Correspondence.

Snow in the Streets.

To the Editor of the Scientific American:

A huge, heavy roller, about four feet in diameter, with its periphery two inches thick, would probably be the most effective thing that could be used; but the one difficulty in the way would be in the heating of it, heat being absolutely necessary to prevent the adherence of snow to the outer surface. It would not be impossible to heat such a cylinder, but it would be costly and difficult.

The next best shape for a machine for the purpose would be a sledge, made something after the following pattern: Instead of simply the two runners with which ordinary sledges are furnished, I would cover the bottom of a snow sledge with fifteen, placing them two inches apart from each other, thus giving to the runners and their intermediate spaces a width of seventy-three inches, which would be the width of the sledge. The runners should be of oak joists, fifteen inches in depth and from eight to nine feet long. The width of these joists would be reduced at their lower faces to one and a half inches, which lower faces would be covered with straps of wrought iron half an inch in thickness. Between the runners, set some other three and a half inch joists, which, at the rear end of sledge, would almost close up the space between the runners, but would be gradually cut away toward the front so as to leave an opening equal in amount to that closed at rear. From midway to rear these intermediate joists would be shod with a malleable casting, having several deep lengthwise grooves covering its lower face, the object which would be to make corresponding depressions in the pressed surface of snow, thus to afford foothold for horses. The front of the sledge should turn up some three feet, at an inclination or angle of 45 degrees, up which face the runners would be continued; and their final termination should be properly rounded and finished off. It might be well to have two rows of harrow teeth attached to extreme rear of the sledge to act as a thorough roughener to the compressed snow surface. Over the runners should be a flooring of two inch pine plank, the stuff to be twelve inches wide and placed transversely with length of the sledge. The runners should be of oak, and all exposed surfaces of the same would necessarily require to be planed perfectly smooth. Three or four tuns of pig iron properly distributed over the floor or platform would complete the craft.

This is a very rough sketch of the idea, but it may answer a purpose in pointing out a proper direction in which to seek for the machine wanted. These machines, as long as the snow lasted, could be used for the transportation of goods, and every movement of them would have the effect of making an admirable surface to travel over.

Finally, let me say that the true, the only economical and rapid way of getting rid of snow as a street obstructor is by compression, by condensing its loose particles into a thin, solid stratum or layer, into which wheels will not sink and over which horses and humanity can move freely. In short, you must make of the obstruction (snow) a new roadway.

N. N.

The Steel Tool Question.

To the Editor of the Scientific American:

I have been much interested in the discussions on tempering steel tools. My experience has been that no amount of skill and care in hardening and tempering can make a right down good tool of one not judiciously forged. In forging, bring the steel to a mellow heat, and keep it so until you have your tool forged to shape. As the heat declines to black hot, compact your steel by light hammering on the face of the tool, but do not hammer the tool edgewise. Now if the tool is ready to harden, when it is heated it will swell so as to loosen up the compacting that was done by light hammering as it was cooling off. So it follows that whatever will harden the steel at the least heat will do it the best.

I use strong cold brine, and want it near the fire so as to utilize all the heat in the tool. As soon as the tool is cool, I dip it in oil (sperm or whale oil preferred). Now hold the tool over a well burnt-down fire, without the wind on. Hold the tool so as to retain as much of the oil on it as possible. Now tip it up slightly so as to make the oil flow from over the hottest part to the edge. The oil becomes a carrier of heat, and will help to let down the temper (exactly alike every time) from any thick part to a delicate cutting edge. I think the color that comes on the steel under hot oil can be depended upon much more with than without oil, although it (the color) will be a little tardy. In letting down the temper, I want to do it slow enough at last, so that I can lay down the tool to cool off, and not have to dip again. But if it is going too low, I invert it and dip the body part and leave the edge out. There are very few tools in which I like to leave heat enough in the body to let down the temper with, for this reason: as I grind back on the tool, the cutting edge is apt to get a little farther from the outside film of refined steel. This film is harder than the steel under it, so I would leave the tool slightly harder a little way back from the end. Whereas, if you run out heat enough from the body of the tool, you will very soon be at work with a tool altogether too soft.

Bennington, Vt. TAYLOR D. LAKIN.

Inversion of Image on the Retina of the Eye.

To the Editor of the Scientific American:

It is a well established fact that the image of every object is inverted on the retina of the eye. How is it, then, that we see every object right side up? The common explanation in works on optics is that we correct it by habit, that is, that we know that the image of the object is inverted; but by an exercise of the judgment or imagination we correct it. This seems to me to be irrational and unsatisfactory, and I set myself to the task of finding a better solution. In studying the anatomy of the eye, I found that the optic nerves, which spread over the retina of the eye on which images and impressions are made, converge or are collected into a bundle, and cross each other (at the back of the retina, on their way to the brain or sensorium) about as far from the retina as the pupil is. W. S. TURNER.

Napa, Cal.

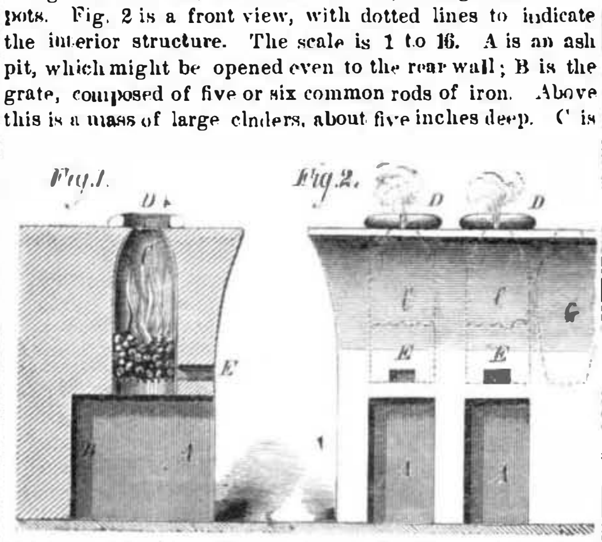
Chinese Cooking Stoves.

To the Editor of the Scientific Ameri an:

A Chinese cooking stove is cheaply built, and is very economical of coal. It has occurred to me that a description of it, and of the coal used, might be interesting and profitable to some of your readers.

The accompanying engraving represents the stove, which is used daily in my kitchen, and is a good sample of the common stove used in those parts of northern China where hard coal is used. The stove is built in the corner of the room upon a paved floor, against solid walls. The material used is dried brick or adobe, laid in clay mud.

Fig. 1 is a section, from front to rear, through one of the pots. Fig. 2 is a front view, with dotted lines to indicate the interior structure. The scale is 1 to 16. A is an ash pit, which might be opened even to the rear wall; B is the grate, composed of five or six common rods of iron. Above this is a mass of large cinders, about five inches deep. C is



the pot, seven inches in diameter, with hight, from grate to mouth, of fifteen inches. The mouth is about three inches in diameter, and is made in a cast iron plate, six inches square by half an inch thick, which is sunken into the upper surface. D is a collar or ring, about three inches thick, made in two pieces, and separated, as they lay loosely upon the top, far enough for smoke and flame to escape by the sides of the rounded pot or kettle. E is an aperture into which the straight poker is thrust. G is an earthen pot for heating water.

In building, the coal pot is made square, and the adjacent side of the water tank exposed. Afterward pieces of the adobe are worked into the corner, and the interior is plastered with a clay mud, differing from that in which the bricks are laid by the addition of hogs' bristles, which give it tenacity. The collar is made of the same material. The exterior of the whole structure is plastered with a mortar which, being made of lime and clay, gives a smooth hard surface to the stove. The adobe is cheaper than burned brick, and, in the parts near to the fire, much better.

The Chinese live with their doors open, and depend for warmth upon their wadded clothing. The smoke and gas are, therefore, of little account to them. Should any of your readers be inclined to experiment with such a stove, a funnel might be arranged above the stove, so as to carry off most of the smoke.

The coal used here is a flaky, friable anthracite, of poor quality. It costs about $7 a tun, or, allowing for exchange, $8.50 United States currency. To earn this amount, a carpenter or mason, doing first class work, would have to labor sixty days. Coal dust can be bought at a reduction of 25 per cent, and is used more than the pieces. The people take two parts of clay dust and eight parts of the coal dust, mix them thoroughly, and add water to make mud or mortar. This is spread on the ground, about an inch and a half thick, to dry. When partially dry, a shovel cuts or marks the surface into small squares. When nearly dry, these are broken up. Generally, at this stage, a coarse sieve is used, and the cakes, rolling together, lose their corners, and become round. In this form, they burn readily in the stove above described. The advantages of the spherical coals is merely in the fact that they are more easily used than rugged cubical ones.

I see no reason why the poor of our cities in America may not avail themselves of this process, and, buying coal dust at a small price, use the coal balls, as we call them, in common stoves. Perhaps some pieces of coal would be necessary in connection with the balls. But either with or without, it would be a great saving of money.

In the stove which we have described, the common coal dust, wet and mixed with water, is put upon the top of a good fire; a straight poker thrust through this makes a vent for gas, and the fire keeps in with but little consumption of coal. ISAAC PIERSON,

Missionary of American Board.

Paotinghi, 100 miles south of Peking, China.

The Flying Machine.

To the Editor of the Scientific American:

Allow me to add, to the explanation of my proposed flying machine, published on page 357 of your current volume, the following:

By having the wings revolve in opposite directions, I balance their forces against each other so as to secure the car against a spinning motion, which would attend its flight and its descent if the two wings revolved in one and the same direction.

By disconnecting or separating the arms at the center of the canopy, and giving them an independent action, I am enabled to have one wing shaft incline forwards while the other inclines backwards, and thus to cause the machine to turn round in the air as desired, either to the right or left, and in a smaller or larger circle as the wing shafts are more or less inclined.

Thus it is seen that, with only two wings and a suitable motor, we may gently ride in the air, and fly high or low, fast or slow; and the handles, which are to be connected with the movable arms, will enable us quickly to steer our course in any desired direction. W. D. G.

Mending Machine Belts.

To the Editor of the Scientific American:

As, in a recent issue of the SCIENTIFIC AMERICAN, one of your correspondents gives his method of lacing belts, I am induced to offer another which I have found valuable.

Lay the two ends of the belt exactly even, with the insides together, and punch one straight row of holes across the end, driving the punch through both pieces so that the holes may correspond. Now take your lace, pointed at both ends, and pass the points in opposite directions through the first hole, still keeping the two ends of the belt together as when punched, and draw the loop tight, observing to keep the ends of equal length. Pass the points through the second hole and so proceed to the last; then tie the ends over the edge of the belt, and the job is done. A belt can thus be mended in half the time and with half the length of lacing required in the usual way; and when the belt is subjected to heavy strains or slipping, it will wear ten times as long, as the lace never touches the pulley faces.

Of course the plan is not applicable when both sides of a belt run over pulleys, nor when the projecting ends would strike anything in their track. JOS. R. PARKS.

Kansas City, Mo.

Cribbing in Horses.

To the Editor of the Scientific American:

Having seen several communications in your paper on cribbing in horses, I will give you my experience on the subject:

I had a three year old addicted to the habit. I tried various remedies without success, the horse growing worse all the time. Seeing the animal always kept his head nearly in a line with his body, I so arranged the stable that he could not get a resting place for his teeth except on the manger. This I put on the floor of the stall, and kept him confined for a short time. This was done two years ago; and although he has frequently been allowed to exercise in a lot, I have not seen him indulge in the habit. Others have tried the experiment with like results. B.

Washington, N. C.

The Patent Office Tea Set.--A Correction.

To the Editor of the Scientific American:

I learn that, in my note published in your paper of December 26, 1874, I did Mr. Thacher an injustice by stating that he headed the list of subscribers for the tea set with $50. The statement was made on what was believed to be good authority, and with no intention of wronging any one. I now desire, in the same spirit of fairness, to say that Mr. Thacher did not join in the subscription, and did not give anything towards paying for it. JAMES.

Synthesis of Purpurin.

To 8 to 10 parts of concentrated sulphuric acid are added 1 part of alizarin, dried and powdered, and 1 part of dried arsenic acid, or of peroxide of manganese. The temperature is gradually raised to 150° or 160° until a drop of the mixture, if thrown into water containing a little caustic soda, gives the coloration of purpurin. The mass is then thrown into a large quantity of water; the precipitate, exhausted with cold water, is then dissolved in a sufficient volume of a cold saturated solution of alum, and deposits, on the addition of an acid, abundant flakes of purpurin, which may be purified by a second solution in alum water, followed by a crystallization from superheated water.—*M. F. de Lalande.*

Monads.

At a recent meeting of the Royal Microscopical Society, a paper by the Rev. W. H. Dallinger and Dr. Drysdale, on the life history of monads, was read. It minutely described a form repeatedly met with in macerations of the heads of codfish and salmon, and traced the development and reproduction in all stages, and was illustrated by drawings. The observations had extended over several years, and had been conducted with the greatest care under various powers up to $\frac{1}{50}$ inch. The results of experiments were also given, and conclusively showed that exposure to temperatures of 220° and 300° Fah. had failed to destroy the germs of these organisms.

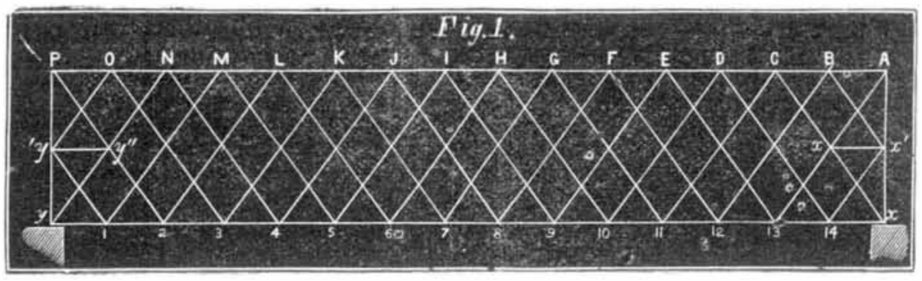
Danger from Excavations.

It is well known that the exposure of large quantities of fresh earth, as attends railroad and canal construction, develops intermittent and typho-malarial fevers. To lessen this, Dr. Stephen Smith, of New York city, offers the wise recommendation that sewers be laid only after November 15 and before June 1; and last Tuesday week the Board of Health, accordingly, resolved that the Commissioner of Public Works be requested to omit all excavations between June 15 and October 1, and that no subsoil be exposed during that time.

Double Lattice Wrought Iron Bridge at Springfield, Mass.

Mr. W. Bartlett, in a letter to the *Railroad Gazette*, says:

Few Western engineers have ever seen or heard of the double lattice wrought iron bridge over the Connecticut river, at Springfield, Mass. A bridge which is so carefully designed in regard to economy and durability is well worth taking notes upon. The notes found in the following running description are reliable, and will be valuable to engineers for reference.



The structure was designed by Charles Hilton, C.E., to replace the old wooden Howe bridge on the Boston and Albany Railroad at Springfield. The piers of the old were used for the new structure. There are seven equal spans, each span being 177·15 feet long, making a total length of 1,240 feet. The spans being all similar renders it necessary to describe one span only.

The span is composed of three trusses, one central and two outside, the object being to carry a double track. The width between centers of outside chords is 31 feet 6 inches; hight, 24 feet 3 inches. There are 15 panels, each 11 feet $9\frac{3}{4}$ inches long; inclination of diagonal to horizontal, $45\frac{1}{4}°$ (intended probably for 45°); width of portal, 14 feet; hight, 18 feet 8 inches from top of rail to crown of arch.

The skeleton engraving herewith (Fig, 1) shows the system of bracing.

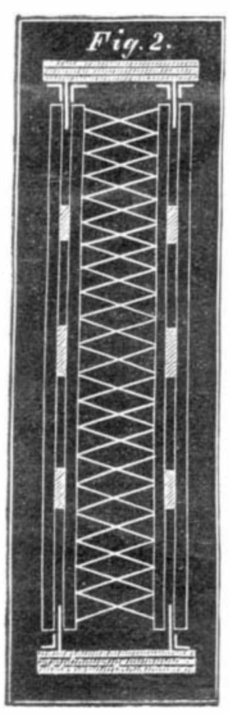
From a bill of material for one span we find the total weight distributed among the several portions of the span as follows:

	Pounds
Chords	140,022·66
Webs	79,372·15
End posts	10,000·00
Stringers	25,200·00
Cross beams	25,200·00
Pier ends	18,921·00
Total weight of bridge proper	300,715·81
Rails	14,400·00
Timber	39,000·00
Total dead weight	354,115·81

which equals 177·06 tuns. This gives almost exactly one tun per foot run for the dead load.

It is worth noting here that, of the 300,715·81 pounds weight of bridge proper, nearly one half is found in the chords, one fourth in the webs, one sixth in the stringers and cross beams, and one tenth in the pier ends.

The side figure shows section at the center of central truss, where the area of top chord is 74·6 square inches, and of lower chord, 65 square inches. The area of top chord (74·6 square inches) is obtained by three horizontal plates, 30 x $\frac{9}{16}$ inches each, two vertical plates, 12 x $\frac{1}{2}$ inches each, and four angle irons, 3 x 3 x $\frac{1}{2}$ inches each. The area of lower chord (65 square inches) is obtained by the same number of similar plates, and but two angle irons, 3 x 3 x $\frac{1}{2}$ inches each, allowing for rivet holes. From these areas at the center, the areas decrease toward the abutments as the stress diminishes; and near the pier ends the horizontal chord plates are replaced by a system of double lattice bracing, the braces being riveted to the outside angle iron, the inside angle having been stopped two panel lengths from the ends.



Of the diagonals, the struts are riveted on the inside and ties on the outside of the vertical plates. The struts are angle irons united by double lattice bracing. The ties are simply angle iron. The struts and ties are firmly riveted together at their intersections.

The vertical chord plates are connected by zigzag bracing, $2\frac{1}{4}$ inches x $\frac{3}{8}$ inches at their lower edges.

All rivets are $\frac{7}{8}$ inches diameter, with a pitch of not less than $2\frac{3}{4}$ inches.

The lower sway braces are united to chord plates and cross beams by gusset plates.

Stringers are $10\frac{1}{2}$ inches rolled I beam.

The data for computing the strains in the different members are as follows:

Dead load at each joint	11·81 tuns
Live load at each joint	35·43 "
Total dead and live load	47·24 tuns
Length of panel	11·81 feet
Length of diagonal	33·85 "
Depth of truss	24·25 "
Stress allowed for tension	10,000 lbs. per sq. in.
Stress allowed for compression	8,000 lbs. per sq. in.

Paris Green Poisoning.

The question of whether the use of Paris green (arsenite, or aceto-arsenite, of copper) upon potato plants as a means of destroying the bugs will tend to poison the soil, and thus render it unfit to produce vegetation, receives a definite answer from Professor Le Conte, in his paper recently read before the Academy of Sciences. The opinion advanced and concurred in by such high authority as Professors Silliman and Alexander and Dr. Mitchell affirms unequivocally that arsenic and copper are poisons which act with equal energy upon plants and animals. The material diffused upon the leaves of the plants to be protected, which are incapable of absorbing it, is speedily carried into the soil; and if used annually, it is merely a matter of time, how many years will elapse before the soil is poisoned so as to prevent the growth of all vegetation.

Professor Le Conte enters an earnest protest against the present loose yet enormous use of this fearful poison in the hands of uneducated men. It is ordered by Western druggists literally by the tun, and repeated deaths have resulted among farmers through its careless employment.

To this Professor Silliman adds a warning against the too prevalent habit of scattering the substance about dwelling houses as a cockroach poison. The death of several persons in a single dwelling in this city from eating pickles upon which some Paris green had been blown, by a stray draft of wind, occurred quite recently. It should be remembered that the poison contains from fifty-five to fifty-eight per cent of arsenic, and that its deadly effect is as certain as that of the latter mineral. From houses where there are children, the substance should be rigorously excluded. Servants often sift it about on the edges of floors near the mop boards; and we have found it on kitchen sinks, close to the dishes and to food prepared for a meal.

It is well settled that arsenic is dangerous even externally, and experiments have proved that its poisonous effects are developed by a smaller amount inserted in a recent wound than when taken into the stomach. A cut finger, therefore, or a mere scratch on the hands when handling the poison, may serve as a means of the same entering the system.

Paris green, owing to its brilliant color, is employed in so many different uses that to avoid its proximity care is necessary. Professor Alexander, in the discussion which followed the reading of Professor Le Conte's address, said that wall paper has been so thoroughly impregnated with the poison that persons have experienced its effects after half an hour's stay in the room. We have recorded cases of paper hangings which on analysis showed three grains of arsenic to every square foot. Green tarletan, when dyed with the substance, has been found to contain 8·21 grains of arsenic in the same area. In artificial flowers and grasses, *bonbon* papers and boxes, even in the candies themselves, chemical investigation has repeatedly proved the poison to be present. Boxes of toy water colors containing greens, it would seem, are hardly safe children's playthings, as a single cake of paint weighing 38·26 grains has been found to contain 8·89 grains of arsenic. The simplest test for the poison is to put a fragment of the suspected substance in a solution of ammonia. If arsenic be present, a blue color will be produced. For a further test, pour a little of the ammoniacal solution on crystals of nitrate of silver, when the arsenic will appear on the crystals in a yellow deposit. The antidote, as is well known, is peroxide of iron—a tablespoonful to adults every five or ten minutes—together with milk, white of eggs, and other demulcent drinks.

Dr. Le Conte sharply criticised the National Agricultural Bureau for failing to experiment and search out proper remedies for the potato bug, particularly since its ravages were predicted in ample time. Paris green, he certainly thinks, is not a proper nor a safe preventive. The Academy proposes to take active measures against the increasing industrial use of the poison, and before adjourning adopted a resolution appointing a committee to investigate and report upon the subject of the use of poisons applied to vegetables or otherwise for the destruction of deleterious insects and other animals, and also the incautious use of poisons in the ornamentation of articles of food, and for industrial purposes generally, such, for instance, as the coloring of paper.

The Effect of Wind on Sound Waves.

We reverted not long ago to a conflict of opinion between Professors Tyndall and Osborne Reynolds, relative to the proper explanation of the irregularities observed in the transition of sounds under varying conditions of the atmosphere. The former scientist, after experimenting with fog horns and other sound producers, concluded that the unequal range of the sound was owing to the greater or less "acoustic transparency" of the atmosphere, due to the presence or absence of streaks of vapor or unequally rarified air. Professor Reynolds, by similar investigations, was led to the belief that the sound waves, assumed by Professor Tyndall to be quenched, were simply deflected upward and carried over the listener's head, and this lifting he ascribed to the increasing velocity of air currents as the elevation increases, and a direct proportion to the upward diminution of the temperature. For a more extended discussion of these varying theories, the reader is referred to our editorial relating thereto, in the first number of volume XXXI.

The latest contribution in connection with the subject is from a scientist no less eminent than either of the above, Professor Joseph Henry, who, in a paper recently read before the Academy of Sciences, takes direct issue with Professor Tyndall as to the effect of vapor in the air on sound waves, and, at the same time, fails to coincide with Professor Reynold's statement of the upwardly increasing velocity of the air currents. Referring to the fact that sound is heard more distinctly when propagated in the direction of the wind than when in opposition to it, Professor Henry adds that, on the other hand, there are well authenticated cases where sound has been heard a greater distance against the wind; so that the phenomenon is by no means susceptible of ready explanation. The idea that wind accelerates sound in one case, or retards it in the other, has evidently little bearing when it is considered that sound moves at the rate of 700 miles per hour, while a wind of seven miles an hour is sufficient to give a penetrating power, to a given sound, of double the intensity; whereas, from the forego ing consideration, it should have an effect of only one per cent. The only explanation which has been offered for the phenomenon is that, in a river of air of considerable depth moving over the surface of the earth, the lower part moves with less velocity, on account of friction, than the upper part, and that, consequently, the tendency would be to tip the sound wave so as to throw the sound downward toward the earth in the case of the sound moving in the same direction as the wind, and to deflect it upward in case the movement is in an opposite direction, throwing it into the air above the head of the observer. This hypothesis gives a ready explanation of all the phenomena observed, and was fully illustrated by a series of experiments made by Professor Henry in the vicinity of the lightship of Sandy Hook last summer. Two steamers were supplied with whistles producing the same tone, and sent, one to the westward and one to the eastward. A wind was blowing from the west at the time with a velocity of $6\frac{1}{2}$ miles an hour. The whistle on one steamer was heard until it sailed a mile from the steamship on which the observers were stationed, while the sound of the other, which was carried by the wind, was heard $2\frac{1}{2}$ miles. This was in accordance with the most experience of the effect of wind in accelerating the sound waves. At noon, however, the experiment was repeated in a dead calm, and the same effect was observed, the sound from the steamer that sailed eastward being heard two and a half times as far as the sound from the other steamer. Again, in the afternoon, the experiment was tried after the wind had chopped about and was blowing from the east, but the observers were surprised to find no change in the result. Apparently the course of the wind had no effect upon the velocity of the sound. Professor Henry was satisfied, however, that the variation in the wind occurred only at the earth's surface, and that a river of wind was flowing steadily from the west all the time. Next day he repeated the experiments under exactly similar conditions, the wind falling to a calm and then shifting as before. He sent up small balloons at the same time, and found the idea to be correct. A steady current from the west prevailed all the time. By this beautiful experiment, Professor Henry considers the truth of his theory as to the uniform effect of wind on sound to be completely demonstrated.

The fault with Tyndall's experiments was that they were all made in one direction. Last summer Professor Henry placed a large steam trumpet on a steamer. The wind was from the west, and the trumpet was pointed northward. The steamer sailed toward the wind, and carried the sound only $3\frac{1}{2}$ miles, but in sailing in a contrary direction the sound was heard for a distance of eight miles. If Professor Tyndall had observed the sound from one direction only, he would have called the day opaque; if from the other, only he would have concluded that it was quite clear.

Professor Henry's opinion relative to the steady flow of wind from the east revives the idea of the constant easterly current so much discussed during the transatlantic balloon attempts of a year ago. It may be added, however, that, although the aeronauts shared fully in believing the existence of such a vast aerial river, subsequent and repeated ascensions have failed conclusively to demonstrate its presence. It is somewhat difficult, therefore, to reconcile the results, noted by Professor Henry with his small balloons, with those obtained through actual ascents by individuals. Altogether, the subject is like the Tyndall and Draper difference of views on the invisible rays of the spectrum: one of those anomalous instances of doctors disagreeing. With such a triumvirate as Tyndall, Henry, and Reynolds at variance, the humbler physicist is indeed at a loss to determine to which theory to anchor his faith.

A Suicidal Scorpion.

The statement that a scorpion, when driven to bay by its enemies and unable to escape, will kill itself by a blow from its venomous sting has usually been regarded as rather mythical. A well attested instance, however, of the suicide of the insect has lately been published by Dr. de Bellesme. The writer states that, having captured a scorpion, he converged the rays of the sun on its back by means of a burning glass. The insect became furiously enraged, and finally raised its sting and struck itself, dying within half a minute afterward.

WE see it stated that three Dartmouth students, named Colby, Brown, and Dustin, will start for Egypt this month under an engagement with the Khedive for service in the surgical corps of his army. They will reside in Cairo and be attached to the personal staff of the Khedive, who is to pay them $2,500 to $3,500 a year, in gold, and traveling expenses.