granules which have been mentioned and some few other calcareous shells; but a small percentage of the chalky mud—perhaps at most some five per cent of it—is of a different nature, and consists of shells and skeletons composed of silex or pure flint These silicious bodies belong partly to those lowly vegetable organisms which are called *Diatomaceæ*, and partly to those minute and extremely simple animals termed *Radiolariæ*. It is quite certain that these creatures do not live at the bottom of the ocean but at its surface,—where they may be obtained in prodigious numbers by the use of a properly constructed net. Hence it follows that these silicious organisms, though they are not heavier than the lightest dust, must have fallen in some cases through fifteen thousand feet of water before they reached their final resting place on the ocean floor. And considering how large a surface these bodies expose in proportion to their weight, it is probable that they occupy a great length of time in making their burial journey from the surface of the Atlantic to the bottom.

But if the *Radiolariæ* and Diatoms are thus rained upon the bottom of the sea from the superficial layer of its waters, in which they pass their lives, it is obviously possible that the *Globigerinæ* may be similarly derived; and, if they were so, it would be much more easy to understand how they obtain their supply of food than it is at present. Nevertheless the negative and positive evidence points the other way. The skeletons of a full-grown deep sea *Globigerinæ* are so remarkably solid and heavy in proportion to their surface as to seem little fitted for floating; and, as a matter of fact, they are not to be found along with the Diatoms and *Radiolariæ* in the uppermost stratum of the open ocean.

It has been observed again, that the abundance of *Globigerinæ* in proportion to other organisms of like kind, increases with the depth of the sea; and that deep-water *Globigerinæ* are larger than those which live in shallower parts of the sea; and such facts negative the supposition that these organisms have been swept by currents from the shallows into the deeps of the Atlantic.

It therefore seems to be hardly doubtful that these wonderful creatures live and die at the depths in which they are found.

However, the important points for us are that the living *Globigerinæ* are exclusively marine animals, the skeletons of which abound at the bottom of deep seas; and that there is not a shadow of reason for believing that the habits of the *Globigerinæ* of the chalk differed from those of the existing species. But if this be true, there is no escaping the conclusion that the chalk itself is the dried mud of an ancient deep sea.

(To be continued.)

ICE MACHINES.

(Continued from page 196.)

Since publishing the former article, a pamphlet has appeared in Germany containing a short description of the modern ice machines, in which, however, the American inventions and improvements, as usually is the case with European publications, are totally overlooked. We possess here a decided avantage over Europe, in the fact that Americans always keep themselves posted about European inventions and improvements, while Europe has not yet come fully to the persuasion of the great importance of our inventions and improvements, and how useful it would be, always to take due notice of them.

We see from the German pamphlet referred to, that five different forms of the machine described by us, have been patented in Europe, the first by Vranken in Cologne and Meller in Essen, a second by Grubeaud, a third by Penant, a fourth by Fouju, and a fifth by Toselli. None of them possess any striking peculiarity or advantage, their differences being of the same mechanical kind as in the different cream freezers so well known in this country, and on which there exist several scores of United States patents. In general they all resemble our cream freezers, of which many could be used for ice machines of this description; perhaps some of them have already been patented in this country as such.

We will only add a few more freezing mixtures to our list, page 196:

MIXTURES.	PARTS.	DESCENT OF THERMOMETER.
Carbonate of Soda	1	70° Fah.
Nitrate of Potash	1	
Water	1	
Chloride of Ammonium	1	68°
Water	1	
Sulphate of Soda	8	73°
Water	[illegible]	
Nitrate of Ammonia	1	50°
Water	1	

As these mixtures are made simply with water, and not with acids, the ingredients may be regained by evaporation and recrystallization of the salts, and therefore they are much less expensive than the solutions in acids, mentioned on page 196. It is curious that also here heat must be employed in order to return to the salts their cold-producing qualities, and in this sense the chemical ice machines described are related to those of the second class to be described next week, which operate entirely and solely by the previous application of heat.

The different makers of these machines recommend special solutions, according to the amount of success they obtained with them, in their machines. So the chloride of ammonium, saltpeter, and water (page 194) is recommended by Vranken; by Grubeaud, nitrate of ammonia, and water (see above); Penant recommends hydrated glauber salts and muriatic acid (hydrated sulphate of soda and hydrochloric acid); Toselli recommends crystallized soda and ammoniacal salt (he means probably carbonate of soda and nitrate of ammonia, or chloride of ammonium, or sulphate of ammonia, which are cheaper than the nitrate of ammonia.)

In order to be successful in these manipulations, they must be made with as large quantities as possible, the different salts must be well powdered, and, as well as the liquids used, be cooled before hand as much as practicable, the mixing of the ingredients must be done as rapidly as possible, and great care taken that no heat can be absorbed anywhere, except from the water to be cooled or frozen.

One more point must be observed in relation to this method of producing cold. When the salts are too dry, no cold will be produced, even heat, as in place of liquefaction, at first a solidification of water in the salt will take place, which of course in solidifying will set its latent heat of fluidity free, the same as takes place in pouring water on quicklime, which is anhydrous lime. This is illustrated in the cooling method of Berzelius, described on page 196. When the chloride of calcium* is too dry, as is the case with the fused anhydrous substance, it will commence with absorbing water, and solidifying it, to form first a hydrate. The heat thus produced in some portions, may counterbalance to a considerable extent the cold produced by other dissolving particles; from there the prescription of Berzelius, to let the salt, by powdering it and passing it through a sieve, absorb water from the atmosphere, previously to using it.

*On page 196, lines 23 and 31, in mentioning chloride of lime, we intended not the hypochlorite of lime, or bleaching powder, which is commonly erroneously called chloride of lime, but we intended the above chloride of calcium, made from lime and hydrochloric acid.

Correspondence.

The Editors are not responsible for the opinions expressed by their correspondents.

"What Makes the Difference?"

MESSRS EDITORS.—An article which appeared in the SCIENTIFIC AMERICAN, of Oct. 14th, commenting upon the difference in social position, pay, etc, of mechanics and clerks, does not seem to me to touch the real point of the subject discussed.

In the first place, labor, *per se*, is not degrading, nor is it generally considered so, but many men working as mechanics do not take the pains to qualify themselves for social position. They affect to despise the points of etiquette, and other things considered essential in society, and cry out against them. There is no reason why a man working only ten hours per day should not have abundant time to study and perfect himself in all the rules of conduct for the best society, as it is called, that is the society of educated and refined people.

A young man who takes a little care to learn, and practice the rules of good society, and read works of a character tending to elevate and improve his mind will find plenty of opportunities for associating with people of the so-called first circles. In the circle of my acquaintance I know of many persons, who started in life as working mechanics who are now leaders of society, and I know others, having abundant means, so far as bare money is concerned, to gratify every desire and move in the highest circles, who are content to grovel along without any social intercourse, so to speak. It is not wealth alone that gives the entrée to refined circles, but it is mind, and the attention to points of etiquette which have become established in the course of centuries of attrition among crowds of gentle-men and gentle-women, known in ordinary conversation as "gentlemen and ladies."

Now clerks in stores are selected for their gentlemanly style of behavior; it is an essential qualification for a clerk that he should be polite and well behaved, and it is on account of their having these qualifications that they are better received in society than mechanics. Let a mechanic however, qualify himself for society and study to make himself agreeable, as clerks are obliged to be, and he can have the entrée of as good society as the clerk, in fact, my experience is that the workingman or mechanic, has advantages in social intercourse above the mere clerk, because, as a general thing his mind is superior. The training his mind receives in learning a trade improves him in more ways than one, if he only aims for superiority.

A MECHANIC.

[Our correspondent falls into the error that there is a distinction generally made in favor of clerks over mechanics, in regard to their admittance into good society. We repeat that we know of no society in this country—beyond a select and exclusive class to which neither would be elligible under ordinary circumstances—that makes any such distinction.

We dissent from the opinion that the servile and puppyish manners acquired in the counter-jumper's profession are superior in any respect to the manly independence yet general courtesy of mechanics. We affirm that as a class mechanics are infinitely better informed, have better minds, better health, look better and feel better, live better, earn more money, and use it more wisely than clerks in dry goods and fancy goods stores. Of course we dont include every kind of clerks in our expressions of opinion, but we do believe, man was created for a nobler purpose than peddling dolls or attending milliners' shops.

Our correspondent has missed the entire drift of our article, if he failed to see that the difference which we alluded to was in favor of the bricklayer, as compared with the fancy goods clerk, in his manliness, his mental ability, and his courage, and that these qualifications, not his greater wages, were the true secret of his power when he "strikes" and the want of them the very reason why the fancy goods clerk, *is* a fancy goods clerk, and why he will always bow his neck to the yoke, and submit to the exactions of his employers.—EDS.

Center of Gravity.

MESSRS. EDITORS:—The difficulty with Mr. McCarroll, about the centers of gravity in revolving wheels, arises from the fact that he does not, or has not, considered the difference between gravity (which is an immutable principle) and centrifugal force, which is changeable—being a mechanical force and not a principle. Gravity has no motion, but is the same every instant of time; and, hence, a wheel cannot be put in such rapid motion as to change the center of gravity. If it could, then we could have perpetual motions. Gravity cannot be changed by mechanical force, hence nature will, in every case, find its own balance; and thus no such thing as a self-moving machine, or perpetual motion, can be brought into existence. JOHN S. WILLIAMS.

Thermometers—How to Select.

MESSRS. EDITORS:—I have just purchased a thermometer, made by Sargent & Co., and, on comparing it with one of Kendall's thermometers, I find a uniform difference of two degrees between the two instruments. There must be an error somewhere; but where is it? It cannot be in the tubes, for the improbability of two tubes having the same imperfections—which must be the case, other things being equal—to give uniform results, amounts to almost a moral impossibility. It cannot be in the graduations, or in the scales, for the same reason. If there be an error in the graduation of one of the tubes, or one of the scales, there must be precisely the same error in the other tube or scale, to give a uniform difference of two degrees. It is possible that the discrepancy is due to such a combination of errors in the two instruments as exactly compensate for each other, and so give uniformity of action; but this is too improbable to merit a moment's attention. The fault must, then, be sought for in the adjustment of the tubes to the scales. By the aid of a microscope I find, upon the Kendall tube, certain scratches or file marks, evidently made by the graduator, corresponding to the figures on the scale—32, 60, 100, and 140.

On the Sargent tubes are similar marks, corresponding to figures 34, 62, and 92. As the file marks upon the former occur at the definite figures or landmarks—32 "Freezing point," 60 "Temperate," 100, and 140; while those upon the latter at 34, 62, and 92—I conclude that the Kendall tube is properly adjusted to the scale, and that the Sargent tube is raised two degrees too high—an error which cannot be corrected without taking the instrument apart, and enlarging the upper hole in the brass scale. If the above premises and deductions are well founded, the inference is that both the instruments are perfect in all their parts, with the single exception that one of them is imperfectly put together.

It is a notorious fact that hardly two cheap thermometers exactly agree at all temperatures; but by comparing one instrument with another, and noticing whether the difference in the hight of mercury, if any, is uniform, at different temperatures; whether the file marks, which can generally be found by sliding the point of a knife along the sides of the tube, occur at definite figures or landmarks, of which 32 will always be one, and whether a portion of the mercurial column, broken off by a slight jar, occupies equal or varying lengths in different parts of the tube, it is not difficult to ascertain where the error if any is, and whether it is remediable.

J. H. PARSONS.

Eating Clouds.

Dr. Livingston, relating his adventures on Lake Nyassa, thus tells one curiosity which he fell in with: During a portion of the year, the northern dwellers on the lake have a harvest which furnishes a singular kind of food. As we approached our limit in that direction, clouds, as of smoke arising from miles of burning grass, were observed bending in a southeasterly direction, and we thought that the unseen land in the opposite side was closing in, and that we were near the end of the lake. But next morning we sailed through one of the clouds in our own side, and discovered that it was neither smoke nor haze, but countless millions of minute midges called "kungo" (a cloud of fog). They filled the air to an immense hight, and swarm upon the water too light to sink in it. Eyes and mouth had to be closed while passing through this living cloud, they struck upon the face like fine drifting snow. Thousands lay in the boat after emerging from the clouds of midges. The people gathered these insects by night and boiled them into thick cakes, to be used as a relish—millions of midges in a cake. A kungo cake an inch thick, and as large as the blue bonnet of a Scotch plowman, was offered to us, it was very dark in color, and tasted not unlike caviare or salted locusts.

Presto Change.

The *Richmond News*, says a man in that city is manufacturing butter by a chemical process at the rate of one pound and nine ounces from one pint of milk and two eggs. It says: "We know that the statement seems improbable; we know that people will turn up their eyes incredulously, and say, 'it can't be done, it can't be good,' etc., but the proof of the pudding is in the eating. The operation is performed every morning at nine o'clock, and every evening before sales commence at Mr. Smith's auction room, in the presence of crowds; and doubters are invited to go and see the butter made, and see it weighed, and then to taste it before they pronounce the thing impossible. The butter can be made in any churn, crock, or jar."

We have not the least doubt of the truth of this statement. We have heard that a French cook will make plenty of good soup from pebbles, provided a sufficient allowance of other materials are incorporated. So in this case we see no reason to doubt that one pound and nine ounces of butter can be made from a pint of milk and two eggs, provided the chemical employed in the process be one pound and a little over eight ounces of butter.

Improvement in Joiners' Planes.

The objects of the invention shown in the accompanying engraving are to give a control over the thickness of the shaving and depth of the cut by the pressure of the hand, and to prevent the drag of the bit on the board when the plane is drawn back. The stock of the plane is made in two parts, the upper portion, A, which holds the bit, being pivoted to the lower part, B, at the rear end by a screw, C, passing through metal guide plates, D, on each side the plane. The front end of the upper portion is raised from the lower portion by means of a spring, E, which, when the pressure of the hand on the front of the plane is withdrawn, lifts the upper portion together with the bit or plane iron. The amount of this movement is governed by the thumb screw, F. From this description and the engraving, which is partly in section, the construction and advantages of this device may be plainly seen.

Patented through the Scientific American Patent Agency, August 25, 1868, by George Buckel, who may be addressed at 17 Prospect street, Detroit, Mich.

THE PROTUBERANCES ON THE SUN.

Among the several scientific expeditions sent to the East by the European governments for the purpose of observing the late total eclipse of the sun, was a photographic company under the auspices of the North German States. This party was led by the distinguished scientist and photographer, Dr. Vogel, whose interesting contributions often appear in our paper. A new photometer, or instrument for indicating the actinic power of light at all hours of the day, has been lately patented in this country by him. Dr. Vogel has communicated to the Philadelphia *Photographer*, and also to the London *Photographic News*, some interesting particulars concerning his photographic eclipse experiences, among which are the following:

We were not spared the sufferings generally imposed on the traveler who passes through the Red Sea at the hot time of the year. This sea, inclosed on both sides by deserts, and connected with the Indian Ocean only by a very narrow channel, forms an isolated bay, where, in consequence of the customary calms and want of currents in the water, the temperature increases in the same degree as you advance toward the south. The perspiration flows down your body just as if you were in a steam bath; the whole of the skin is heated and irritated, and happy is he who finds a spot on deck where a slight breeze cools him for a moment. We were glad to reach the more airy ocean, and anchor near Aden on the 2d of August.

The aspect of this town is not in the least an agreeable one. You see a quite bare, savage mass of rocks, interrupted by some works of fortification, warehouses, shops, and coal sheds. The heat was supportable as long as we were not at work, but as soon as we began the slightest exertions the discomfort was very great.

At the day of the eclipse we rose at four o'clock in the morning. It was the task of the North German expedition to make a photographic view of the eclipse during its totality. For this purpose we had a long telescope with a lens of six inches, without difference of focus, and with a focal distance of six feet. This lens, constructed by Steinheil, afforded a solar image of three quarters of an inch in diameter, which was taken upon a photographic plate by means of an ordinary sliding chest for two images.

The totality of the eclipse at Aden was about three minutes long (in India five minutes); nevertheless, we had chosen Aden for our station because there were already photographic observers in India, and because the totality appeared at Aden about an hour earlier than in India. Therefore a comparison of the different results would enable us to decide the question, if the *protuberances* appearing at a total eclipse of the sun were changing in the course of time or not.

Our task was now to get within these three minutes as many views of the phenomenon as possible. For this purpose we had previously exercised ourselves in the employment of the photographic telescope, like artillerymen with their guns.

Dr. Fritsche prepared the plates in the first tent, Dr. Zenker put the sliding chests into the telescope, Dr. Thiell exposed, and I myself developed in the second tent.

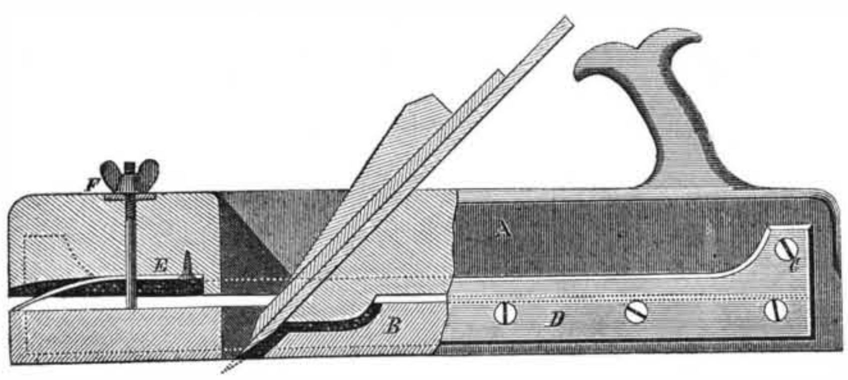
We stated that it was possible in this way to get six images (three plates of two images) during three minutes.

When the decisive moment was fast advancing, the sky, hitherto covered with clouds, showed some openings, through which the sun, already covered partially by the moon, was to be seen. The landscape around was illuminated by the strangest light, a medium between moon and sun light.

The chemical strength of light was exceedingly weak. A proof plate gave a wholly exposed image of the cloud after fifteen seconds. The sun cresent became smaller and smaller, and the opening in the clouds seemed to increase.

The last minutes before the totality (which began at twenty minutes past six o'clock) went rapidly away. Dr. Fritsche and myself crept into the tents, where we remained, consequently we have seen nothing of the totality. Our work began; we exposed the first plate five and ten seconds, in order to know what was the just time.

Muhammed, our black servant, brought the first attempt into my tent. I poured the iron developer over the plate, eager to know what was to come. At this moment my light was extinguished. I called for light, but nobody heard me, as all were about their task. I stretched my right hand out of the tent, holding the chest in the left, and happily caught a small oil lamp, which I had previously prepared. And now

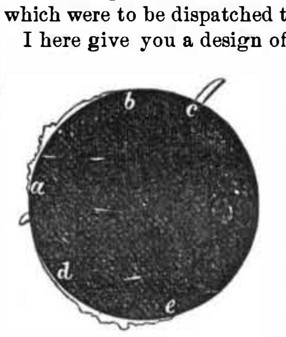


BUCKEL'S ADJUSTING PLANE.

I saw the image of the sun appearing on the plate. The dark margin of the sun was surrounded by a series of peculiar elevations, the other side showed a strange hook; the phenomenon being exactly the same in both views. My joy was great, but there was no time for enjoyment. I soon received the second, and, after another minute, the third plate. "The sun is coming forth!" exclaimed Dr. Zenker. The totality was over. All this seemed to have been done in a moment.

When I developed the second plate I perceived only very weak traces of an image. The clouds had veiled the sun at the very moment of the exposure. The third plate gave two brilliant views, with protuberances at the lower margin. Glad to have reached so much, we washed, fixed, and varnished the plates, and immediately took some copies on glass, which were to be dispatched to Europe separately.

I here give you a design of the plate. Over the margin of the sun we see the protuberances, *a b*; on the opposite side we perceive the strange hook already mentioned. Its height was about one-fourteenth of the sun's diameter, and it would therefore in reality be 12,000 miles high. On the third plate we got the protuberances, *d e*, at the lower margin.



Great and Small—Microscopes.

A correspondent of the Boston *Journal of Chemistry* says:

"There is a curious principle (which may be perhaps called physiological) involved in the terms *great* and *small*. It is this: that one has no conception of magnitude except by comparison of one object with another; and no one has or can have any knowledge of the appearance of magnitude to any other one. That is, I cannot convey to you my idea of the size of any object except by comparing it with my idea of the size of some other object. If I say that a thing appears to me to be one inch long, I merely compare it with an inch rule; but I do not, cannot know, that an inch appears to you as long as a foot does to me, or the reverse. Again, when one looks at an object that is completely isolated (to the vision) from all other objects with which it might be compared, we form an idea of its magnitude entirely arbitrary. For example, the moon in a clear sky must present exactly the same apparent magnitude to every observer. This is determinable mathematically; yet it is notorious, that, of a dozen people who may be asked their idea of the moon's apparent size, no two may agree.

"This same fact comes out in the use of the microscope. Almost all novices in the use of that instrument ask what is the magnifying power, as if the answer to that covered the main value of the instrument, thinking that the more it magnifies the better it must be; when in fact power is a secondary consideration in the value of a microscope, great power of inferior quality being obtainable at very little cost, and that what is called the magnifying power is calculated from an arbitrary standard. The apparent size of any one object in the field of the microscope is by all observers governed by their estimate of the apparent diameter of the illuminated field in which the object is seen. There are modes of determining this by comparison with other objects, but as the instrument is generally used, nothing is presented to the eye but the 'field,' and no other object is compared. Under these circumstances, different persons make widely different estimates of the size of the field. I once tried the experiment of obtaining their estimate of the apparent size from ten individuals, all of them accustomed to the use of the instrument, and they varied from 9½-inch diameter down to 2-inch (my own case). I have since met an individual who estimated it 15 inches. Any one possessed of a microscope can try this experiment, and it will be found to afford a company much amusement, and excite great surprise.

"Now, it is self-evident, that to the one who made the estimate of 15-in., any object of, say 1-1000 of an inch in length, would *seem* to be seen 7½ times as large as it seemed to me, although we must have seen it exactly alike. Thus, the only conception of magnitude is comparative."

Cook's Telegraph.

We have before us as we write some very beautiful specimens of printing by Cook's improvement of the late Gaetano Bonelli's automatic printing apparatus, just received from Paris. The printing is done in fine bold letters, the words well compacted and spaced, and printed not on a continuous strip, but line under line, as in a printed circular. It is certainly a very admirable result, and indicative of a perfection in telegraphy and a use of the subtile powers of electricity which must enhance the acceptability of the telegraph to the public. The great advantage of the autographic process is that it renders error next to impossible, or rather, that it does not leave to the action of outside causes, or the use of arbitrary characters whose relations to each other may be misunderstood, or to the vagaries of an operator's brain as he manipulates his messages, letter by letter, the opportunity to change their composition. The message is set up and compared before it is transmitted, and if it goes at all, must go exactly as first prepared

The paragraph before us is one of 35 words, transmitted in 20 seconds, a speed equal to 315 messages of twenty words each per hour. This fact is suggestive of a future in which the entire labor of our offices will be changed, and the operation of transmission become simply mechanical and comparatively unlaborious. We will not be surprised if, in time, parties who prosecute much of their business by telegraph should supply themselves with telegraphic type, arrange their messages for transmission in a case adopted for that purpose, prove them before sending to the telegraph office, and the operator have nothing to do but pass them through the manipulating instrument. By such processes as these only can large quantities of matter be sent over the wires without the fatigue connected therewith, and, what is equally desirable, with the utmost assurance of correctness which mechanism can afford.—*Journal of the Telegraph.*

Editorial Summary.

THE VELOCIPEDE MANIA is beginning to set in, and with the opening of the spring months we may expect to see our parks and highways thronged with this cheap and agreeable substitute for the horse. The two-wheeled velocipede is not exactly the thing wanted for general use, as it will be somewhat difficult for novices to keep upright upon it. A nicely adjusted vehicle with a double hind wheel would be most desirable for all classes. The ladies will need something of the kind, and for obvious reasons; unless they don the Bloomer costume, they will not be able to ride on the two-wheeled machine. It appears to us, judging from the numerous letters we receive on the subject, that there is to be a brisk demand for a good velocipede, and whoever gets into the field first will find it a profitable speculation.

GEOLOGICAL NEGATIVES.—Mr. James Thompson, of Glasgow, Scotland, has contrived a new method of producing photographic negatives of geological specimens. He saws from the stones thin slices containing fossil remains or other specimens; these when polished are so thin and transparent that they may be used as negatives for photographic printing upon the usual sensitive paper. Beautiful prints are thus obtained, having all the fidelity of nature itself. Large numbers of these fossil negatives have been prepared by Mr. Thompson, and he has undertaken to supply the British Museum with duplicates.

IT is proposed to remove Yale College from its present site to a more suburban one, thereby securing to the institution an accession of funds from the sale of its property, which, from its central location, is of great value. The value of this property is sufficient, it is said, to to purchase and fit up suitable grounds, erect buildings, and leave an endowment of a quarter of a million dollars, should the proposal be acted upon. The removal of the college is also said to be worthy of consideration for sanitary reasons.

THE Powell Scientific Expedition ascended to Longs Peak, in the Rocky Mountain range, on the 23d inst. After making the usual scientific observations a monument was erected as evidence of the visit. In it was placed a tin case containing a record of the observations with date, names of party, etc. A flag was planted and left flying. This peak is a celebrated landmark. Its hight however is not remarkable, being only 14,250 feet above the sea level.

THE English scientific papers are criticising severely our new war steamers. They say that the entire new steam machinery of the United States navy is the most costly, most cumbrous, least efficient, and most utterly ridiculous in the world, and that no other power in Christendom would tolerate such blunders in its national engineering practice.

COMETS SELF-LUMINOUS.—The London *Daily News*, says that the special points of interest attaching to the two comets of this year—Borsen's and the new one—is the remarkable discovery that both comets are gaseous and self-luminous, and that the latter consists of volatilized carbon.

CIDER may be preserved sweet for years, by putting it up in air-tight cans after the manner of preserving fruit. The cider should be first settled and racked off from the dregs, but fermentation should not be allowed to commence before canning.

IT is stated as a fact worthy of note, that London was recently exempt from accidental or incendiary fires, for a period of twelve hours.