Correspondence.

Venus' Fly Trap.

To the Editor of the Scientific American:

The interesting story about the Venus' fly trap on page 265 of the SCIENTIFIC AMERICAN, April 28, 1894, which represents that plant as being able to distinguish between animate and inanimate matter, lacks some elements of truth, if it includes that variety which grows in North Carolina—and I have never heard of any other kind.

There are on each lobe of the trap, down near the line of junction, two small hair-like spines which are the triggers of the trap, and nothing can throw it without touching one of these. A single touch is sufficient to throw the trap. The location of these spines renders it impossible for a fly or any other small insect to spring the trap until it is in such a position that the closing will entirely envelop it. There is no need of any "second stimulus," and the plant cannot distinguish the touch of a fly from that of any other object, living or dead.

These plants are numerous in my native county, and I have always found it more agreeable to watch their pranks, and those of their neighbors, the trumpets (Sarracenias), than to "fret" myself "because of evil" political "doers." B. F. GRADY.

House of Representatives, U. S., Washington, D. C.

[FROM THE NEW YORK SUN.]

Arcturus, the Greatest of all Suns.

Since Sirius has practically disappeared with the progress of the year the brightest fixed star in sight is Arcturus. It is worth while for anybody to take the very slight trouble needed to find Arcturus, for who would not wish to see what is, perhaps, the greatest sun contained in the visible universe? I suppose everybody knows the figure of the "Dipper" in the sky. At this season, about 9 P. M., it is nearly overhead in the north, its handle being to the east and its upturned bowl to the west of the meridian. Follow the curve of the handle to the end and extend it with a similar curvature for a distance somewhat exceeding the entire length of the Dipper, and you will find Arcturus. There is not the slightest danger of missing or mistaking it, for there is no star in that part of the sky possessing one-quarter of the brightness of Arcturus. A soft reddish tinge distinguishes its light from that of all its fainter neighbors. This reddish hue, which I believe to be variable, has a peculiar significance, as we shall see.

The statement will be found in some of the old schoolbooks that Arcturus is probably oneof the nearest of the stars. As a matter of fact, it is one of the most remote of those whose distance is measurable. It must be admitted that the few measures that have been made are very discordant, and in what follows I shall assume the correctness of the results obtained by Dr. Elkin. The measurement of the distance of a star is a very beautiful problem, and the fundamental principle is perfectly simple. It depends on the revolution of the earth around the sun. On the 1st of January the earth is about 186,000,000 miles from the place it will occupy on the 1st of July, because on those two dates it is at opposite points in its orbit, and the distance across the orbit is 186,000,000 miles. The diameter of the earth's orbit thus serves the purpose of a surveyor's base line. It is plain that the direction in which a star is seen cannot be exactly the same from both ends of that line unless the star's distance is so immense that the diameter of the earth's orbit bears no measurable ratio to it. Most of the stars are so distant that that ratio cannot be ascertained, but there are a few whose apparent places are appreciably different when viewed from the extremities of our 186,000,000 mile base line. According to Dr. Elkin, the position of Arcturus is thus shifted to the amount of 0·018 of a second of arc, and this is called its parallax. How exceedingly delicate the methods employed in measuring such a quantity must be can, perhaps, be understood when it is stated that 0·018 of a second of arc is equal to the apparent distance between the heads of two pins placed one inch apart and viewed from a distance of 180 miles!

Having ascertained the parallax of a star, the next step is an easy one. Multiply the earth's distance from the sun, 93,000,000 miles, by the number 206,265, which is a mathematical constant that I shall not here undertake to explain, and divide the result by the parallax of the star. The quotient will be the star's distance in miles. If we apply this rule in the case of Arcturus, we have

$$\frac{19{,}182{,}645{,}000{,}000}{0{\cdot}018} = 1{,}065{,}790{,}250{,}000{,}000$$

miles. In round numbers, one thousand millions of millions of miles, or about 11,400,000 times the distance of the sun from the earth. The reader may jot down in his notebook the number 19,000,000,000,000, leaving off the less significant figures we have used above, and it will always enable him to ascertain the approximate distance in miles of a star whose parallax is given, this number being used as a dividend, and the parallax, expressed in the form of a decimal fraction, as a divisior.

Now, having found what Arcturus' distance is, another simple calculation will enable us to compare the actual amount of its light with that of the sun; in other words, to say how much greater a sun than ours it is.

Various estimates have been made from time to time of the light which we receive from certain of the brightest stars compared with that received from the sun. It is probably fairly accurate to say that the sun sends us about 25,000,000,000 times as much light as Arcturus does; in other words, that it would take twenty-five thousand million stars as bright as Arcturus to make daylight on the earth.

But, as everybody knows, the intensity of light decreases with increase of distance. If we were twice as far away from the sun as we are, we should get only one-quarter as much light from it as we do; if we were three times as far away, we should get only one-ninth as much light, the light varying inversely as the square of the distance. Situated where we are, the sun gives us enormously more light than Arcturus does; but we have just seen how enormously further away than the sun Arcturus is. Let us suppose, then, that the earth could be removed to a point half way between the sun and Arcturus. In that case those two shining bodies would be on equal terms so far as distance was concerned. Which, then, would give the greater light to the earth? Arcturus, unquestionably. The real distance of Arcturus is 11,400,000 times the real distance of the sun; but at a point half way between them the sun's distance would be 5,700,000 times greater than it now is, while Arcturus' distance would be diminished one-half. But since light varies inversely as the square of the distance increases, the sun's light would be diminished the square of 5,700,000, or 32,490,000,000,000, while that of Arcturus would be quadrupled. Now, glancing back we see that in the present position of the earth the sun's light exceeds Arcturus' light in the ratio of 25,000,000,000 to one; but with the earth half way between them the sun's light has diminished, as a result of increased distance, 32,490,000,000,000 times, and Arcturus' light has increased, through decrease of distance, four times. Multiplying together these two numbers, and dividing the product by 25,000,000,000, we get 5,198, which is the number of times that the light of Arcturus exceeds the sun's at an equal distance; so that Arcturus is really, as far as radiating power goes, equal to 5,198 such suns as ours!

Does the heat of Arcturus exceed that of the sun in the same ratio? Very likely it does. If, then, we were as near to that giant star as we are to the sun, we should be not only blinded, but burned up. The frame of the earth itself would melt and dissolve and burst into a cloud of fiery vapors. If we suppose that the intensity of the radiation of Arcturus is the same as that of the sun per unit of surface, Arcturus must be about seventy-two times as great in diameter as the sun, and about 375,000 times as large in volume. Its diameter in miles is, on that supposition, no less than 62,350,000! Imagine all the planets of our solar system removed to Arcturus and set revolving around that star in orbits of the same size as those in which they travel around the sun. Poor little Mercury, when in perihelion, would be plunged more than 2,500,000 miles beneath the blazing surface of that marvelous sun; neither Venus nor the earth nor Mars nor Jupiter would be able to withstand its overwhelming heat. Even Saturn, at a mean distance of 855,000,000 miles from the surface, would also be overwhelmed with that mighty outpouring of radiant energy; Uranus, 1,750,000,000 miles away, would be a most torrid and unendurable place of abode, if, indeed, it would be habitable at all, and Neptune, a thousand million miles more distant still, would broil under a fervid temperature nearly six times as intense as the mean temperature that the sun now imparts to the earth. If Arcturus is surrounded by inhabited worlds, it is plain that they must keep a very respectful distance between themselves and their solar ruler, or else they are inhabited by beings whose blood would freeze in their veins during a midsummer day in the Desert of Sahara.

We have some knowledge also of the kind of sun that Arcturus is. It belongs to a separate family from that of our orb of day. Leaving out of account their difference of magnitude, they are as unlike as an elm and an apple tree. I have spoken of the red tinge visible in the rays of Arcturus; the analysis of its light indicates that it is surrounded by a vast mantle of metallic vapors, enormously deeper and more extensive than the similar surroundings of the sun, shutting out an immense quantity of light, while at the same time the surface of the huge globe within glows with a greater intensity of heat than prevails on the sun. There is some reason for thinking that the screen may eventually be stripped from the face of this wonderful star, and that, as Sirius has done, it may change from red to white. Such a change might imply a tremendous increase of radiation. In 1852 its light suddenly paled, and the dazzling whiteness of its rays astounded those who had observed the change. In a few years it became red again. Its color is paler now than it has been in past years. This spring it has sometimes appeared to me to have almost parted with its familiar ruddy yellow tinge. What do such mutations import?

It would surely be worth the risk involved if we could place ourselves within easy observing distance of Arcturus, and study the play of solar energies there on a scale which dwarfs even the gigantic phenomena of the sun. And possibly the improvements that the coming century will undoubtedly bring to the telescope, the spectroscope, and other instruments of research will enable us to approach Arcturus in effect, if we cannot in fact; for man already sits like a god upon his little earth, and reaches out to the orbs that surround him. GARRETT P. SERVISS.

The Rail Industry in England.

In his recent presidential address before the Iron and Steel Institute, Mr. E. Windsor Richards said:

Never since the organization of this institute has the metallurgist experienced a more difficult time than the depression we are passing through. Added to his commercial troubles are constant demands from the workmen for either higher wages or fewer hours of work. The gravity of the situation demands the closest consideration of commercial men and of statesmen. We may well anxiously look round to see where the markets for our produce and employment for our workmen and capital are to come from. Great hopes are entertained at home that the tariff laws in America will be so altered and improved in our favor that we shall be able to resume delivery of iron and steel to that country. But American legislators are perfectly well aware of the needs of their own country, and know quite well that their own industries must first be fostered, and employment found for their own people. We may rest perfectly assured that they will legislate in that direction, and not in favor of England or any other country to the detriment of their own. We should not turn our eyes either so much to America for a market, for they have experienced a far greater degree of depression than we have. Nor must we look to Continental nations to take our iron and steel, for they are well able to supply themselves; and if present tariffs are not sufficient to keep out our productions, they will be increased. We cannot and do not complain of countries fostering their own industries, but we claim to exercise our privilege of grumbling when these tariffs are so high as to enable our competitors to poach on our lands and throw our workmen out of employment, and especially when, by placing even a small quantity of iron and steel in Great Britain, they depress the value of the whole of our products, and we have reason for complaining of a competition which is so one-sided and unfair to our manufacturers.

But we must look to our own possessions and to our own colonies for relief, and our legislators must safeguard their interests and ours. Canada is thoroughly loyal to us, and needs our markets as much as we need her to take our surplus population. We look anxiously for further development of railways in India and Australia, and Africa should, ere long, become of enormous advantage to us. It is to be hoped that our legislators may find time to consider these important questions, which affect the well-being of so many thousands engaged in the iron and steel industries, and are, indeed, of vital interest to the whole of the community.

The invention of our venerated and most highly esteemed past president, Sir Henry Bessemer, conferred the greatest good on the greatest number, but even he could scarcely have imagined that steel rails would be put on board ship at £3 12s. 6d. per ton. The manufacturer, not being included in the category of the greatest number, would perhaps not complain so much of the price if he could obtain enough employment to keep his workmen together until times improved. One cannot wonder, however, that orders for rails are few when we are informed that those laid down from Ostend to Brussels, made to Mr. Sandberg's Goliath section of flange rail weighing 105 lb. a yard, have recently been accurately gauged after being in use for five years, and are calculated, at present rate of wear, to last a hundred years.

Effect of the Trolley on Watches.

A great many men are wondering what is the matter with their watches. Never since the town was a town have there been so many pocket timepieces taken in for repairs. The trouble lies in the trolley. The introduction of the electric wire for propulsion, making the car stop and go fast or slow, affects the average watch in a similar manner, and fortunate is the man who gets off a trolley with his watch in the same condition that it was before. He may catch a train or reach bank in time to pay a bill, but it will be by town clock time, not his own. Every watch thus affected has to be demagnetized.—*Philadelphia Times.*

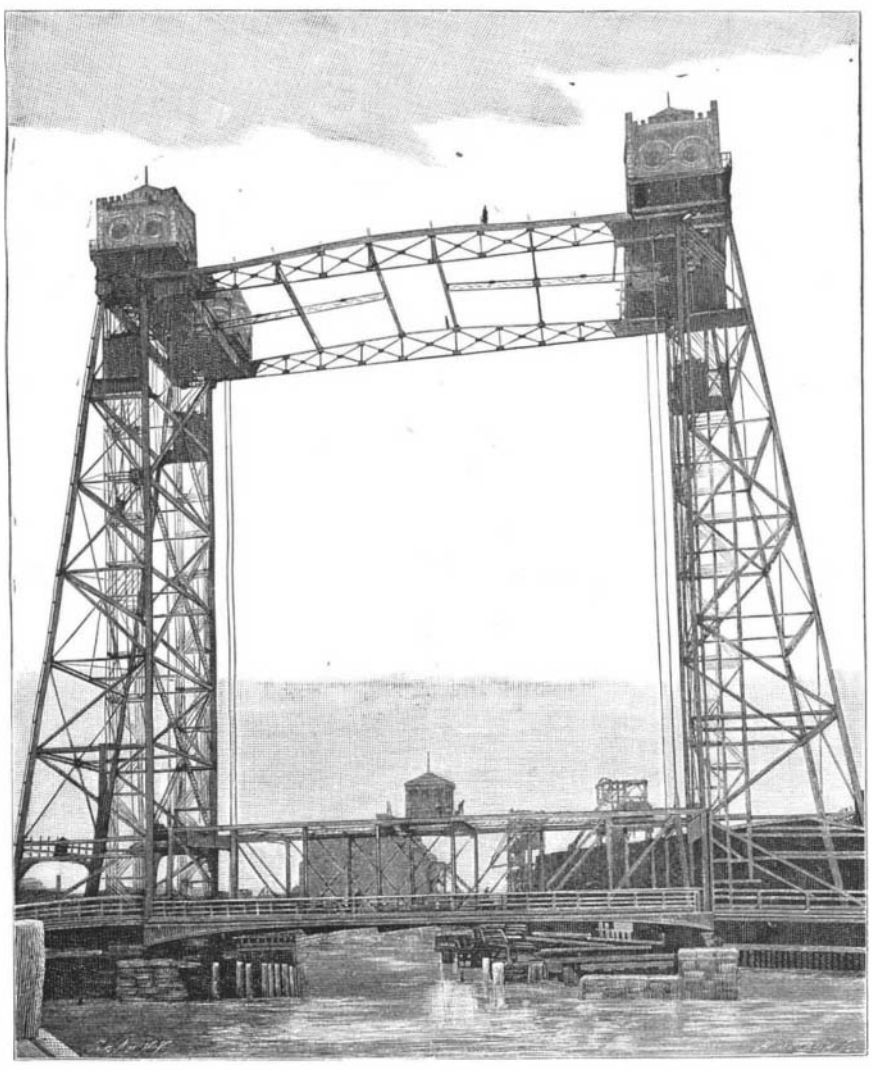
Water Taken from a Tree.

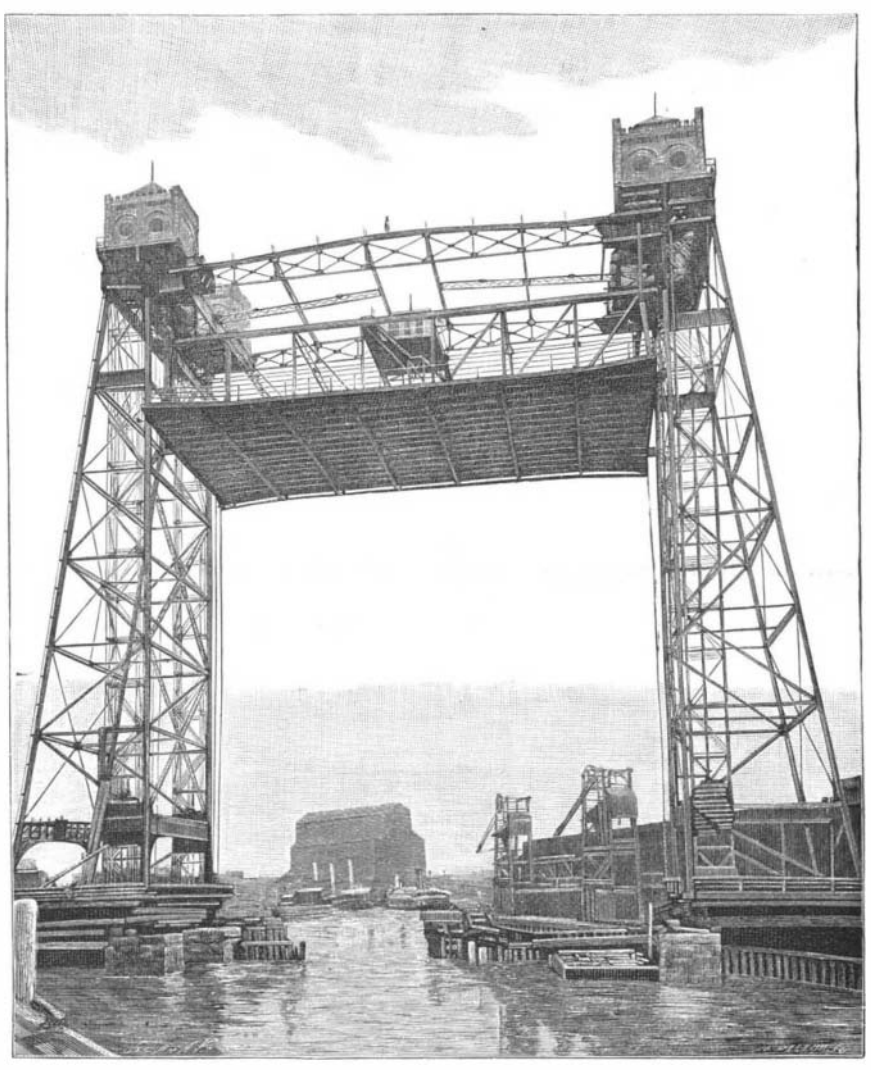
"There is a tree which grows in Madagascar called the 'Travelers' Tree,' which is of the greatest service to the tired and thirsty travelers in that tropical climate," said Professor Wilbur G. Stebbins, of Richmond, to a St. Louis *Globe-Democrat* reporter. "This wonderful tree has no branches, the leaves growing from the trunk and spreading out like the sections of a fan. These leaves, of which there are generally not more than twenty-four on each tree, are from six to eight feet in length and from four to six feet broad. At the base of each leaf is a kind of cup containing about a quart of cool, sweet water. The natives save themselves the trouble of climbing the tree by throwing a spear, which pierces the leaf at the spot where the water is stored. The water then flows down into the vessel held beneath it, and the traveler is enabled to continue his journey, cheered and refreshed by the precious liquid nature has so kindly provided for his use."

NEW LIFT BRIDGE, CHICAGO.

Our engravings illustrate the new lift bridge lately completed over the Chicago River at South Halsted Street. Owing to the refusal of the Secretary of War to allow the placing of a pier central in the river, the same being considered an unnecessary obstruction, it became necessary to erect either a drawbridge, or a two-leaved bridge, or a lift bridge. The two first-named forms were found, for various reasons, to be objectionable for the Halsted Street locality, and that of the lift bridge found favor and was adopted. The method of construction will be understood by a glance at our engravings, which are from photos. given in the *Graphic*. Frame towers are erected, one on each side of the river, between which the bridge proper is made to rise and fall by means of cables and counterbalancing weights. This form of bridge has several special advantages. The cost is comparatively low, the expense of operation is small.

The bridge itself is similar to the fixed bridge. It is continuous from end to end; is exceedingly stiff; any type of floor can be used on it, even granite blocks, if desired; and is more free from the danger of injury from collisions with boats. It is believed the merits of the design are such that this first bridge of this type will be produced in many similar localities.





CLOSED. NEW LIFT BRIDGE, SOUTH HALSTED STREET, CHICAGO. OPEN.

The Sunflower and its Uses.

BY NICOLAS PIKE.

This common but beautiful plant is familiar to everybody, and grows wild over our whole country. It will grow in almost any soil, and requires little in its cultivation. I shall endeavor to show in this article what a valuable plant it is, and what a profitable industry may be made by small farmers who have waste lands that could be profitably used for its cultivation at comparatively little expense. There are over fifty species of sunflowers known, but I shall refer more particularly to the giant flowered *Helianthus Annurus*. It is supposed to get its name from its head turning to the sun, from east to west, every day, hence its French name "Toures;" or, more probably, it is from its resemblance to the old pictures of the sun surrounded by golden rays.

In the year 1596 Girard notices the plant in England, and calls it flower of the sun, or "Marigold of Peru," as it has quite a respectable antiquity even in civilized countries. An acre of land will contain 25,000 plants, at 15 to 20 inches apart. It has been found that they will produce 80 to 100 bushels of seed, that will yield from seven to eight quarts of oil to the bushel. The refuse of the seeds, after the oil is expressed, can be made into oil cake for fattening animals. The stalks when burnt for alkali give 10 per cent potassa. As the sunflower exhausts the potash in the land to a great extent, the ashes would be valuable to return to the soil with manure. The green leaves make good fodder or can be used as ensilage. If dried and burnt to powder, they are good to mix with beans for milch cows. The seeds are said to be more oleaginous than those of the flax plant, and combine all the qualities of the best olive oil. It can be used for lamps and it burns as well as sperm oil, without its smoke. Painters say it is superior to linseed oil, as it dries rapidly and spreads easily.

The stalks are full of a strong fiber, like that of flax or hemp, which I shall speak of later. Machinery for all purposes has attained such excellence here, and much of it is so simplified and inexpensive, that machines for expressing the oil and separating the fiber can be procured at small cost. As the sunflower is less dependent on the weather than many plants, it is well worth trying by those who have waste lands, as the returns are quick and pretty sure.

There is another item where this plant can also be made most profitably available. Wherever a field of sunflowers is grown its owner should set up an apiary. It is one of the best bee pastures known. Its luscious and numerous nectaries yield an abundance of the best and most palatable honey. Any one who has passed near a clump of sunflowers in full bloom must have noticed what a buzzing the bees keep up round them, and what a strong scent of honey they exhale. I trust that this information may induce many to give this culture a fair trial, and that we may yet see fields of sunflowers as common as those of oats or rye.

Mr. Hargen, writing from Abilene, Kansas, says: The sunflower grows all over that State very luxuriantly, and that the great fields of these plants are seen through the summer, forming beautiful seas of gold when in bloom. They have been the bane of the farmer, as they take possession of every uncultivated field and wave their yellow medallions from the tops of eight and ten foot stalks for six months in the year. The difficulty has been to get rid of these stalks when clearing the field for spring crops, as it was thought they were useless. At last a use was found for them. The president of a paper mill in Salina had difficulty in procuring straw with which to make paper. He looked upon the acres of sunflowers that grace the bottom lands of the Smoky Hill River, and went to experimenting. With a flatiron and hammer he pounded up the stalks and decided that the pulp would do. He arranged at once for a trial of the stalks in lieu of straw at his mill, and the results surprised not only those who witnessed the experiments, but himself as well. The fiber proved to be better than that of straw and produced better paper, as the toughness enabled them to make a larger amount of paper from a given amount of pulp. The gummy substance that destroys so much paper at the press rolls is absent, and the sheets run through driers and finishing calenders without sticking or tearing. The entire stalk of the sunflower is used, and the small cost of the raw material, being merely that of gathering, promises to make a new manufacture profitable. The mill is now turning out the unique product steadily and others will soon take it up. Thus far only express and hardware papers are being manufactured regularly, though sufficient paper of a better quality was made to print the *Daily Republican*, of Salina, on the day of the trial, October 27, 1893. Kansas seems to be only just learning the extent of her resources.

The seed of the sunflower given to chickens in the winter answers as well as animal food for them, and helps to produce eggs early in the season when fresh ones are scarce, so profitable in every market. The young flower cups, when taken before the seeds are formed, and dressed like artichokes, are very palatable. One species, the *H. tuberosa*, a tall, wild plant, known as the Jerusalem artichoke, is also a useful plant when cultivated so as to increase the size of the tubers. They give a wholesome vegetable, and will prosper where potatoes fail and make a good substitute. Thus it will be seen that the sunflower is one of the most valuable crops the farmer can raise on his waste land, as it will grow where other crops fail.

Electrolysis of Water Pipes.

Corrosion of water pipes and other underground furniture by the ground return of electric railways continues to be observed. The recent annual report of the Brooklyn Electrical Subway Commission states that discoveries of corroded water and gas pipes have been of late so numerous that there seems no escape from the conclusion that metal pipes of all kinds extending below the surface along the routes of the trolley cars are being in many places destroyed by the ground currents. *Engineering News* says that at Peoria (Ill.) the water company have formally notified to the city authorities that their mains are being injured by the currents from the street railways; and unless these ground currents are removed, the company will refuse to further extend their mains, or be responsible for the maintenance of those now laid.