined State-line between Connecticut and New York, are about 300,000 acres of water territory, a large amount of which is supposed to be suitable for the cultivation of oysters with modern appliances. All this is under the jurisdiction of the oyster commission, who are to map it out and who may designate the portions surveyed to applicants for the purpose of actual cultivation. The price is $1.10 per acre, for which a deed of permanent possession is given. Among the conditions, however, is one enabling the purchaser to return the ground if it should prove to be worthless for the purpose in view; in which case he gets his money back. But, on the other hand, if he allows it to lie unimproved for five years, it returns to the State as forfeited.

Of course numerous questions arise, some of them sufficiently vexatious, concerning the practical operation of this system. One of these has reference to the reservation of "natural beds," from which any one may remove oysters provided he does not dredge for them by steam. Cases are now pending that will settle many of these disputed matters. Meanwhile the fact remains that in Connecticut waters there is room for enterprise, as shown in the cultivation of what may very properly be styled "oyster farms." There are at this time more than 300 applications before the commissioners for the designation of grounds, varying in size from a few acres up to 1,000 or more; and some of the grounds hitherto sold and now under cultivation include several thousand acres.

The largest oyster-farm in Long Island Sound, if not the largest anywhere in the world, belongs to Mr. H. C. Rowe, of Fair Haven, a gentleman whose sagacity has done much to shape the legislation of Connecticut, and whose shrewdness has enabled him to profit by opportunities as they presented themselves. Mr. Rowe now controls between 10,000 and 11,000 acres of oyster-ground, and has it all staked off by buoys, so that he can go from one field to another, as a farmer would traverse his wheat-fields and grass-lots. For the successful cultivation of such extensive grounds resort has been necessary to steam dredging, but not without strenuous opposition from those who feared that such a method would injure the natural beds. Several other persons have now entered farms rivaling his in size, including from 2,000 to 6,000 acres, and more will be staked out as soon as the surveys can be completed. There is quite a contrast between the old method of "tonging," and even the more effective but uncertain mode of dredging by sail-boats (often at the mercy of wind and tide), and the trim, wide-awake little steamers that run four large dredges and rake up a thousand bushels of oysters a day. With the facilities thus furnished, grounds are managed under water from 25 to 50 feet deep.

Not long ago the Connecticut Academy of Arts and Sciences accepted an invitation to visit the oyster-farms, on the new steamer the Gordon Rowe, in company with the commissioners, and Lieut. Francis Winslow, U.S.N., of the U. S. Fish Commission. The day was favorable, and a large party went, including Profs. Dana, Brewer, Waldo, Platt, and others learned in geology, agricultural chemistry, astronomy, law, and theology, but confessedly having much yet to learn as to the growth of shell-fish. Omitting the incidents of the excursion, it is my intention to explain to the reader the facts exhibited to us by Lieut. Winslow.

Preliminary to doing so, it should be stated that fishing without restriction tends to destroy the source of supply. This fact seems so obvious as to be self-apparent. Yet a wrong impression has prevailed that the millions of eggs annually laid would repair any waste resulting from human invasion. Under this wrong impression they did away with the "closed season" in England some time ago, and in consequence their oyster-beds were nearly destroyed in six years, and it was found necessary to restore the old usage.

Count Pourtales made observations for a single season, ten or twelve years ago, in the Great South Bay and in the Hudson River. In 1877 the Maryland oystermen began to make inquiries as to how far up stream oysters could be raised in brackish water. About the same time Lieut. Fred. Collins made investigations as to the density of the water of the Chesapeake Bay. These steps were designed to be preparatory to similar investigations to extend over the entire area of national oyster-grounds. In 1878, Lieut. Winslow relieved Lieut. Collins in the Chesapeake Bay, and began his inquiries as to the conditions having special reference to domestic economy. They were continued in 1879, and the results, in part, have been published by the Maryland Fish Commission, but are to appear in full in the report of the U. S. Coast Survey, next fall. Dr. Brooks, of the Johns Hopkins University, began and successfully concluded, in 1879, his experiments in artificially fertilizing the egg of the female oyster, and raising the embryo from the period of segmentation through various stages up to the formation of the shell. An account of these interesting experiments was published in the proceedings of the Johns Hopkins University Laboratory. In 1880, Mr. J. H. Ryder, of the Philadelphia Academy of Science, investigated further, but with no results of especial importance. In the same year, Lieut. Winslow, following Dr. Brooks' methods, succeeded in raising from the egg, artificially, the Portuguese variety of the European oyster, the first attempt of the kind abroad.

During the present year, Lieut. Winslow has been able to reduce the period required for the hatching operation from six or eight days to two or three; and has been trying to devise methods of raising oysters artificially that would be of practical value. His investigations show that the Chesapeake beds are rapidly disappearing, and it remains to be decided whether experiments for restocking them are to be carried on by individuals or by the States. The latter seems to be impracticable, because the young brood will unavoidably attach themselves to localities, instead of benefiting the public oyster grounds at large. Hence Lieut. Winslow has been carrying on his experiments in Connecticut waters, where he can put large quantities of newly hatched oysters directly on the beds where they are to stay.

The parent oysters are first cut up by knives, or more usually ground fine in a small mill, and mixed in glass jars holding sea water. As soon as the particles have settled somewhat, the excess of spermatozoa is drawn off by a siphon, and the remaining mixture is set away to await further developments. The principal difficulty thus far is to supply the young with a sufficient quantity of food and lime in suitable proportion to aid in the formation of the growing shell. It is now known that the male and female oysters differ little in their appearance to the eye, but the "milk," as it is termed, differs greatly under the microscope, that of the male consisting of an infinitude of minute particles gyrating among themselves, while that of the female contains true eggs. In the mixture each egg is forthwith attacked by the spermatozoa, afterward taking the form of globules. All this takes place in a few minutes after the chopped particles are stirred together. The process of segmentation lasts for perhaps twenty-four hours, after which numerous cilia are put forth, and the young oyster uses them to enable it to swim about during its brief life of freedom. The sight is a strange one of a hundred of these diminutive creatures darting about in a drop or two of water, executing a sort of dance under the magnifying glass. The shell on its first appearance is single, then it parts into two valves, at first separate from each other, and afterward joined by a hinge. The cilia grow into a sort of hairy tuft, by means of which it is conjectured that the final attachment is made to the old shells, or other objects at the bottom where the shell fish is to stay. When this has been accomplished, the upper valve grows far more rapidly than the under one.

Each female oyster is estimated to contain from one to ten million eggs, not a tenth of which are vitalized in the course of nature. But by the artificial process, when perfected, it is hoped that fully one-half may be safely brought through the embryo state and then left to take care of themselves. As the matter now stands, each five-gallon planting can used by Lieut. Winslow, when finally lowered with its load of young oysters, is thought to contain about fifty million alive! These cans are provided with double caps, one at each end, which are removed by cords attached to them, after the can has been let down to the spot to be occupied by the young colony. Care is taken to mark the location exactly, so that it can be found again; and thus in a few months we can tell if the experiment has been followed by practical results.

It may as well be added, for the information of those not familiar with the mysteries of the oyster trade, that "seed oysters" are those that have attained the age of one or two years, when they are about as large as a dollar; the size varying according to the waters. At this stage they are gathered by ship-loads from the Connecticut beds and sold to oyster-raisers in New York and Rhode Island and elsewhere, at fifty cents a bushel. This is a profitable operation to both seller and buyer. For, while it thins out the beds of the former, it allows what are left to grow to better advantage, on the same principle that thinning a bed of beets will benefit the plants that remain; and for the latter it is profitable, because the third year of an oyster's life witnesses an extremely rapid growth, ending in a fine and marketable bivalve. Those that are four years old, and have been properly cared for, are the so-called "saddle rocks," for which the consumer must pay a fancy price.

The Comet.

An observation, unprecedented in the history of comets, was made, says *Knowledge*, at the Cape Town Observatory, on Sept. 17, at 4 h. 50 min. 58 sec. Cape mean time, corresponding to 3 h. 37 min. 3 sec. Greenwich time. "The comet was followed," writes Mr. Gill, "by two observers with separate instruments, right up to the sun's limb, where it suddenly disappeared," at the hour named. To be seen under these conditions the comet must at the time have been intensely brilliant—partly, no doubt, the effect of solar heat and light, but partly also, we conceive, on account of the resistance it experienced in its onward rush at the rate of certainly not less than 340 miles per *second!* The time when Mr. Gill's assistants saw the comet reach the sun's limb, preceded by 1 h. 35 min. the time of perihelion passage as given below.

The Emperor of Brazil telegraphs to the Academy of Sciences that the comet was visible in full daylight on the 18th, 19th, and 20th September. The spectroscope showed the presence of sodium and carbon. On the 26th, from 4 h. 10 min. to 5 h. 40 min. in the morning, it was a splendid object.

Mr. R. A. Proctor has made calculations which satisfy him that the period of the comet and the length of the greater axis of its orbit are rapidly diminishing, that it will return to us within a few months, and that it will soon be destroyed by being absorbed into the sun.

Electrical Glass Cutting.

At present large glass cylindrical vessels for scientific and commercial purposes are cut during manufacture by surrounding them with a thin filament drawn out from the molten glass, and then cooling them suddenly by contact with a cold substance. A more sure and perfect method has been devised by Herr Fahdt, of Dresden, who surrounds the glass vessel with a copper wire, connected by binding screws with the two poles of a galvanic battery, and made red-hot by forming contact. The rough edges are then rounded off by turning the object in a blowpipe flame; and, to prevent any unequal contraction of the parts subjected to this action, a slight annealing is effected in the furnace.—*Iron.*

Orange Wine.

A writer in the *Semi-tropic California* describes his experience in making orange wines from the wild orange of Florida years ago. He says that it cannot be surpassed for medical purposes, and sold when only eight months old for $3 per gallon. The oranges must be perfectly ripe. Peel them and cut them in halves, crosswise of the cells; squeeze into a tub. The press used must be so close that the seeds cannot pass into the must. Add two pounds of white sugar to each gallon of sour orange juice, or one pound to each gallon of the mixed sugar and juice. Close fermentation is necessary. The resultant wine is amber-colored, and tastes like dry hock with the orange aroma. Vinegar can be made from the refuse, and extract from the peels.

Vaccinating a Train Load of Passengers.

The New York Express train on the Erie Railroad, passing east at noon, was held at Elmira, Nov. 9, till physicians could vaccinate all the passengers not already safe from contact with small-pox, as a passenger afflicted with symptoms of that disease was taken from the train at Hornellsville.