gas companies of New York, thus sums up the case against them:

"The citizens of New York to-day stand perfectly helpless before the monopolists. They are compelled to pay for what they do not receive; and the thing that is foisted upon them for their money's worth is nearly worthless. The governments of the continent of Europe, which we are accustomed to regard with such horror, are a little more careful of the people's pockets than this; and with all our boasted self-government we are no better than a prey to political and mercantile swindlers."

This condition of affairs upon which the country has unfortunately fallen, is partly due to the want of foresight in the framing of charters; but chiefly to the ease with which legislative bodies can be manipulated by vast monied interests. The history of the gas investigation last winter at Albany, proves that no ordinary means will avail to compel honesty in the dealings of incorporated companies, when they are rich enough to spend money freely. The attempt was made to fix a standard quality for gas, and to enact that when less than fourteen candle gas was delivered, a drawback should be allowed to the consumer. It is well understood how that bill was killed in the Senate, and how by a liberal use of money, and judicious distribution of shares, the gas companies procured its defeat.

How to now curtail the power of such monopolies is a question of the utmost difficulty. Every attempt to do it has thus far signally failed. We confess that we can at present see no adequate means by which the people at large can combat the power so imprudently vested in unscrupulous corporations. But this we can see; that this power is becoming a danger to the commonwealth, which it is blindness to ignore, and the consideration of which it is folly to defer.

THE PRESERVATION OF MEATS WITHOUT SALT.

There are two reasons why the use of salt for preserving meats is objectionable. The first and most important is that meats thus preserved lose important nutritive qualities, and therefore, if used constantly, give rise to scorbutic diseases, of which impaired nutrition is undoubtedly a cause.

Second, salt meats are for the most part less palatable than fresh.

It is true that in temperate climates where a great variety of food—vegetable, as well as animal—is used, salted meats are largely used without seriously bad effects, their defects being compensated for by other kinds of food; but even with the most abundant supply of vegetable food, fresh meats are preferred when obtainable, and they constitute a large proportion of the food supply of all large cities in civilized countries.

Such being the case, all attempts at preserving meats fresh during their transportation through long distances, from localities where meat is cheap and abundant, are of the highest importance, especially to the poor who find it difficult to obtain a proper supply of fresh meat.

It has been recently announced, that an eating house in London has been able to furnish a good nourishing bowl of meat soup to the poor, at the low price of two cents, and a plate of well cooked, wholesome, fresh meat at the same price. It is also stated that a similar establishment has also commenced operations in Paris. These meats have been brought from New Zealand and Australia, and are said to arrive in excellent condition.

We have from time to time discussed various meat-preserving processes invented in this country and in Europe, and we will in this article give some particulars of more recent methods.

One of these is a method employed by M M. Tellier and Lecoq, at Monto Video. The apparatus used was a freezing machine, invented by M. Tellier. The fullest account of this apparatus we have met with is contained in the *Leader*, a journal published in Melbourne, Australia:

M. Tellier, as his means of freezing, uses the volatile gas of ammonia, or methylic ether. Under the influence of the heat contained by the liquid or the air to be cooled, the vaporization of the gases takes place; a force-pump compresses the vapors thus formed, which are condensed in a worm or or series of small tubes, surrounded by cold water, where, being again liquefied, they return to the evaporator, and reproduce the same effects. M. Tellier prefers methylic ether, as under his system he obtains from it the same results in cold, by a pressure not exceeding 50 lb. to the square inch, as he can with the pure gas of ammonia under a pressure from 120 lbs. to 200 lbs., according to the temperature of the atmosphere.

As all forms of ether, from the liability of ignition, are objected to on board ships, M. Tellier was compelled to employ the pure ammoniacal gas as his freezing agent. The meats to be preserved were suspended in a small room between decks, carefully protected by thick non-conductors. Air cooled in the machine down to 32 degrees Fahrenheit was, from time to time, circulated round the meats, the object being not to freeze them.

These gentlemen placed on board a steam packet running to London, about half a tun of fresh beef, mutton, poultry, game, and fish, inclosed in a temperature reduced to 32° by means of one of M. Tellier's freezing machines.

It seems that the machine was too complicated, and that by the time the ship reached the equator, the pump worked with difficulty, and a large escape of gas ensued. From the seventeenth to the nineteenth day out, the temperature rose from 32° to 36° Fah, and when the pump ceased to act, the meats decomposed before repairs could be effected.

An important defect in this experiment appears to have been in not freezing the meat at the outset, as in a frozen state it would have doubtless kept until the pump could have been repaired. The pump works under a pressure of two hundred pounds per square inch, and it must be therefore a matter of some difficulty to keep it from leaking during an entire voyage. On shore, as an ice-making machine, the apparatus is said to work well. One of them is at work at Marseilles in France, producing, it is stated, ten tuns of ice per tun of coal consumed.

The use of flat boxes for packing frozen meat, is said to have proved very good for the purpose, the broad sides being of sheet iron to form a freezing surface, and the narrow sides of deal to form a non-conducting surface. The boxes are about a yard square, and from five to ten inches in depth; and Mr. Julius Jeffreys, the originator of this plan, proposes to place them together in one solid mass, and to keep a double current of chilled air in constant circulation over the whole surface of the mass. Blowers or fanners will draw the currents from the chilling chamber surrounding the ether or ammonia vessel, as the case may be, and containing a series of sheet metal chilling tubes. The air will be driven along air passages traversing lengthways an air casing, surrounding everywhere the block of boxes.

An ammonia ice-making machine, invented by Mr. Rees Reece, is highly spoken of by the Australian press, and our readers will bear in mind that in no part of the world has more attention been paid to this subject than in Australia, where cold is regarded as the only means by which her vast surplusage of mutton can find a market. The details of this machine are not given; but the *Leader* states that its special superiority consists in its construction and arrangement for effecting the continuous distillation and rectification of dilute solution of ammonia upon what is known as the separative principle. By its use, it is stated, twenty-five to thirty tuns of ice can be made with a consumption of one tun of coal, and even more than this is claimed, but it is evident that these results are over-stated.

The tendency of opinion seems to be at present setting more and more strongly to freezing processes as a means for preserving meats, and we think there is more hope that success will be reached "on this line" than in any other way.

CANAL THROUGH THE ISTHMUS OF DARIEN.

There are probably few thinking men who do not foresee that, sooner or later, a ship canal must connect the Atlantic and Pacific waters. Which of the routes hitherto surveyed and discussed will be ultimately selected as most favorable to success in a work of this kind, time will show; but at present there is really too little knowledge of possible routes to form a correct and final judgment. An error in choice, easily avoided by a proper exploration at the outset, may involve unnecessary and enormous expense in construction.

Three routes have been much mooted, and our general knowledge of them obtained by former surveys is enough to give a tolerable idea of their feasibility. The Panama route involves only twenty-eight miles of construction, but there are difficulties which, although not insurmountable are of great magnitude. The Nicaragua route *via* the river San Juan and Lake Nicaragua involves only sixteen miles of construction, but it involves the improvement of the river navigation, and, without doubt, also that of the lake. The third route discussed, called the Tehuantepec route, is one hundred and thirty miles in length, and there is probably less accurate knowledge in regard to it than either of the others.

The matter standing thus the Government has acted wisely in dispatching a steamer to Aspinwall to make surveys and gain further light.

Meanwhile, and in anticipation of the presentation of the subject to Congress for definite action, the press, which will undoubtedly almost unanimously favor the project, can do much to create a popular opinion in its favor.

That the immediate construction of such a canal would result in great and lasting benefit to the commerce of the United States seems to us as scarcely admitting of dispute. The most casual inspection of the map of the world will show that many of the richest and most productive portions of the globe would be brought so near to our Atlantic ports that no nation would be able to successfully compete with us in securing their traffic. The East Indies, China, Japan, and the whole Pacific coast of South America, would naturally pour their vast products into our warehouses and freight our merchant vessels with profitable cargoes. And last, but not least, the dangerous passage of Cape Horn, hitherto the dread of navigators and the scene of untold disasters, would be abandoned forever as an avenue of commerce.

NEW FACTS ABOUT THE PRESERVATION OF TIMBER.

Mr. Charles Coisne, from Belgium, in a report on the prepared timber exhibited in Paris, in 1867, remarks, that at present only two methods for the preservation of railway sleepers seem to be in use, to wit: The saturation with sulphate of copper, and the one with oil from gas tar. Only the latter is considered as really practical and effective. The Southern French Railway Company exhibited pine sleepers that had been impregnated with sulphate of copper; but, albeit, they had been only from seven to ten years in use, some of the specimens, on examination, were found to be more or less rotten. Specimens of Dorsett and Blythe, in Bordeaux, appeared well preserved; but no date as to the time of their being in use could be ascertained. The creosotized fir sleepers from Bethell, in London, were perfectly unaltered after having been in the ground from sixteen to twenty years. Creosotized beech and oak sleepers of Dorsett and Blythe showed also no marks of rot; but they lacked data as to the time they had been in service. The first wood-creosotizing establishment, according to Mr. Coisne, was founded in Antwerp, in 1858, the second in Ostende, in 1859, and a third in Ghent a year later. 1,682,880 railway sleepers were impregnated in these establishments during the last decade, besides a great deal of timber for Belgian sea-ports. Two thirds of all the sleepers in Belgium have undergone the process of creosotizing. It might, therefore, be supposed that the cost of maintenance for ties on these lines would soon be reduced to almost nothing. However, this will probably not be the case, for some of the ties that are injected with oil from gas tar exhibit, after the first few years, marks of a more or less advanced decomposition. This cannot be attributed to the ineffectiveness of the creosote, but must be ascribed to the fact that the impregnation had not been complete. It has been taken for granted that 150 liters of creosote are sufficient for one cubic meter, but this quantity is hardly sufficient to saturate the sap-wood; the denser heart wood becomes rarely saturated. This accounts for the fact that the latter is most subject to rot. Mr. Coisne, in 1864, recommended to perforate the level part of the sleepers where the heart wood lies exposed, and also the surfaces of support of the chair. It is satisfactory to state that this process has been employed with good results by the chief civil engineer of the Department de la Vendée, France. When improper timber is selected, or when the timber is treated on wet or cold days, or when inferior creosote is employed, one may be almost certain that the hopes anticipated as to the endurance of the material will not be fulfilled. The results which Béthell obtained in England have been confirmed in Belgium. Thirty per cent of creosotized fir sleepers were found to be still unaltered, after eighteen years' service. As to the amount of creosote absorbed by them, it was ascertained to be twenty liters, which quantity was obtained in deducting the average weight of non-prepared sleepers from that of prepared sleepers. The creosote did not contain any carbolic acid, but considerable portions of napthaline; it was distilled at a high temperature, dissolving in naphtha to which it imparted a green color.

In 1862, 1,297 telegraph poles were creosotized in Ghent, Belgium; in 1863, 3,553 pieces. On the other hand, 600 were treated in 1864, in closed vessels with sulphate of copper, and 3,010 in 1865. The last mentioned process must be considered far superior to the method of Boucherie, for which the trees must be felled in the most unfavorable season. If not well executed, the impregnation of telegraph poles with creosote oil, will likewise not yield satisfactory results.

Coisne finally recommends to comply with the following requirements: 1. The injection should be carried to complete saturation, 250 liters of creosote being necessary for one cubic meter of wood. For oak, of which only the sapwood need to be saturated, 100 liters are considered sufficient. 2. The creosote employed should be distilled at a high heat. Two thirds should be gathered at a temperature exceeding 480 Fahrenheit, while one-third at most should not be collected below 390 Fahrenheit. The oil should be of a greenish color, and not contain over thirty per cent of napthaline. 3. The heart-wood, wherever it lies exposed, should be well perforated with a proper instrument so that the preservative may pass everywhere. 4. The wood should be exposed to the air for eight or ten months, before treating, and the saturation must be effected first in the vacuum and subsequently under pressure.

MADDER EXTRACTS AND THEIR APPLICATION IN TOPICAL DYEING.

In spite of the discovery of the aniline pigments, madder has retained its prominent position in topical dyeing, or calico printing. This is easily explained when we take into consideration the beautiful shades produced by means of alumina and iron mordants, and also their wonderful stability.

Since the beginning of this century great strides have been made in the preparation of extracts of madder; partly on account of the introduction of cylinder printing machines, partly because of the rapid increase of the knowledge of the chemicals employed in this art.

Let us glance over the various modes for preparing madder root. Formerly this latter was simply dried and ground, but in more recent times, great care has been bestowed upon the removal of the foreign ingredients with which madder is associated; and this eventually led to the preparation of the madder flowers, garancine, and alizarine. But as these dye-stuffs are admixed with a considerable proportion of fibrous substances, their coloring power is only seven or eight times greater than that of the root, and, besides, they can serve for dyeing only, not for printing, at least not according to the old methods.

Various attempts have consequently been made for some time past to fix the madder dyes on the cloth by printing. Experiments in this direction were undertaken by Robiquet, Colin, Lagier, and Persoz in 1827; ten years later, Gastard, in Colmar, discovered a process which was improved upon in 1855 by Hartmann, and introduced into some print works of small extent. These methods were similar to each other in that the cloth was uniformly mordanted, then printed with a solution of madder extract in ammonia, soda, or soap, and finally exposed to steam. However, it was soon discovered that uniform mordanting is not practical, unless perfectly pure alumina bases are at hand, and, besides, the madder extracts at that time brought into market were too impure to yield constant results, or to allow the simultaneous fixation of mordant and pigment.

These extracts were mostly prepared by exhausting madder flowers or garancine with wood spirits or alcohol, their coloring power was fifty times greater than that of the dye root, but they contained about sixty per cent of ineffective resinous matter.

As a very excellent product for its time may be mentioned the "colorin" of Lagier and Thomas, which, however, did not come into very extensive use; the times not being favorable for the employment of madder extracts. E. Kopp first indicated a method, admitting of practical use, by which the two principal pigments of the madder, alizarine and purpurine, could be separated. The purpurine of Kopp has found but a limited sale, but the yellow alizarine, as obtained from the green alizarine by the use of mineral oils, has become generally employed.

The difficult problem to print alizarine on unmordanted goods was solved about the same time. The conditions for the success of this operation may be enumerated as follows: 1. A very concentrated and pure extract of madder. 2. Employment of a perfectly pure acetate of alumina. 3. A proper acid solvent for the pigment. Crystallized acetic acid is generally used. 4. The use of certain substances, as tin salts, fatty acids, or lime salts, in order to impart to the dye a hygroscopic consistency and to modify its shade. The thus composed and properly thickened dye is printed on simultaneously with the other dyes; the printed goods are now hung up for some time in a warm and moist room, then steamed, and finally passed through soap-water, if required.

For violet, the acetate of alumina must be replaced by acetate of iron. As to the white spots which occur after the application of the color on immature cotton; they do not appear in this process.

Pure alizarine yields a very beautiful violet, but a red of a violet tint. A good red can only be obtained with extracts that contain both alizarine and purpurine, and a part of the yellow coloring matter in proper proportions. Such extracts, however, yield a dull violet. The colors with which red is most successfully employed are aniline-black, chrome-orange, and the genuine albumine colors.

According to our present state of knowledge, it is probable that the madder pigments pre-exist in the root in the form of soluble, readily decomposable glucosides, or sugar-yielding elements. However, there remains no doubt about the existence of the following elements: 1. The alizarine, discovered by Robiquet and Colin. 2. The purpurine, examined by Persoz, Runge, Debus, Wolff and Strecker, and Schutzenberger. 3. The pseudo-purpurine. 4. An orange color. Both of these latter were found in the purpurine of Kopp. 5. Purpuroxanthin, a yellow pigment that has also been isolated by Schutzenberger from commercial purpurine. These pigments are crystallizable, and differ from each other by their physical properties, their solubility in different neutral and alkaline solvents, their composition, and finally by their deportment in dyeing, as shown by the following:

ALIZARINE yields stable colors that resist soap and aqua regia; yields a red with a violet hue, but a very pure violet.

PURPURINE AND ORANGE COLOR are both stable dyes, resisting soap and aqua regia tolerably well; produce very bright reds, but dull and grayish violets.

PSEUDO-PURPURINE.—This color is completely decomposed by nitro muriatic acid (aqua regia); it yields a brick red and pale violet.

PURPUROXANTHIN produces shades of little stability; gives orange-yellow with alumina and a pale gray with iron mordants.

This shows that the different madder colors differ considerably. Only the purpurine and the orange color, which is a hydrate of the purpurine, do not differ with regard to their dyeing properties, but the greater solubility of the latter in alcohol leaves no doubt that they are different bodies. The stability of the shades furnished by their dyes seems to be in reverse proportion to the amount of hydrogen present. The greater the percentage of oxygen the more the colors pass from violet red into a pure red, and from a pure violet into a spotted and gray violet.

In noting these differences, the manufacturer will be enabled to mix the various dyes in the proper proportions, they also account for the unequal qualities of madders of different origin. The fastness of the madder from Alsace is, for instance, not only attributable to its freedom from chalk, but particularly to a great percentage of pseudo-purpurine, which is lacking in the Avignon madder. Garancine furnishes also less enduring shades than the madder flowers. The reason for this has been searched for in the presence of traces of sulphuric acid that adhere to the fiber in spite of constant washing; but it is more probable that the coloring matter, which in the madder flowers is combined with lime, belongs to the purpurine group, and that in isolating it with an acid the color is intensified, but it is so at the expense of stability. The purpurine possesses more affinity for bases than alizarine.

AERIAL NAVIGATION.

A paper read by JOHN WISE, Aeronaut, before the Franklin Institute, Dec. 15, 1869.

Dr. James Bell Pettigrew, in a discourse before the Royal Institute, of Great Britain, on the subject of Aeronautics, said, among other things: "In order to construct a successful flying machine, it is not necessary to imitate the filmy wing of the insect, the silken pinion of the bat, or the complicated and highly differentiated wing of the bird, where every feather may be said to have a peculiar function assigned to it; neither is it necessary to reproduce the intricacy of that machinery by which the power in the bat, insect, and bird is moved; all that is required is to distinguish the power and extent of the surfaces, and the manner of their application, and this has, in a great measure, been already done. When Vivian and Trevithick constructed the Locomotive, and Symington and Bell the Steam Boat, they did not seek to reproduce a quadruped, or a fish—they simply aimed at producing motion adapted to the land and water, in accordance with natural laws, and in the presence of living models. Their success is to be measured by an involved labyrinth of railroad, which extends to every part of the civilized world, and by navies, whose vessels are dispatched, without the slightest trepidation, to navigate the most boisterous seas, at the most inclement seasons.

"The aeronaut has the same task before him, in a different direction, and, in attempting to produce a flying machine, is not necessarily attempting an impossible thing. The countless swarms of flying things testify as to the practicability of the scheme, and nature at once supplies him with models and materials. If artificial flight were not attainable, the insects and birds would afford the only examples of animals whose movements could not be reproduced. The outgoings and incomings of the quadrupeds and the fish are, however, already successfully imitated, and the fowls of the air, though clamorous and shy, are not necessarily beyond our reach. Much has been said and done in clearing the forest and fertilizing the prairie—can nothing be done in reclaiming the boundless regions of the air?"

Certainly there can, if we begin right! As the first seaships were not made to be propelled by steam and paddle-wheels, but to be drifted leisurely on the water before the winds, I propose to inaugurate a system of aerial navigation on the like unpretentious principle; namely, drifting in the currents of the trade winds to such points and places as are within the known province of the resources of aeronauts. We have, in this Northern Hemisphere, a system of trade-wind currents, at present so well authenticated and understood as to be acknowledged by the leading scientific institutions of the world as established meteorological facts, of daily recurrence; and I have practically explored them time and again for thirty years past. In the temperate zone these currents blow from the southwest and the northwest, overlapping each other and producing, between them, a compound or eddy current, blowing eastward.

In the spring and in the autumn these two great currents form conjunctions, and produce, for some days, those violent gales termed equinoctial storms, continuing until the balance is restored between the going and the coming of the trade winds, circulating between the equatorial and polar regions. The lower portion of the lower stratum of these currents—that is, the one from the northwest, is all the time, more or less, sliding off toward the south, and gradually curving round until it reaches the intertropical regions, where it is recognized by mariners as the northeast trade wind; and here, meeting the more rapid motion of the earth's surface from west to east, as well as the equatorial heat, it is whirled westward and upward, and pressed outward, as it ascends, producing the great upper current from the southwest; and thus the northwest current has become the southwest current.

On the other hand, our southwest current is all the time passing off a portion of its upper surface to the north, until it reaches the frigid zone, where it sinks down and becomes the northwest trade-wind current, underlapping the upper current, and, by its friction against the latter, producing what I term the eddy current, blowing nearly direct toward the east.

Thus, we have within the practical capability of the ordinary air ship, the means of reaching any place east, northeast, or southeast from the place of departure in our latitude.

It is an easy matter to sail from Philadelphia, New York, Boston, or Baltimore, to St. Petersburg, London, Paris, Madrid, Lisbon, or Gibraltar, or to any point within that range of latitude, as it becomes simply a matter of constructing an aerocraft that is capable of floating in these currents of the atmosphere for a few days, and we know that air ships can be constructed that will retain a sufficient buoyancy for many days. Napoleon the First had one constructed and used, that ascended with its practicing army pupils thirty days after its inflation—time sufficient to circumnavigate the globe with an air-ship.

The change of dimension of the bulk of the inclosed gas by change of temperature between day and night, is to be compensated by a balance rope. When the sun increases the levitating power of the airfloat, it will soon find its equipoise in lifting from the surface of the sea, or the land its equivalent of the balance rope, and its loss by the coolness of the night by giving back to the land or water its equivalent of weight.

I have practiced this current sailing for over thirty years, more or less, made over 400 voyages—from 100 to 1,000 miles in length—and never failed to find these trade-wind currents when an altitude of 5,000 to 12,000 feet was attained, although at these times currents from opposite directions frequently prevailed on the surface of the earth. An air vessel of 100 feet diameter, two thirds filled with coal gas, would have a net carrying power of 9,000 pounds, and would be all sufficient for a practicing machine with a view to sound these currents across the ocean and to test the practicability of establishing an air-line of mail and passenger conveyance from this country to Europe. Pleasure seekers and invalids would find it a swift and easy voyage from America to Europe—no sea-sickness and less than three days to make the voyage.

This is certainly a feasible plan for the inauguration of trial trips, and is seriously worthy the attention and application of the enterprise and genius of the present day and in our own nation. A little barometrical practice in the scheme would soon teach us how to lay our lines for a successful system of trans-Atlantic aerial navigation.

The First Californian Beet Sugar.

A lot of Californian beet sugar has been made, and the business may be regarded as established, with every prospect of speedy and large development. We have heretofore spoken of the experimental factory near Sacramento, intended to test the practicability of making sugar from beets grown in the State of California. There was a doubt about the soil. It was feared that the prevalence of alkali gnerally made it almost certain that, even where not apparent to the eye, there would be enough to prevent the crystallization of the sirup into sugar.

It has already been shown by analysis that our sugar beets are sufficiently rich in saccharine matter. The only question, therefore, being on the crystallizing of the sirup, very rude works were put up, which were considered sufficient to prove the point in controversy. With rusty iron boilers, and rivets covered with oil, the sugar was expected to be dark enough. "But," said the shareholders, "let it be as black as your hat, only so it is crystallized sugar, and the money is ready to put up the right kind of work."

On the 10th of December, 1869, all questions of doubt were set at rest by the production of 150 pounds of crystallized sugar from white Silesian beets grown on the borders of the American river—leaving an unexpectedly small portion of molasses. The experiment was conducted by W. Wadsworth, Esq., who studied in European sugar works, and who is well practiced in the various processes known in France and Germany. The process used in the experiment is very simple A revolving cylinder washes the beets; then revolving knives cut them into very thin ribbons, which are macerated for a short time in cold water, and which extracts every portion of saccharine matter. Some lime is used to extract the bitter principle, and carbonic acid gas removes the lime by precipitation. Steam pipes and evaporating pans follow; boiler, animal charcoal, and settling vessels complete the process. The success of this first experiment will soon lead to the multiplication of sugar mills, and in a few years California may be independent of foreign supplies. The next thing the Sacramento Company will prove will be the percentage of sugar in our beets—which will be determined next week.—*Alta California.*

Immensity and Violence of the Solar Forces, as Exhibited in Recent Photographs.

The astronomer of the *Spectator* is still finding wonders in the sun. He has now been examining some photographs by Dr. Zoller, of the "colored prominences" in the solar atmosphere, and is justly amazed at the immensity and violence of the forces whose action is indicated by them.

"Here," he says, "is a vast cone-shaped flame, with a mushroom-shaped head of enormous proportions, the whole object standing 16,000 or 17,000 miles from the sun's surface. In the cone figure we see the uprush of lately imprisoned gases; in the outspreading head the sudden diminution of pressure, as the gases reach the rarer and upper atmosphere. But turn from this object to a series of six pictures placed beside it, and we see the solar forces in action. First, there is a vast flame, some 18,600 miles high, bowed toward the right, as though some fierce wind were blowing upon it. It extends in this direction some four or five thousand miles. The next picture presents the same object some ten minutes later. The figure of the prominence has wholly changed. It is now a globe-shaped mass, standing on a narrow stalk of light above a row of flame hillocks. It is bowed toward the left, so that in those short minutes the whole mass of the flame has swept thousands of miles away from its former position. Only two minutes later and again an entire change of appearance. The stalk and the flame-hillocks have vanished, and the globe-shaped mass has become elongated. Three minutes later, the shape of the prominence has altered so completely that one can hardly recognize it for the same. The stalk is again visible, but the upper mass is bowed down on the right so that the whole figure resembles a gigantic A, without the cross-bar, and with the down stroke abnormally thick. This great A is some 20,000 miles in hight, and the whole mass of earth might be bowled between its legs without touching them! Four minutes past, and again the figure has changed. The flame hillocks reappear, the downstroke of the A begins to raise itself from the sun's surface. Lastly, after yet another interval of four minutes, the figure of the prominence has lost all resemblance to an A, and may now be likened to a camel's head looking towards the right. The whole series of changes has occupied but 23 minutes, yet the flames exceeded our earth in volume tenfold at least."

The same writer begs those who consider this subject to bear in mind the enormous size of the sun; so great, that if it were represented by a globe two feet in diameter, the earth would appear no larger than a cherry stone. He says:

"We recognize in our hurricane the action of nature in her fiercest moods, but the solar hurricanes would, in an instant, destroy the whole globe on which we live. We wonder at the volcano which lays a whole city in ashes, but our earth would be swept like a mote before the rush of a solar volcano. We see, lastly, in the earthquake, which upheaves a continent, the most energetic of all the forces at work upon our earth, but the least of the throes which convulse the solar surface would toss a globe like ours as waves of the ocean toss the lightest sea drift."

A NATURAL CURIOSITY.—P. C. Mixter, of West Sandlake, New York, has kindly sent us a remarkable root of a fir tree, cut from the interior of a well. The root is a curiosity. He writes us that the tree is about nine inches in diameter, and stands about eight feet from the well. The root entered the well about three feet from the top, and ran down the wall until it reached the water. After descending about nine feet, it divides into three branches which subsequently subdivide until the extremities form a bunch resembling much the tail of a horse. The entire length of the root is not much less than eighteen feet. This power of the roots of plants to search for the water they need almost looks like instinct.