weakened by regrinding, as is the case with the globe valve, but it may be safely repaired many times.

The office of the Peet Valve Company is at 152 Hampden street, Boston, Mass., where users of the valve may obtain this grinding implement.

Correspondence.

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

Spiritualism and Science.

MESSRS. EDITORS:—The article under this heading, page 360. Vol. XXIII., is certainly well intended, serving to prevent persons of feeble mind from being deluded into mischievous notions of spiritual intercourse with departed beings, the basis of which is fallacious. Unless qualified, however, the said article is apt to confirm an error in another direction—an error which we find only too frequent. In proving the fallacy of the theory of spiritualism (as spirit manifestations, etc.,) phenomena of a quite different nature, having no connection whatever with the delusive theory—and which, by the way, are as stubborn facts as the growth of organism from the germ, or, indeed, nearly all animal function that at present baffles explanation—are classed under the same head, and, by implication, their existence is attempted to be disproved, for the reason that they are beyond explanation in the present state of scientific knowledge. We should, however, remember that we know absolutely nothing of many things, but that they take place, and only under certain conditions. The phenomena referred to are those generally designated as mesmerism, or animal magnetism, the powerful influence of the will of one individual upon the other, the trance produced, a more or less genuine clairvoyance, etc. That these conditions can be and are induced, no candid investigator in our time will deny; and that they are taken advantage of for deception is no reason to deny their genuineness under the proper conditions. Remember, there is nothing so noble that cannot be abused, or be made the guise for unworthy motives or actions. Love and the religious sentiment may be accepted as the most elevated conceptions which the human mind is capable of entertaining, and admitted that they are oftener perverted to base purposes than to good, we cannot denounce them as delusions, or humbug. That by the powerful will of the operator the whole system of another individual, bodily functions as well as those of the mind, may be controlled, was probably known and made use of among the first societies of men. They found that ills could be cured, insensibility to pain produced, and a trance, in which the mind appears to be to a greater or less extent liberated from the fetters of the body, the veil raised from an inner vision or perception, which penetrates through solid extraneous matter as through thin air; in fact, matter, distance, or time, ceases to interfere with a perception by which the mind places itself in communication with everything without and within. Admitted that the cases are rare in which the mind, while in such condition, is not influenced by the minds of surrounding individuals, nor by its own individual constitutional peculiarities, trainings, or aims. Finally, the faculty of giving utterance about objects or facts perceived, may be imperfect. But the rarity of a more complete state of the kind explained should not carry us so far as to deny the phenomenon itself. Prof. Gregory Ersdale and other investigators testify to the facts, though they fail to give an explanation for them.

It seems, however, a part of common human credulity to receive the rambling utterances of individuals in the state of trance, in a mood which favors deception, and, awe-struck, to connect them with communications from another world—instance the oracles of ancient and modern times. There is little disposition in general, or ability to examine if the condition is genuine, or unintentional, or purposely fictitious. And granted genuine, the utterances cannot be implicitly relied upon, because we are unable to detect to what extent the individual is influenced by the minds of others, by surrounding objects, or by its own individual constitution. This whole subject, moreover, is one too generally avoided by profound investigators, for the reason that they fear association with professional cheats and deceivers, or that they fail to recognize a tangible basis to start from, on which to build a system. The consequence is, that the phenomena are viewed with distrust and ignored, if not actually repudiated. In this manner, however, as we have seen in other branches of science, nothing is cleared up; the darkness remains, and under cloak of it cheats and impostors play their nefarious game.

Let us have light on this subject, if attainable, by starting from what we know of the working of the mind, and progressively learn what the mind may be capable of.

New York city. R. H.

[The whole subject of mesmerism was investigated by Dr. James Braid, of Manchester, England, in 1842, and his researches lead to the discovery of *hypnotism*, to which this class of phenomena can now be referred. There is no doubt about the partial sleep of certain faculties, while others are wide awake; and Dr. Hammond, of New York, gives remarkable instances from his own practice. The peculiar condition of nervous sleep, called hypnotic, which is produced in certain people by their fixedly gazing at an object, is entirely a subjective phenomenon, and does not depend upon any external force, electrical, magnetic, or nervous, coming from another person, but, under proper conditions, arises spontaneously, just like ordinary sleep. Some persons, as Dr. Hammond relates, pass into the hypnotic state of their own accord, and with the utmost readiness, and are "natural clairvoyants," or "spiritual mediums."

Unconscious cerebration has been a subject of study for a long time, and most of the phenomena are capable of scientific explanation. There is not the slightest necessity of making a mystery of them. Those who are "natural clairvoyants" are fit subjects for the care of a physician, and when they neglect the warnings of nature they are certain, sooner or later, to demand medical treatment when it is generally too late. Mesmerism served one good purpose, and that was to call the attention of scientific men to the possibility of performing surgical operations while the patient was insensible. Some of our older readers will remember that this was one of the strongest claims of the earliest advocates of mesmeric doctrines. The idea was at once seized upon as important, and in the course of researches on the subject, ether was suggested as an anesthetic agent. Afterwards, chloroform and nitrous oxide were employed, and in July, 1869, a new method of producing the hypnotic state was discovered in the hydrate of chloral, a medicine now largely employed for the purpose, and far more rational and effective than the laying on of hands, so popular twenty-five years ago.

Mesmerism, or hypnotism, is a subject for the physiologist to study; other persons had better let it alone.—EDS.

Deviation of the Plummet.

MESSRS. EDITORS:—The SCIENTIFIC AMERICAN for October 29, 1870, contains an editorial under the caption of "Central Shaft—Hoosac Tunnel." In that article you gave a lucid explanation of some of the difficulties the engineer would have to contend with when he made an attempt to lay down the line on the bottom of the shaft, but you forgot to mention one difficulty of considerable importance—you said nothing about the deviation of the plummets toward that side of the shaft upon which the greatest mass is located. That the plummets will lean toward that side is a foregone conclusion, Dr. Maskelyne's celebrated experiment with the plummet near Mount Schehallien, in Wales, having removed the subject beyond the pale of controversy.

To ascertain the amount of deviation I would suggest the following expedient:

With a No. 9 iron wire carry the surface line across the mouth of the shaft. Erect a thirty-foot pole upon either side of the shaft—their bases upon the surface line. Stretch another wire across the mouth of the shaft from the top of the poles. Suspend plummets from the upper wire, and by means of guys attached to the poles strain the points of the plummets exactly over the lower wire. Make all secure, and go below, taking with you two photographic cameras, so modified as will enable negatives to be taken of the zenith. Place one on either side of the bottom of the shaft, perfectly level, and on the tunnel line as established by the plummets. Of course there must be a line cut upon the back of the glass negative, and that cut line must cover the line of tunnel as established by the plummets. Photograph the wires overhead, and when the negatives are finished hold them between your eyes and a strong light. Unless I am very much mistaken, the photograph of the wires will appear like a thin wedge laid across the cut line at an acute angle, the apex pointing towards the center of the shaft. The right-hand plane of one wedge should, if extended, form the left-hand plane of the opposite wedge. The base of the wedges will show how much the tunnel line is out of truth. Photographs showing a clean single wire directly over the cut line will indicate that the true line for the tunnel has been found. Compare the true line with their other and their difference is the amount of plummet deviation.

Perhaps there will be three objections made to the foregoing method:

1st. The test requires too much nicety and perfection of workmanship.

2d. The shaft is too dark.

3d. The wires are too small.

As to the first, I reply that any method must be extremely nice, and the workmanship of the very best.

As to the second, the shaft may be dark so long as the wires remain in the light.

As to the third, it is untenable. In my possession there is a photograph on card-board showing the stem of an oak leaf which was 820 feet distant from the camera.

New York city. R. B. S.

Poisonous Effects of Bee-stings---A Preventive.

MESSRS. EDITORS:—The poisonous effects of a bee-sting can be prevented, or at least considerably mitigated, by passing over it the pipe of an ordinary trunk key.

The reason is obvious. The pipe acting as an annular compress close to the puncture, forces the poison out. Could not this simple process be extended in its application to the bites of serpents and rabid dogs? The absorption and spread of the virus might thus be prevented, or at least retarded, until a physician could arrive with a more effective remedy.

Albany, N. Y. ANTIDOTE.

Glass Cutting.

MESSRS. EDITORS:—The glazier's diamond is an angle of a crystal, the extreme point of which may be regarded as a single atom, which, when pressed upon the glass, acts like a wedge, entering between two particles of glass and producing a minute fracture. When drawn over the glass it produces an infinite number of minute fractures, extending sometimes quite through the glass. A sharp point of iron or lead will not cut glass because it is too soft. The extreme point or atom yields when pressed upon the glass, allowing two or more atoms to touch the glass, which act no longer as a wedge, but as a weight, and if sufficient force be applied, a large and irregular fracture will result.

A sharp point of hardened steel will cut glass nearly as well as a diamond. Take an old worn-out three-cornered file, grind the end to a three-cornered point, heat it red hot, and immediately plunge it into a mixture of snow and salt. Retouch it on the stone to remove the scale, and it is ready for use. If rightly done it will give very good satisfaction. In using it hold the file nearly perpendicular, slightly inclined forward, and with a gentle pressure draw it rapidly over the glass without changing its inclination to the surface. In cutting thick glass it is safer to cut on both sides before attempting to separate the pieces, but thin glass may be cut with the greatest facility. When the point becomes dull from use it will produce only a ragged surface—scratch—but will not cut. It then needs regrinding. A single turn of the stone is sufficient to put it into working order again.

I find such a glass cutter very serviceable for preparing glass for honey boxes and for various other purposes.

J. H. P.

How to Prove a Millstone Level.

MESSRS. EDITORS:—I think the writer of the article in a recent number of the SCIENTIFIC AMERICAN, headed "How to Prove a Millstone Level," is in error. Suppose the bedstone to be level, and the spindle trammed to it; put on the runner, raise it from the bedstone, and set the runner in motion. Now the runner may be out of balance, if so it will click on the bedstone. Will this prove the bedstone is not level?

Again, the writer says another way to make the stones come evenly together is to move the bottom of the spindle *from* the lowest side of the bed stone. If the runner was fastened on the spindle, so as to have no play on the top of the spindle, this would be correct. But at present the irons in millstones are so arranged as to allow the runner to balance and play on the top of the spindle, so that inclining the top of the spindle by moving the foot of the same in an opposite direction, would not incline the runner. If it would, there would be no real need of leveling the bedstone.

I will now give you my plan to level a millstone. Procure a spirit level that is true. But how shall its truth be tested? Easily enough. Lay it on your proof staff, or red staff, if you have no proof staff. Now bring the staff to an approximate level, and change ends with the level, and if it shows the same each way it is true. If it is not true, plane off the bottom of the level, or paste paper on one end at the bottom of the level, until both ends show alike.

Having the bedstone in good face, proceed to level it. The level being true, the stone leveled by it will be true, and will need no proving. Now tram the spindle to it, put on the runner, and set it in motion. The spindle being tight in the step and bush, if the runner ticks on the bedstone, it will not prove the bedstone is not level, but it *will* prove that the irons are not properly fitted, or the runner is out of balance, or both.

Grand Haven, Mich. THOMAS BRADFIELD.

Sounds Produced by Telegraph Wires.

MESSRS. EDITORS:—Having frequently noticed the humming from telegraph poles alluded to by F. P. Dodge, in a recent issue of the SCIENTIFIC AMERICAN, I have no hesitation in assigning said humming to the action of the wind. The telegraph wire forms an Eolian harp, of which the wind is the motor, the wire string the vibrating body, and the poles suspending the wire regulate the tension upon which its pitch depends.

To account for special intensity of sound from a particular pole, a variety of causes may operate and contribute either singly or together. These may be the near presence of a good conductor, as a board fence, a sewer, or covered ditch, or a firm foundation for the pole itself, the adjoining length of wire being exposed to a particular blast or current.

A wire stretched at a certain tension, between unyielding bearing points, and vibrated by the same force, whether plucked or continuous, will give out the same tone. But when the force is variable, as a wind current, not only of changing velocity, but of different densities and velocities at different parts of the string, and the poles or bearing points yield under the changing stress, the wire gives out a ground tone, which rises and falls in accordance with the variability of motor and materials. Add to this tone the higher ones resulting from the string breaking into smaller divisions of vibrating length, and there results the peculiarly wild and uncultivated whining of the Eolian harp, which represents musically all that is uneasy, weak, and miserable.

Professor Tyndall's work "On Sound" gives with admirable clearness a full review of vibrating bodies, whether cords, rods, plates, or pipes.

Washington, D. C. C. W. CHAPMAN.

The Mississippi Bridge at St. Louis.

MESSRS. EDITORS:—You have recently had several articles in regard to the progress of the great bridge across the Mississippi at this place. Difficulties unseen, or, rather, unexpected, which presented themselves in the sinking of the two channel piers, have been guarded against more effectually in the details and machinery of the abutment caisson, with the happiest results so far. Although this pier is much larger and must go much deeper than the east pier, the arrangements are so complete that the engineer experiences no anxiety about the abutment being safely placed on the bed rock of the Mississippi without accident of any kind. The rate of its descent during the last three weeks has averaged nineteen inches per day, thirty inches being the greatest day's work in that time. The masons have been laying stone night and day, eight traveling hydraulic purchases being used to supply the stone and mortar to them. The rate of descent named involves the laying of about 100 cubic yards of stone per day of 20 hours. The penetration of the pier is now 43 feet 6 inches below the surface of the river, 57 feet still interveuing between it and the bed rock.

The operations at this pier have been suspended for the last three days, owing to extreme cold weather and the river being gorged with ice. The front of the pier stands out in the river about 100 feet from the Illinois shore, and the derrick pontoon or barge about 40 feet further. On this barge are 6 large steam boilers, 4 or 5 flues each, about 26 feet long and 44 inches in diameter, 2 steam engines driving air pumps, 2 ditto driving traveling purchases, 3 driving hydraulic rams, 8 hydraulic lifting jacks for hoisting stone, 5 large Cameron steam pumps to drive sand pumps, besides smaller ones for each battery of boilers (four in all). In fact this barge, *G. B. Allen*, is loaded down with a precious freight of most valuable machinery, and should she sink it would cause great trouble. To prevent this she is thoroughly bulkheaded into eight water-tight compartments, and a strong ice apron has been established above her to deflect and break up the ice as it comes down, This is now running so heavily as to thoroughly prove the apron to be a success, the ice being turned off from it like turf from the plow.

The river is so nearly blocked this morning that the ferry-boat can scarcely cross, even below the channel piers, and the ice is so heavy and moving so slowly that a close of the river is confidently expected if the cold continues many hours more.

The river is very low now, but I think it quite likely that 20 feet more will have to be worked through before getting down to the rock; this would give about 120 feet of water, Thirty working days will suffice to put the pier to the rock.

St. Louis, Mo. A. B. C.

Special Correspondence of the Scientific American.

EASTERN LONG ISLAND---MENHADEN OIL AND THE FISHERIES.

SAG HARBOR, Dec. 9, 1870.

This is by no means the most pleasant season of the year to visit this end of Long Island, but business and pleasure do not always go together. This place, once one of the largest and most important of the whaling towns, now does almost no business in that line. Once they fitted out more than twenty good-sized ships every year, now two or three constitute the whole number.

The town has lately received some impetus from an extension of the Long Island Railroad to it, but it is hard for a seafaring population to learn new tricks. It contains one good-sized cotton factory, run by steam, and a large steam flour mill. Through the politeness of Mr. R. S. French I had an opportunity of seeing the place in its best aspect. It is much resorted to in summer, and its hotels are always crowded during the warm season. I could easily see the good one might derive from the sea breezes and recreation under the shade of the great elms around the Fordham House, or lolling lazily on a yacht floating down the bay.

The history of the cotton factory is that of too many similar institutions. As a corporation two distinct capitals were sunk; now it is in the hands of one man, and he makes it pay.

South of this place is the ancient town of East Hampton. With its venerable church, its cemeteries with their quaint old tombstones, its old-style houses, and good, honest old-fashioned people, not to speak of its excellent boating and fishing, and superb bathing beach, it has become not only a curiosity, but a favorite resort for hundreds of New Yorkers. A change is what the wearied city man wants, and in East Hampton he finds most emphatically the opposite of New York.

The Old Church is built chiefly of oak and juniper. There are timbers in it, perfectly sound, yet it is over 220 years since they were cut and hewed. The original church was built in 1649; this one was built partly of the old materials in 1717, and, unfortunately, somewhat remodeled in 1824. The frame is so strong that I think it would be possible to roll it over without starting a joint. The tie-beams are 8×10 inches and the rafters 8×4, with braces 6×4, and supports the same—all of hewn white oak.

The town is a singular place. It has one long wide street with a cemetery at each end, and there are not more than two or three modern styled houses in it. By far the greater portion of the houses are shingled on the sides, and are unpainted.

The power used for grinding corn, etc., is the old-style windmill. There are three in the village; one was running. We said to the proprietor, "Why don't you paint your mill house, your shingles will last longer?"

"Well, it's been here as it is for over seventy years, and I guess it won't hurt much more than it has."

The town is simply a well-preserved relic of more than one hundred years ago, and as such is well worth a visit. As we were leaving, about the only man we didn't find pretty near asleep hallooed out, "Tell the folks up in New York you found one live man in East Hampton, and that's Bill Gardiner." Asleep as they are, they are good farmers, good livers, and honest, hard-working people.

To this same live man we are indebted for much information about the menhaden fisheries. If the whale fishing has decreased the menhaden fishing has been found fully as profitable, and a much less dangerous substitute. The business was first commenced in Massachusetts. The first factory on Long Island was started about twenty years ago. The new style of oil did not sell well at first, but since the decay of the whale fisheries the business has grown into enormous proportions, and is immensely profitable. There are now about twenty factories on Eastern Long Island, and several in New Jersey. These hereabouts took last season about 70,000,000 fish. One seine caught during the season 1,500,000, and there is one factory which has the ability to take care of 200,000 per day.

The fish which are used for this oil-making is called "menhaden," "porgie," and "moss-bunker," and some say it is the same as the bony shad. The fish are caught in seines. Some of the men work on shares, each owning a part in a boat, and running risk of good catch, weather, etc. Some such, thus working, we were informed, made this year $1,053 each. Some of the factories own their boats and hire the men, others depend on buying. In the spring, when they first commence running, the fish sell for $2 per thousand, as they are poor then, and only yield about four gallons of oil to the 1,000. As the season advances they get better, and sell for $3 in the fall, and yield some as high as 18 gallons of oil per 1,000.

In making the oil the first are put in large tanks, and boiled with free stream; the oil and water are drawn off, and the residuum is pressed. This gives more oil of an inferior grade. The pummace is sold as fish guano for $20 per tun. It is an excellent fertilizer, and very generally used by the farmers of this section. It is also bought by manure-makers in New York and elsewhere, and mixed with phosphates, bone, and other less valuable matters. We think that mixed with a small quantity of ashes and a greater proportion of cotton-seed cake, it would make a first-class manure for the South. One manufacturer told me that he had made this year 1,800 tuns of this pummace. A great deal of it is now shipped South, and on Shelter Island there is a fertilizer factory which mixed it with Charleston phosphates.

Greenport is rather the headquarters of this fish and oil interest, and a large number of the factories are on Shelter Island opposite that place. The old frigate *Falcon* was some time ago purchased, and has been fitted up as a floating factory. The steamer *Algonquin* has lately been purchased for the same purpose. The object in having these floating factories is two-fold: if the run of fish is bad in one locality they can move; again, the smell from them is none of the pleasantest, and hence the inhabitants around the stationary factories frequently complain. That being the case near a floating factory they "up anchors" and move out of the way of injunctions.

This oil, the manufacture of which has become such a great interest to this end of Long Island, if well made, is a clear, bright-lemon color, sweet, and with but little fish smell or taste. Such oil, however, is rare, and sells at much higher figures than the ordinary grades—usual price 55 cents and 60 cents per gallon. There is, however, a great deal of very good oil made of a dark-lemon color, and from that to red. It is chiefly used for adulterating other oils and for manufacturing various patent or special lubricating oils. As an adulterant it is principally used in whale and tanner's oils. Well made it sometimes goes into low grade sperm. It has been put in linseed oil, but the cheat is there too easily detected, by simply dropping a little of the adulterated oil on hot iron.

It is one of the singular facts of our life experience, that wherever one of Nature's supplies becomes scarce, she raises up another to take its place. This fish interest is every year increasing, and we thought there might be a chance that all the little bunkers would be caught up, but some of the old fishermen told us they were more plenty than ever.

From these facts it will be seen that this business is one of considerable importance, and employs not only a large capital but many men. Greenport is the great seat of this industry, and every inhabitant is in some way interested in it. For the accommodation of the vessels engaged in it the United States Government has just ordered the erection of an iron lighthouse on the point of Shelter Island, just at the entrance of Peconic Bay. Both Great and Little Peconic and Gardiner's Bays are beautiful sheets of water, and much resorted to by yachtsmen in summer. Every island and spot of the shore is hallowed by reminiscences of our early settlers, and wild traditions of the Indian aborigines.

H. E. C.

[For the Scientific American.]

WHAT CAUSES AURORA BOREALIS?

BY DANIEL KNODE WINDER.

In a recent letter, Mr. Proctor, F. R. A. S., remarks that "there is no generally received theory of the aurora." This, when we take into consideration the number of theories which have been proposed, is remarkable indeed.

A review of them indicates that there has been no lack of careful observations of the phenomena, and that very many of them have been correctly interpreted; and yet no theory is found adequate to meet all the requirements of the case.

Professor Loomis suggested that the light is produced by a current of electricity which flows outward from the equator of the earth, and inward at its poles; and Mr. J. E. Hendricks attributes it to a similar current of ether or air; and, although both are correct, they fail to give us an explanation of the way in which these currents cause the diversified phenomena.

In a recent number of the SCIENTIFIC AMERICAN, Professor Van der Weyde has demonstrated that interplanetary space is filled with a ponderable, but exceedingly rarefied medium. This, too, is certainly an important step toward a correct interpretation of the phenomena in question.

Why is it, then, that we are still left without the long-sought-for theory that will explain all the facts connected with the Northern Light?

I think the reason is that heretofore we have failed to recognize a number of well-established facts in regard to the nature of the forces—electricity, heat, and light. Believing this to be so, I determined to bring together all known facts relating to these forces, now generally believed to be correlated—and as the learned Tyndall has shown, but modes of motion—and having them before me to see if we should not learn more concerning their nature. With what success my labors have been rewarded, the scientific world will decide.

I am happy to say that one of the results which this letter is intended to present to the readers of the SCIENTIFIC AMERICAN, is a full explanation of the way in which electricity produces the diversified phenomena of Aurora Borealis.

Many established facts connected with the movement of electricity, heat, and light, have satisfied me that they are but one force, which is simply motion, undulating and progressive; and that the difference between them consists in the length and rapidity of their wavelets. I find, too, that force changes from waves of one length to another, and that the change results from the nature of the medium through which it is passing. The waves of electricity are shortest, those of heat longer, and those of light the longest, adapting them to the larger sizes of the molecules in a rarefied medium.

Let us now notice the changes in motion, as it passes from the sun to the earth. It exists in the body of the sun as electricity; in passing through the photosphere, owing to its insufficient conducting capacity, but a small portion retains its original form, and the excess is changed to waves of heat-length (this accounts for the heated condition of the photosphere of the sun), then, entering the rarefied medium which fills interplanetary space, it is changed to swifter and longer undulations, and in the form of light passes through space to the earth's atmosphere; there the resistance of air retards its waves to the form of heat, in proportion to the density, and passing to the earth, the force is changed (both light and heat) to the original form, electricity.

Now, I think we can explain the cause of auroral light. The currents flowing outward from the equator of the earth and inward to its poles, must increase motion in the molecules of the rarefied medium in the elevated region through which it passes; then, the property of diffusion, which force manifests, causes a flow to the surrounding molecules of atmosphere and to the earth. Now motion in that elevated region can only exist as light, and is the Aurora Borealis. But it must be remembered that it cannot be seen as luminous aurora until it enters the earth's shadow.

The upper edge of the dark bank beneath the luminous arch, in brilliant displays, marks the line along which the change from light to heat-length waves occur.

It may be said that the flow of the equatorial current being regular we should have aurora constantly. I reply that this is certainly true; but not in such quantity as to be visible, only at such times as there is more than ordinary flow of motion from the sun to the earth, which would correspondingly increase the equatorial flow of force. [The words motion and force are synonymous.] And it is the corresponding increase of the current inward at the poles of the earth that causes the agitation of the magnetic needle. Now, from this we may readily see the reason why the records of observations show a coincidence of the maxima and minima periods of sun spots, aurora, and magnetic storms.

When the auroral region is quiet, we have displays of steady light, but when disturbed by winds, or the inflowing current of air, there are dark spaces, by interruption of the flow of force, gently moving beams, or waving currents, while the grandeur is increased by reflection from masses of vapor always present during the displays.

Thus we see that the phenomena of Aurora Borealis are the results of the movement of electricity, heat, and light—the three forms of cosmical force.

Toronto, Ontario.

Manufacture of Buttons.

The first manufacturer of buttons in this country was Samuel Williston. While he was dragging along as a country storekeeper—his eyes having failed him while studying for the ministry—his wife bethought her that she could cover by hand the wooden buttons of the time, and thus earn an honest penny. From this the couple advanced in their ambition until they had perfected machinery for covering buttons; the first employed for the purpose in this country. From this sprang an immense factory, and then others, until Samuel Williston made half the buttons of the world. His factories are still running at Easthampton, coining wealth for the proprietors, and known to every dealer in buttons the world over. He is now between seventy and eighty years of age, is worth five or six millions, and has given $100,000 to Easthampton for a seminary and for churches, $200,000 to South Hadley Female Seminary, and $200,000 to Amherst College, besides lesser gifts.

BEET-ROOT SUGAR IN CALIFORNIA.—The *News Letter* says: "No one article in all the notices of the California Beet Sugar Company begins to do the affair justice. We publish a few facts to correct the bungling misstatements made in the dailies during the past week. Two hundred and fifty barrels of A-1 sugar stands credited to shipment No. 1, with many more ready at mill to end over, and beets enough on hand to make two thousand barrels first-class sugar, besides second-class, sirups, etc. The mill, when running to its full capacity, will work fifty tuns of beets per day: they are now running through about forty tuns every twenty-four hours. They have one hundred head of cattle under cover to fatten on the pulp. The managers met with no difficulties in reaching the result they have, the parties engaged in the affair knowing their business. They owe no one, and, so far as we can learn, there is no stock for sale, except at a premium."