have attained a maximum, that is,of the Cambrian and silurian formations.

Chalk deposits and coral reefs are, by a process of metamorphosis, converted into crystalline limestone, and by the action of sea water even into dolomite. Granite and other so called primitive rocks have been shown to be in many cases only metamorphosed sedimentary strata, so that we are unable to say in what particular line the recurring cycles of geological operations began; nor, on this account, can we assert, except in the case of species which have become extinct, that the fauna of any preceding differed from that of the present age.

When this red clay comes to be slate, the only traces of life it can exhibit will be derived from silica-secreting organisms of a low type, like those doubtful appearances in older slate rocks which have been described as fossils. It is therefore altogether unwarrantable to regard this low type as the sole, or even prevailing, form of life during the time when these rocks were formed; nevertheless, there have not been wanting supporters of this view.

For aught, then, that geology can say, while the oldest rocks of Britain were being laid down in 3,000 fathoms of water, far away silurian man may have been cultivating vines on the fertile slopes that flanked the volcanoes of the period.—*A. S. Wilson.*

Correspondence.

Hardening and Tempering Tools.

To the Editor of the Scientific American:

It has been with no inconsiderable degree of interest that I have read Mr. Joshua Rose's several papers, published in your recent issues, treating on machinists' tools and their treatment in forging and tempering for specific purposes. He prefaces his remarks on tool hardening, in his fourth paper (in your issue of July 11), with the remark: "The degree to which a tool may be hardened is dependent in a great measure on its shape;" and he states what particular shapes or forms of tool require special treatment, in forging and tempering, to render them of maximum utility. With very great clearness, he sets forth the practice of lowering the degrees of hardness by watching the hue assumed by the polished surface of the tool that had been immersed in water at a "moderate red" after it had been reheated, or allowing that part of the tool that had not been immersed to impart its heat to the part that had been immersed to "draw the temper," or obtain the required degree of hardness or tenacity: while in other specific cases, he states that tools require to be "as hard as fire and water can make them." His several papers have evinced considerable practical knowledge, and he evidently writes his experience with great perspicacity.

I would not now have obtruded upon you had I not noticed, in your issue antedated August 1, a communication from Mr. John T. Hawkins, in which he makes an extract from one of a series of lectures he had delivered to the engineer class at the Annapolis Naval Academy, in 1868. "It is safe," he had stated in this lecture, "to say that a cutting tool cannot be too hard for any purpose whatever, so long as the edge will not crumble or break up." Mr. Rose, in his paper, says: "It is undoubtedly advantageous to make the tool as hard as it can be made, so long as it will bear the strain of the cut," and enumerates the several steels (with the makers' names) capable of such treatment. Mr. Rose, treating his subject in quite a masterly manner, states that tools for particular kinds of work require to be "as hard as fire and water can make them," while the temper of others, for other special service, should be "lowered in temper" (hardness) "to a light straw color, which leaves them stronger than they would be if hardened right out," that is, changing the condition of the tool by sudden immersion and allowing the tool to remain in the fluid until cold or of a temperature equal to that of the fluid, for he also states (and correctly) that the "chill should be taken off the water." Mr. Rose is evidently giving the result of his experience, for the benefit of those who have not had the varied experience he evinces in his papers on tools and their treatment under the elements of fire and water. His language is plain; he makes the object of his investigation speak, as it were, in its own language.

Steel or iron, immersed in water at a "moderate red" or white heat, hardens. In this Mr. Rose and Mr. Hawkins are agreed; but Mr. Hawkins states that Mr. Rose makes his "greatest oversight" in the final operation of drawing the temper, and adds that to "give simply a certain color to a tool is the least of what is required to be known or observed." By whatever chemical action or cause the various hues appear, that guide the operative in tempering tools, it is doubtless a natural law or sequence, and, as such, is subject to conditions. The different hues will appear, faster or slower, which alike are subject to conditions of degrees of temperature at which they commence to evolve, rapidly at high, and gradually at low, temperatures, to produce what Mr. Hawkins calls "films of oxide."

I have failed to see where Mr. Rose has made his greatest oversight. Mr. Rose states: "While he who has been accustomed to the use of tools properly forged and hardened right out, upon entering another shop where the tools are overheated in forging and underhardened to compensate for it, finding he cannot," etc. Mr. Hawkins says: "If a tool be dipped at the lowest temperature at which it will harden at all, it will be harder when ready for use than if dipped at any higher temperature, if required to be drawn at all."

Here the gentlemen in question evidently mean the same thing, namely, that low temperatures are best for tempering tools. Each seems to regard the color evolved during the process of tempering tools as important. Still while Mr. Rose speaks of positive colors, Mr. Hawkins treats of conditions. Mr. Rose treats things as they are and as they appear to every observer, and advises the easiest means to the end. Mr. Hawkins writes of films of oxide and conditions necessary to produce them, as if they were negative or absent. Mr. Rose, on the contrary, mentions them as ever present and attendant upon the operative for him to avail himself of.

Many tool dressers there are who regard the hues evolved in the process of drawing the temper as the steel maker or iron maker does those evolved or emitted by the spectroscope, while watching to shut off the blast at the proper instant of time; and it seems that the hues evolved in tempering tools is so regarded by Mr. Rose. The hues will appear sooner in a thin piece of metal having the same temperature as that of a thick one; but these differ in hardness or tenacity if immersed at the same instant of time. A thin piece of metal will harden more thoroughly than a thick one and will differ in degrees of hardness. I hope that you may deem my criticism worthy of a place in your paper.

Trenton, N. Y. JUAN PATTISON, C. E.

Steam Cars.

To the Editor of the Scientific American:

Some months ago I referred to a short line of three feet gage railway which was then being put in operation between Worcester and Shrewsbury; and since that time I have watched with much interest the working of the steam cars which have been running on the line. On account of the heavy grades, one hundred and sixty feet to the mile, it has been a pretty severe trial for these machines, and they have stood the test remarkably well; but I think that a slight modification in their construction would render them far more durable and efficient. It was demonstrated practically and in a most thorough manner, seventy years ago, that the steam engine was applicable to the hardest kind of locomotive work. Where Oliver Evans propelled his mud scow, weighing sixteen or eighteen tuns, over the sand, from his shops along the bank of the Schuylkill, a distance of some two miles, by the power of its own engine—which was about five horse—it was sufficient proof that the thing was quite feasible.

During these seventy years since that exploit of Evans, the thing has been verified in every possible way; locomotives have been constructed in every conceivable form: with boilers vertical, horizontal, and both combined; with one, two, three, and four cylinders; with cylinders vertical, horizontal, and slanting, with cylinders placed inside as well as outside of the boiler, with cylinders of unequal size, with cranks between and outside of the drivers, etc. And the result of all this long and costly experience is our present locomotive, an ideal at once of simplicity, symmetry, beauty, and efficiency; and it certainly seems that a model which is the outgrowth of such an ordeal, and which has proved so so eminently satisfactory and efficient for the whole of the immense railroad work of the world, ought to be more of a guide for those who are engaged in making steam cars and traction engines for whatever purpo e of locomotion.

The great efficiency of our present locomotive is doubtless chiefly due to its boiler. It seems to be the only plan which possesses so perfectly all of the qualities needed for locomotive work. It is simple, compact, accessible for repairs, has vast generating power; all of its parts exposed to intense heat are deeply covered with water, and, of course, it may be constructed of any desired strength. Its center of gravity is low, and this part is an important item in the construction of all locomotive engines.

I believe that if makers of steam cars or traction engines of any kind would adopt precisely this type of boiler for the foundation of their machines, and then make and correct their running gear in as thorough and symmetrical a manner as is the practice of our best locomotive builders, we should see far better results in this line of engineering. The common upright boiler, though an excellent boiler for certain uses, is unsuitable for first class locomotives. If made short, the tops of the tubes are too much affected by the intense heat required to maintain the 120 or 150 lbs. to the square inch, which is necessary to do the work; if made long, the center of gravity is too high; if made with an annular steam chamber above the top of the tubes of sufficient capacity, this also brings the center of gravity too high, and also renders the top of the tubes unhandy for repairs. In either case the boiler lacks generating power.

I have much confidence, as a matter of economy, in the idea of making the cylinders of locomotives of unequal capacity, say in the proportion of three or four to one, the small cylinder exhausting into the large one through a superheater, but so arranged that direct steam may be used in both cylinders whenever an exigency requires. Our present locomotives might be easily arranged in this way without affecting their style at all. In passenger and express work especially, considerable economy would doubtless result from this change. F. G. WOODWARD.

The Zodiacal Light.

To the Editor of the Scientific American:

The erroneous assertions made by one of your correspondents (page 371 of the number for June 13), in regard to the zodiacal light, ought not to remain uncorrected. He says: "The zodiacal light is not on two sides of the sun, neither is it all around the sun; but, on the contrary, it is ever on one side of the sun only, his hinder side, if you will," etc. This error proceeds from the fact that he judges only from its appearance in our latitude, where we see this phenomenon distinctly only in April and May after sundown, and in October and November before sunrise. If this were the case over the whole earth, his assertion might have some foundation; but as in the southern hemisphere it is not visible at the periods stated, but only distinctly seen in April and May before sunrise, and in October and November after sunset (exactly at the very times that it is invisible in our northern hemisphere), the assertion that it is only at one side of the sun falls to the ground.

Between the tropics this phenomenon shows itself the whole year round, every morning and evening, with great splendor. Humboldt states, in his "Cosmos," that in the highlands of South America he watched it morning and evening, and observed that it sometimes varied in brilliancy, and often equaled in luminosity the brightest spots of the Milky Way; sometimes it was weaker, but it was always there, whether the observer was on land, or on the mountain tops, or at sea, on shipboard.

Some account of the latest observations between the tropics were furnished by Chaplain Jones, of the United States Navy, who observed it in the years 1856–57 from the elevated equatorial region in which the city of Quito is situated. His observations verified the fact that the light is entirely confined to the region of the zodiac; that it was very strong in the central band and broadly diffused at the sides, where it it gradually faded away; however, a boundary line between the stronger and weaker portions was quite distinct.

He not only saw the light every night, but at midnight at both sides of the horizon, in the east and in the west at the same time; and during favorably clear nights, it extended as a broad, luminous arch over the zenith, entirely from one horizon to the other, having a pale white luster, and a breadth of about 30°.

In high northern and southern latitudes it is never visible, as the ecliptic is too much inclined to the horizon: in the temperate zone, it is only visible in those periods of the year in which the zodiac is as nearly perpendicular to the horizon as possible. In the northern hemisphere, this is the case in April and May, at evening, and in October and November, at morning; and in the southern hemisphere, the cases are reversed. At other seasons, our atmosphere obstructs the diffused light from reaching our eyes, as it is too far from the zenith, and this is the sole reason that we do not see it always, as is the case between the tropics. In December, however, it may be faintly observed, both morning and evening, even in the latitude of New Jersey.

The discovery of Professor Wright that it is caused by the reflection of solar light from solid meteoric material, combined with the above observations, proves that this zone of meteors extends beyond the earth's orbit, and that the earth moves among them. It is certain that they revolve around the sun, so as to counterbalance solar gravitation, and it is highly probable that, in regard to their orbits and velocity, they are subject to Kepler's laws. In the course of ages, their mutual gravitation causes some of them to combine, and so their number must diminish; while also, from time to time, the earth, Mars, Venus, and Mercury appropriate others of them. In regard to our earth, at least, we know that the fall of meteorites is not a very uncommon occurrence. It is probable that our whole planetary system has been made up in this way, and that the different belts of meteors, the zodiacal light, the asteroids, etc., constitute what there is now left of the material from which sun and planets were primitively formed by the action of universal gravitation.

New York city. P. H. VANDER WEYDE.

The Business Outlook.

In a time of drouth, it is safe to predict rain, because we know that in the economy of Nature there is an inevitable law of reaction; and in a period of business depression, we known that it cannot always last, because the elements exist which are certain to bring about renewed activity. These elements are manifest and visible all around us. The great staple products of grain and cotton, to say nothing of other crops which promise an abundant yield, will in a few weeks add untold millions to the wealth of the nation. There is midsummer stagnation now, and dullness prevails in all departments of trade and manufacture; but is it rational to suppose that the crops now maturing are to be gathered in to rot in warehouses, that exchanges and consumption will cease, the reduced stocks of general merchandize remain unreplenished, and the accumulation of unemployed capital wait in vain for profitable investment, and all because a few railroads have been built on speculation, and have come to grief for the lack of capital and earnings to meet their obligations? We admit there is a present want of confidence in railroad securities which ties up capital and keeps it in abeyance; but it is a significant sign that, notwithstanding the Wisconsin imbroglio and the record of embarrassment and bankruptcy of the past eight months, choice securities are more in demand and command better prices than before the panic. The movement of the crops which must soon begin will give employment to capital and also to the roads; confidence will gradually be restored, the machinery of trade set in motion, and the activity thus inaugurated will be legitimate and lasting. The crippled roads will gradually get upon a better basis; and with the natural development and increase of traffic, there is no reason to doubt that existing lines will be improved, and new ones constructed wherever they are really required. If this is a rose colored view of the situation, not justified by present appearances and indications, then the history of previous revulsions in trade and business is no criterion by which to judge, and any speculation in regard to the future is of no avail.—*National Car Builder*

Concrete as a Building Material.

In a paper lately read before the British Association of Gas Managers, by Mr. J. Douglas, of Portsea, upon the subject of making gas tanks of concrete, he presents the following information: "At the London Exhibition of 1851 it was found that a beam of pure Portland cement 14 inches long and 4 inches square, fixed at one end, bore 1,580 lbs. at the other, which is about half the strength of Riga fir. The reduction in strength by mixture with sand was the subject of experiment this year by Mr. Lamb, of Newcastle on Tyne, who found the following remarkable results.

	Pure. lbs.	1 cement and 1 sand. lbs.	1 cement and 2 sand. lbs.	1 cement and 4 sand. lbs.
7 days	830	550	375	77
112 days	1,065	859	580	224
Inciease per cent	36	55	60	200

The inference he draws from these figures is that, seeing that pure cement at 7 days is ten times the strength of mortar containing one cement and four sand, and at 112 days is only five times the strength, there is good reason to believe the process continues till there is very close approximation. In corroboration of this, Mr. Colson, of the Portsmouth Dockyard Extension Works, who has tested within the last few years about 80,000 tuns of cement, has furnished me with the following figures respecting the relative strength of pure cement and one cement to two sand

	Pure cement. lbs.	Increase per cent.	1 cement and 2 sand. lbs.	Increase. per cent.
6 months	1,200	....	246	....
12 months	1,400	16·6	404	64·2
3 years	1,600	33·3	1,174	377·2

These are extraordinary results, no doubt, but they are the average of many tests, and most of us will be able to appreciate them when we remember with what difficulty a piece of brick and cement mortar in the above proportions can be broken; frequently the brick gives way before the cement joint. I have at this moment a slab of concrete, 10 feet by 8 feet 6 inches and 12 inches deep, in all 85 square feet, bearing 6 cwt. to the square foot without any appreciable strain. On the other hand, the resistance of Portland cement concrete to compression is greater than that of any of our best building materials. At nine months old, the comparison stands thus, upon a block showing 40 inches of surface:

Portland stone	47 tuns.
Fire brick	50 "
York landing	96 "
Portland cement	120 "

Experiments were made by Mr. B. P. Smith, the well known engineer, for Mr. Hawkshaw, prior to determining the foundation of the Spithead forts; so that, whether for resistance to crushing weight or to tensile strain, Portland cement concrete is stronger than any other ordinary materials.

Chemical and Galvanic Action upon Teeth.

Dr. S. B. Palmer, of Syracuse, N. Y., publishes in *Johnston's Dental Miscellany* an interesting paper on chemical and galvanic action upon the teeth and the material used for their preservation. The author appears to have conducted extended original investigations into this curious and important subject, the results of which will be found below, condensed from the article above mentioned. He considers that chemical action and the electric current stand in the same relation to each other as do electricity and magnetism—inseparable. This brings us to consider the action of the force upon the teeth. We adopt the theory that chemical action, which results in the disorganization of the teeth, is stimulated generally by acids. An investigation of the constituents of tooth bone and its surroundings warrants such conclusions, and numerous recorded experiments attest the same. Calcium, magnesium, and sodium are ingredients of dentine; the saliva in which teeth are bathed is usually alkaline; the calculi which become attached to the teeth are also of the same nature, having no chemical action upon the bone or dentine. Having decided that these agents are acids, how do they find their way to the mouth?

Chemically speaking, the oral cavity is an electro-chemical cell and laboratory, in which Nature employs certain forces, that act by laws as inflexible as Nature herself. Mechanical force for crushing and pulverizing is furnished in mastication; heat and moisture are not wanting to facilitate fermentation.

Saliva contains chloride of sodium and soda; galvanic currents decompose this compound, the chlorine unites with the hydrogen derived from the water of the saliva, and hydrochloric acid is the result. We have sent the current from two cells of Daniell's battery through litmus paper wet with saliva, and been able to write, in acid, characters with the copper wire forming one pole of the battery. Hydrochloric acid is the result of decomposition of saliva by the current. The singular combinations of nitrogen and oxygen as satisfactorily explain the manner in which nitric acid finds its way to the teeth. Abundant material is furnished in the lodgment of meat fiber, rich with nitrogen, also in other articles of food that are permitted to decompose between the teeth.

The galvanometer teaches that the filling and tooth in which it is inserted, or an approximate tooth, are sufficient for two elements, the saliva of food forming the third; or, by union, a more complex current may be established. We take gold foil as a unit, or negative element for our experiments; with it and tin, we make a test and pronounce tin positive to gold, or, in chemical language, it is an *electrolyte*, a substance that is oxydized, or, if a compound, that is decomposed. We find tooth bone, also an electrolyte, or positive; the gold will remain a negative. Between the tooth and the gold, the action of the needle will be slight; between the tin and gold, very great. The tenth part of a grain of each will deflect the needle fifteen or twenty degrees. Tooth bone and tin foil are both below the gold, and both positive to gold, therefore electrically nearer to each other than either is to gold. The trial of tin and the teeth shows but a slight difference, the tin occupying the place of gold, still throwing the action and consumption on the side of the tooth.

Substitute alkali for acid, and the current is reversed; the bone now occupies the negative, and the tin the element oxydized. There is less galvanic action between tin foil and tooth bone, than between gold and tooth bone. In other words, a loose porous tin filling would be better in a tooth than a gold one in the same condition. If the saliva be alkaline, the tin might be blackened and wasted away, while this action would throw the tooth into the electro-negative condition to be preserved. In an acid saliva the tin would be oxidized upon the surface, and by that means form an insoluble compound to greatly lessen further action.

Gold, being so far superior to tooth bone, throws the latter into positive relations with itself, be it in a poorly applied plug, or in approximation to another tooth, or in a clasp for the support of an artificial denture. In the latter case we need not look for base solder to prompt the action. The only remedies to correct the evils that arise from this source are cleanliness and perfect filling. A gold filling so imperfect as to show discolor will in time enlarge the cavity.

A tooth containing an amalgam plug has in it the elements of a minute yet intense battery, capable of decomposing not only the plug, but the tooth around it; this is in accordance with a law of chemical affinity. The moisture in the tooth bone is sufficient to communicate the current which exists in the plug, to the tooth, and thus enlarge the cavity, or diminish the plug, or both.

The galvanometer shows that the intensity of a current between two elements in a battery increases as the metals approach each other, inversely as the square of the distance from one to four. In the amalgam, the elements are in the nearest possible relations. The smallest possible particle of gold and tin or amalgam, even the dust that may be taken from separating files used for those metals, shows decided action, by turning the needle. On separating the elements a short distance, no action is perceived. Thus minute surfaces, excited in close proximity, equal larger ones at a distance. Again, a current, if very feeble, continued for a long time, is equivalent to an intense one for a short period.

In view of the above statement, the importance of thorough amalgamation of the compound, and cleanliness of the mouth, cannot be ignored. Amalgam should be resorted to, as the physician resorts to other mercurials, to arrest a violent and threatening disease. A tooth, that would be speedily lost without it, is a proper tooth to be preserved by it.

Iron Dams.

The Elmira *Gazette* urges a new departure in the method of constructing dams. It says:

Masonry is but a little better than earthwork when opposed by rushing water. What is needed, it seems to us, is material which will not crumble or break up when attacked by rushing water. A dam might be constructed with a frame work of iron, held by subterranean guys anchored beyond the reach of the water. The foundation could be planted in a rock bed, or, in the absence of rock, against a system of piling, so as to be absolutely immovable. Thus strength would be attained. By planking the iron frame and covering the latter with earth or cement, tightness would be secured. This system would achieve one end, at least. In case of a break in the dam, no disaster could follow to the region below, because only a small portion would give way and the water would escape comparatively slowly. The anchor could be so disposed as to render complete giving-way impossible, or at least improbable. The matter of cost, and the process of rendering the iron durable as against rust, are matters for engineers and iron makers to consider. We believe that, for dams as well as bridges, iron is destined to come into use.

[We have no doubt, as the *Gazette* suggests, that dams of almost absolute security could be made of iron. The only difficulty is the expense. The interest on the outlay would in many cases pay or nearly pay for the fuel required to produce an amount of steam power equal to the water power furnished by the iron dam.—EDS.]

How to Tell a Goose from a Gander.

In sorting out a flock of geese for home breeding or to make sales, it is often difficult to distinguish the males from the females. A correspondent of the *Farmers' Home Journal*, Ky., thus delineates the difference:

"The goose has always a feminine appearance and the gander the opposite. Her head is smaller and her beak shorter; knot on forehead smaller and not so pointed; her neck shorter and more delicate; the black streak on back of neck not so high; colored ring around head not so bright; her neck comes out of her body more abruptly (this is occasioned by her having a larger breast than the gander), giving a square appearance to the body. The voice of the gander is keener and louder; coloring about head more briliiant; eyes keener and always on the lookout. With such marks plain to view, any practical gooseman can readily distinguish one from the other."

THE British steamer Tagus is now taking on hoard, at the Jersey City wharf, opposite New York, ten large locomotives, built at the Grant locomotive works, Paterson, N. J. They are for a Russian railway and are to be delivered at Taganrog, on the Sea of Azof. They are said to be splendid examples of American mechanism

New Theory Comets.

The following novel theory of comets is proposed by a correspondent of *Iron*: "Comets are supposed to consist of thin vapors of gases, held together by the mutual attraction of their particles. Like all bodies so circumstanced, they necessarily assume the spherical form; and therefore the common notion, that they consist of a comparatively small and bright nucleus and an immensely long and illuminated tail, evidently derived from their appearance in the heavens, cannot for a moment be entertained. That their spherical form, as shown by the reflected light of the sun, would scarcely be discernible at the distance of our earth, even though the comet were as dense as the densest cloud of our atmosphere, would not be surprising; but if their attenuation, as described by Sir John Herschel, be considered, all wonder ceases. Sir John Herschel says 'that the most unsubstantial clouds, which float in the highest regions of our atmosphere and seem at sunset to be drenched in light and to glow throughout their whole depth as if in actual ignition, without any shadow or dark side, must be looked upon as dense and massive bodies compared with the filmy and all but spiritual texture of a comet.' Owing to this extreme tenuity of matter, the rays of the sun's light, as reflected by it, are absolutely invisible to the inhabitants of the earth; but the other rays, penetrating into the center of the comet, are refracted by this powerful lens of twenty millions of leagues diameter into the focus which forms the nucleus of the comet, where there is, perhaps, a greater concentration of rays of light than anywhere else, not in the body of the sun. Hence this large body of concentrated light, streaming in a narrow path through the remaining half of the comet, in a direction opposite to the sun, forms that splendid appendage called the tail.

It seems scarcely necessary to point out that this mode of viewing a comet accounts for the circumstance of the tail being always in opposition to the sun, whether in advancing or receding. Also for the wonderful celerity shown by the tail in turning round the sun when the comet is in perihelion, and for the rapidity with which the comet darts out its tail after the perihelion passage. It explains, also, on the principle of the aberration of light, the bend which the tail of some comets have towards the region they have left, also the absence of a solid nucleus, and the non-obscuration of the stars by the body of the comet. If the conjecture be correct that the nucleus of a comet is near its center, and that the comet extends in every direction round the nucleus to as great a distance, at least, as the length of the tail, then it follows that at this present moment the sun is feasting on our comet, and that when it emerges from his embraces, a few days hence, it will have suffered some diminution of size."

Coating Cast Iron with Copper.

The Society of Forges and Founderies of Val d'Osne has recently opened in Paris an exposition of their curious products, consisting of objects of art in cast iron, some of considerable volume, which are covered with copper by the Gaudoin process. This operation admits of the deposition of copper upon cast iron without necessitating any previous coating of the latter. The difficulty of accomplishing this has been the scouring of the iron, the baths of chemicals hitherto used being incapable of thoroughly cleaning the metal. M. Gaudoin has found that very acid solutions are necessary to remove the oxides of iron which escape the scouring; but at the same time the acids do not attack the subjacent metal. Such a solution acts continually on the points upon which the copper is not deposited, and ends by dissolving the oxides and allowing the deposition to take place. A large number of organic acids have been found suitable for the purpose. The oxalates of copper combined with the quadri-oxalates of soda are said to give excellent results. An electric current is employed to secure the fixing of a thick layer of copper.

Moles.

W. S. N. says: "On page 50 of your current volume, you have an item about moles; and I would like to give you my experience with them this spring. I planted some sweet corn in the garden very early; and after waiting longer than the proper time for it to come up, I examined it to see what the cause was, and found that a mole had taken every grain in four rows of corn, across a garden three fourths of a square acre, not only once, but two more plantings after the first. On the rear end of my farm, in a piece of "new ground," they finished half of an eight acre field. I would like to know what Monsieur Flourens would say to that? The negroes in this section always plant several hills of caster oil beans in their gardens to keep the moles out."

Powdering Camphor.

G. T. Eberts, in the *Pharmacist*, says that the methods and suggestions for powdering camphor and retaining this refractory body in its powdered state, have not alone been numerous but curious.

Glycerin is the simplest and most efficient substance to keep camphor in a finely divided state. Take camphor 5 ounces, alcohol 5 fl. drachms, glycerin 1 fl. drachm. Mix the glycerin with the alcohol and triturate it with the camphor until reduced to a fine powder.

FRENCH RAILWAY CARS.—Some of the double deck cars which are quite common upon French roads, exhibit a most extraordinarily small proportion of dead weight. One on exhibition at Vienna, with a capacity of 90 persons, weighed only 11 75 tuns. Freight cars weighing but 10,000 lbs. carry 20,000 or even as much as 30,000 pounds.