American Torpedo Boat in Foreign Waters.

Mr. Herreshoff, ot Bristol, Rhode Island, America, who has long had a great reputation for the building of small fast steaming vessels, recently sold to the English Government one of his launches in order that the American system might be thoroughly tested against the productions of the English building yards.

The boat is sixty feet all but three inches in length, with a beam of seven and a half feet, and when fully manned and equipped will float in less than four feet of water. Her speed is stated to be over sixteen miles an hour, above the standard of the Admiralty second class torpedo boats, which are nearly as possible of the same dimensions as the American launch. The hull, which in appearance is not unlike a coffin painted a dull gray, consists of bullet-proof steel, with a wooden skin below the water line. The funnel is almost in the middle of the boat, and the screw is placed under the patent boiler, or "steam generator," which is also in the center of the craft. She is steered from near the stern by a balanced rudder, and her powers of quick stopping and going astern, and ability to turn in a small circle, are said to be surprising.

During the trial she described a complete circle in a diameter of about 50 yards, came to a dead stop when steaming 12 miles an hour, in her own length, and then went astern at the same rate of speed and equally well under the control of the rudder. She steamed several times in the course of five minutes round and round a Russian steamer, Peter the Great, proceeding down the river, and amply proved her extraordinary powers to the entire satisfaction of every one on board. The steam is supplied by Herreshoff's steam generator, which will raise 100 pounds of steam within six minutes of the fires being lighted. The generator consists of a coil of 2 inch pipe, nearly 300 feet long, and possesses the valuable quality of an inability to explode. She works at a pressure of steam of 140 pounds, but has been tested up to 300 pounds. The screw is capable of 300 revolutions a minute. The absence of a heavy boiler adds greatly to the lightness of the boat, enabling her to be hoisted on davits with wonderful facility. It seemed to be the general opinion among the engineers present that the introduction of the Herreshoff steam generator into England would create a complete change in the method of producing steam for working machinery, and the success of the new invention appeared complete.

New Electrotype Process.

A new and ingenious process has lately been introduced in France for electrotyping on non-conducting materials, such as china, porcelain, etc. Sulphur is dissolved in oil of lavender spike to a sirupy consistence; then chloride of gold or chloride of platinum is dissolved in sulphuric ether, and the two solutions mixed under a gentle heat. The compound is next evaporated until of the thickness of ordinary paint, in which condition it is applied with a brush to such portions of the china, glass, or other fabric as it is desired to cover, according to the design or pattern, with the electro-metallic deposit. The objects are baked in the usual way before they are immersed in the bath.

CHEST OF EBONY.

The engraving on this page represents an ebony chest, richly ornamented with gilt, bronze, and silver castings and repoussé work. It was one of the exhibits at the late Paris Exhibition.

Subterranean Telegraph Wires in Germany.

In 1876 the first subterranean telegraph wire was laid down in Germany. Recently, subterranean lines have been completed from Berlin to Cologne, from Cologne to Elberfeld and Barmen, from Frankfort to Strasbourg, and from Hamburg to Cuxhaven. Altogether the length of these lines now amounts to 1,554 English miles. Most of the cables consist of seven wires, very few of four only. The difficulties encountered in laying down the cables in marshy or rocky ground, along the streets of large towns, across, or rather under, rivers, and through fortifications, have all been successfully overcome. Next year six other lines are to be laid down, and then the projected system of subterranean telegraphic communication throughout the German empire will be almost complete. The cost of the lines already laid down amounts to about $3,039,000.

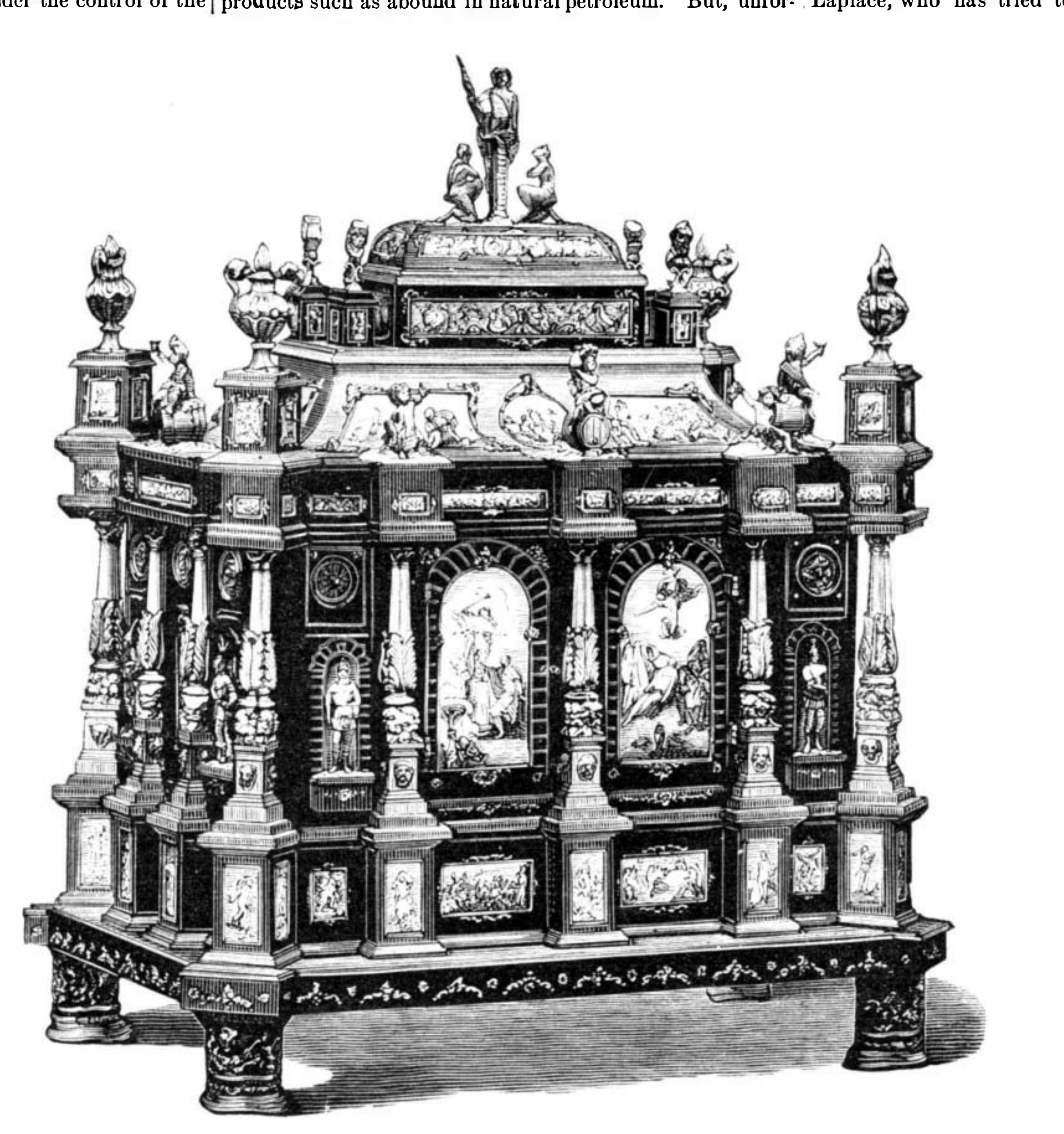
The Origin of Petroleum Springs.

The origin of our oil springs has been the subject of a great deal of investigation among scientific men, and various have been the theories they have advanced. A writer in the London *Grocer* takes the subject up and concludes, as many have before him, that if petroleum were found in the neighborhood of coal, or even in those rocks among which coal abounds, or somewhere near to such rocks, there would not be much difficulty in explaining its origin. We then need only suppose that a slow distillation had taken place similar to that which is carried on at the works for the distillation of paraffine oils from cannel coal or shale, and that the product thus evolved had somehow found its way into cavities, or had filled up crevices, and remained there until disinterred by human effort. This theory would be aided by the fact that the quality of crude artificial paraffine oil approaches more and more nearly to that of natural petroleum the more and more slowly the distillation of the coal or shale is conducted; and as nature has certainly operated very slowly indeed in the formation of geological products, the petroleum of Pennsylvania and Baku, and other places, might thus have been the result of ages and ages of very slow distillation at the low temperature which the mineral oil maker knows to be so favorable to the production of a light-colored crude oil, containing a large proportion of the more volatile products such as abound in natural petroleum. But, unfortunately for this theory, petroleum is not one of the products of the "coal measures," as miners and geologists call the coal bearing strata. It appears to be especially absent from them, or we should long ago have found it in our own island (Great Britain) where these rocks have been so riddled with trial borings, pits, and workings. It is true that a few small dribbles of something of the kind have been found here and there. We have heard of an enterprising publican in the neighborhood of Bilston, who discovered some gas or vapor hissing from the floor of his cellar, who fixed a jet thereto and lighted it, and thus converted the cellar into a subterranean tap room, the curiosity of which brought much custom. His business rivals affirmed that he had carried a gas pipe surreptitiously under ground.

We have ourselves visited a coal mine near Lilleshall, in Shropshire, known as "the tarry pit," on account of the liquid tar that oozed out of the sides of the shaft and accumulated in what the colliers call the "sump," that is, the lower wall of the shaft where it is sunk several feet below the road that leads to the workings for the purpose of receiving the water that has to be pumped out. But these and other similar cases are mere exceptional curiosities, by no means comparable with the vast and apparently inexhaustible subterranean reservoirs from which we derive our commercial supplies of hydrocarbon oils. These occur in the Silurian and Devonian rocks, which are of vastly greater antiquity than our coal-bearing rocks. These Silurian or Devonian rocks belong to the period when life was just making its beginnings upon the earth, or rather in the waters that covered the earth at that time; for the animals whose remains we find in these rocks are marine animals; no air-breathing creature, nor even an amphibious reptile like a crocodile, is found among the Silurian rocks. Nothing approaching to forest trees or other terrestrial vegetation is there; the only vegetable remains being aquatic plants, and these so scarce that small specimens are prized as curiosities. Land plants just begin to make a scant appearance in the Devonian, but are very rare indeed in those lower beds where petroleum is found.

This has led to many speculations. As the remains of odd-looking fishes, marine things like swimming wood lice, huge lobster like brutes (*pterygotus*) five or six feet long and a foot across, a variety of soft animals in shells, and vast quantities of coral, are found in these rocks, some have suggested that petroleum is produced by the decomposition of the flesh of these strange creatures. The very "ancient and fish-like" smell of some of the Canadian mineral oils was regarded as confirmation of this, which in the early days of American petroleum enterprise was a somewhat favored hypothesis. Another, and a very bold, theory has been propounded by Professor Mendelejeff. He maintains that neither the animal nor the vegetable remains of the Silurian and Lower Devonian rocks are sufficiently abundant to supply the petroleum and other bituminous matter they contain. He goes back to the origin of the earth, and to the hypothesis of Laplace, who has tried to show that our sun, our earth, and all its companion planets, were formed by the condensation of an enormous cloud or nebulous mass of heated vapors a few thousands of millions of miles in diameter. He supposes that when our globe was formed by the solidification of a portion of this, there were great masses of iron and of carbon, of inorganic origin, in the inner parts of the earth; that the iron remained melted within the earth long after the crust had cooled down and water had condensed upon it. Then this water found its way through fissures and came upon the molten iron and the inorganic carbon or graphite that was associated with it. What would happen then? Water is composed of oxygen and hydrogen. Iron has a strong affinity for oxygen—strong enough, when heated, to take it away from the hydrogen of water. Mendelejeff supposes that such a decomposition of water took place, that the iron was thereby converted into the oxide of iron (the iron ore that we now obtain for our blast furnaces), and that the hydrogen set free from the water combined with the carbon, and thus formed the hydrocarbons which are found in the forms of petroleum, asphalt, etc.

Dr. T. Sterry Hunt, of Massachusetts, one of our boldest and most able of philosophical geologists, still adheres to the theory he expounded in 1861, that "petroleum and similar bitumens have resulted from a peculiar transformation of vegetable matters, or in some cases of animal tissues analogous to these in composition;" and he derives these vegetable matters and animal tissues from the ancient limestones. He argues that the animals of very low organization, that resemble plants in so many respects, are composed of material also chemically resembling vegetable matter, or a sort of half-and-half between wood and flesh, and that this, in the course of ages, would decompose and produce hydrocarbons. If this is correct, he may find his supply in the coralline rocks of that period, and may get it in such quantities as to leave us in no apprehension as to failure of supply; and he actually has found certain oleiferous magnesian limestones which contain within their pores as much as 4¼ per cent of their bulk of petroleum supposed to be thus formed. A square mile of this only one foot in thickness would contain 221,247 barrels of 40 gallons each; and taking its actual thickness at 35 feet, every square mile contains 7,743,745, or nearly 8,000,000 of barrels, all this in store and ready to ooze and filter out into the cavities as they become pumped out. Whatever theory may be adopted, one important practical fact appears very certain, namely, that the supply of petroleum is by no means limited to the present contents of the oil wells, or the accumulations in the cavities which are tapped by the wells. This is shown by the fact that after a well has been pumped dry and then left for a while the oil returns, as though it came from such porous rock as the oil-bearing limestone of Chicago which Dr. Sterry Hunt examined. As this and other similar rocks cover some thousands of square miles of the American continent, the supplies of petroleum are likely to be quite as lasting as those of coal.



EBONY CHEST, WITH GILT AND SILVER ORNAMENTS.

Practical Value of Science.

BY PROFESSOR S. H. TROWBRIDGE.

Can the study of geology be of use to any outside of the guild? Let us see, for a moment. The science of geology, dealing as it does with the only visible record of any considerable age, in regard to the history of life upon our planet, must settle the vexed questions—if they are ever to be settled—of the origin of species the antiquity and perhaps the unity of man. To many, the acceptance of the new theories on these points is equivalent to legislating God out of the universe. If so many are wrecked upon these questions, the correct understanding of them is a matter of no little importance.

Has a farmer any interest in knowing whether mineral products are to be found upon his land, and, if so, whether they are valuable, and in paying quantities? Has he coal, iron, lead, zinc, baryta, ocher, peat, or clay, valuable minerals or mineral springs, or rock fit for building purposes, within his limits? These questions must be answered, if at all, by the geologist. These products are found in certain layers or groups of rocks, whose position is definitely known by certain marks easily recognizable. These marks are the remains of the buried dead of ages past, that have written their own epitaphs upon the rocks, which serve the double purpose of sepulcher and tombstone. Many a man has spent all his living in trying to extract gold or other valuable minerals from deposits which one initiated could tell him at a glance were entirely worthless. Many a man has sunk a fortune in mining for coal, lead, zinc, or other ores, on the unsafe supposition that, because his neighbor in the valley below him finds these in abundance, he will have equal success by sinking a shaft to the same level. A brief survey of the inclination of the rocky strata would show that the rocks which his neighbor finds so productive, dip away from him; or, by an upward curvature of the earth's crust, which formed the elevation on which he stands, the wealth-bearing stratum was exposed, on the surface, to the action of frost and flood, and has been completely washed away.

From bitter experiences like these, prospectors and miners have learned that knowledge and advice of a well versed geologist is invaluable to them, and have not hesitated to offer and pay a thousand dollars per day for his services.

From later geological study of Hoosac Mountain, it seems probable that millions of dollars might have been saved to the State of Massachusetts if such a study had preceded the excavation of the great Hoosac Tunnel. The assertion is ventured that enough funds were needlessly expended to pay for a complete topographical, geological, zoological, and botanical survey of the whole Commonwealth, such as no State in the Union now possesses, and such as would for ever put away the danger of similar loss in the future.

How to make two blades of grass grow where one grew before; and how, in general, to get the most out of this rich old earth of ours, is the absorbing question of all ages. In the van of all exploring expeditions goes a band of scientists, or at least the geologist, to learn of the wealth which the earth possesses. And when the settler is ready to seek a home in the distant land, he finds that science has furnished for him a satisfactory showing of the natural wealth of his future home; and by the use of these revelations of scientific research, he may select beforehand his locality, and carry with him the information concerning it.

The cost of production of the precious metals, and their probable abundance for years, decades, and centuries to come, must be determined by the geologist. Upon this knowledge depends the value of gold and silver, as standards of value and media of exchange. From this source we learn that the amount of gold obtainable is constantly diminishing, while that of silver is slowly increasing. The former is much more fluctuating than the latter, hence a less desirable standard of value; and as each acts as a check upon the other, there is wisdom in accepting both as media of exchange. From this we see the important part the geologist plays in the mooted question as to the demonetizing of silver.—*The Advance.*

Stimulation of the Nerves of the Head.

Dr. Brunton, in the *Contemporary Review*, remarks that there are two nerves, known as the "fifth pair," which are distributed to the skin of the head and to the mucous membrane of the eyes, nose, and mouth. These nerves are closely connected with the heart and vessels, and by stimulating their branches the circulation may be greatly influenced, as in the case of fainting. It is a curious fact that people of all nations are accustomed, when in any difficulty, to stimulate one or another branch of the fifth nerve, and quicken their mental processes. Thus, some persons when puzzled, scratch their heads; others rub their foreheads; and others stroke or pull their beards, thus stimulating the occipital, frontal, or mental branches of these nerves. Many Germans when thinking have a habit of striking their fingers against their noses, and thus stimulating the nasal cutaneous branches, while in other countries some people stimulate the branches distributed to the mucous membrane of the nose by taking snuff.

The late Lord Derby, when translating Homer, was accustomed to eat brandied cherries. One man will eat figs while composing a leading article; another will suck chocolate cremes; others will smoke cigarettes; and others sip brandy and water. By these means they stimulate the lingual and buccal branches of the fifth nerve, and thus reflexly excite their brains. Alcohol appears to excite the circulation through the brain reflexly from the mouth, and to stimulate the heart reflexly from the stomach, even before it is absorbed into the blood. Shortly after it has been swallowed, however, it is absorbed from the stomach, and passes with the blood to the heart, to the brain, and to the other parts of the nervous system, upon which it then begins to act directly. Under its influence the heart beats more quickly, the blood circulates more freely, and thus the functional power of the various organs in the body is increased so that the brain may think more rapidly, the muscles act more powerfully, and the stomach digest more easily. But with this exception, the effect of alcohol upon the nervous system may be described as one of progressive paralysis. The higher centers suffer first, and the judgment is probably the first quality to be impaired, and this becomes the more so as the effect of the alcohol progresses, although the other faculties of the mind may remain not only undiminished by the direct action of the alcohol on the brain, but greatly increased by the general excitement of the circulation. By and by, however, the other parts of the nervous system are successively weakened, the tongue stammers, the vision becomes double, the legs fail, and the person falls insensible. It is evident, then, that only the first stages of alcoholic action are at all beneficial, the later stages being as clearly injurious.

A New Method for Vapor Densities.

The most important element in determining the formula of a chemical compound, next to its percentage composition, is its vapor density, and often this is the quickest and surest method, if not the only one, to establish its atomic weight. The number of methods proposed and introduced is legion, every prominent chemist—Hofmann, Bunsen, Gay-Lussac, and Dumas—has given his name to some apparatus for that purpose. The latest and simplest is that of Victor Meyer, in Zurich, Switzerland.

A glass vessel holding 100 c.c., and resembling a flask with long and very narrow neck, on which is set a fine tube bent like a gas delivery tube, is used. The widened mouth of the flask is closed with a rubber cork which reaches to a certain mark on the neck. The delivery tube dips under the surface of mercury or water in a pneumatic bath. The vessel being placed in another and larger vessel of water, oil, or easily fusible metal, can be heated to any desired temperature. For a while the air in the flask of course expands and escapes through the mercury or water. When all the air in the flask has reached the temperature of the bath no more will escape. At this point the opening of the delivery tube is closed, the rubber stopper removed, a weighed quantity of the substance is thrown in, and the stopper quickly replaced to the mark. Some asbestos on the bottom of the flask breaks the fall and prevents its breaking the flask. If now the temperature of the flask is higher than the boiling point of the substance introduced it will be converted into a vapor, and must expel a quantity of air exactly equal in volume to the volume of vapor generated. If the volume of the vapor generated is not over one quarter or one third that of the flask, and it is quickly vaporized, the error through diffusion will be very small. The air expelled is collected over water in a graduated tube, or in a common eudiometer, and differs so little from that of the vapor generated that it may be neglected in determining the molecular weight of body, as shown by the following figures found by Mr. J. Zueblin:

	Theory.	Found.
Chloroform (with steam).	4·13	4·32; 4·51; 4·44; 4·36
Bisulphide of carbon (with steam).....	2·63	2 87; 2·91; 2·92
Chloroform (in aniline)..	4·13	4·31
Water (in aniline)	0·62	0·69; 0·66; 0·62
Aniline (in ethyl benzoate)	3·21	3·27; 3·37
Phenol " "	3·25	3·28; 2·98

It is characteristic for this process that it is independent of the capacity of the vessel and of the temperature at which the experiment is made. It is only necessary to know the temperature of the room, the weight of the substance, the barometer, and the volume of the air expelled into the tube. The vapor density of substances which boil at very high temperatures can be determined in metal bath at very high and unknown temperatures. It may be used as a lecture experiment also.—*Berichte.*

Liquefaction of Oxygen.

Mr. Raoul Pictet concludes an article on the liquefaction of oxygen with the remark that his investigations necessitated an unusually large number of experiments for the establishing of preliminary data, and these he obtained by aid of the Geneva Society for the Construction of Physical Instruments, who furnished him with apparatus worth 50,000 francs, and thereby enabled him to work out results with perfect accuracy. He recommends that similar apparatus should be provided in all laboratories as an "essential means for the study of the molecular forces. Who knows," he asks, "but what crystallization and certain reactions may thereby be placed in peculiarly favorable conditions for further investigation?"

Roach Poison.

For the benefit of several subscribers, who have written for information as to the best means of ridding their houses of cockroaches, we may state that equal parts of powdered borax, Persian insect powder, and powdered colocynth, well mixed together, and thrown about such spots as are infested with these troublesome insects, will prove an effectual means of getting rid of the scourge. This powder, in all cases where its use has been persistent, has by long experience been found an infallible remedy.

Cooked Air.

A clever writer in the Philadelphia *Ledger* very happily characterizes the air which most city people breathe indoors in cold weather as "cooked air." The lower down the thermometer goes the higher the burning coal is piled; all the chinks and cracks are stopped that would let any fresh air in, and its main chance, indeed, is when the front door opens for twenty seconds, or when the beds are made in the sleeping rooms. In the living rooms of the family there is no occasion, many people think, to raise the windows ever, except to wash them on periodical cleaning days, or to close the shutters. So carpets and furniture and people, lungs and skin, are dried and baked in the hot, dry rooms, until ingenious persons can bring out electric sparks from their finger ends by skating rapidly up and down the room in their woolen slippers.

These breathers of cooked air are often extremely particular about wearing their own clothes, and would by no means consent to take the cast off garments of a neighbor; yet one and all of them are perfectly comfortable to breathe over and over again the cast off and soiled air from each other's lungs, when it is cooked especially; for in summer time they do insist on a change of it, and do get their houses ventilated. Janitors of public buildings, in a short sighted economy of fuel, will shut up all the apertures by which fresh air might get in, lest they should suffer some heat to escape thereby, and are rewarded by sleepy audiences, especially when the gas burners are at work, also draining the cooked air of what little life it has. There are some people—many, it is to be hoped—who open an inch or two of their bedroom windows every night to insure a modicum of fresh air to sleep by. But these do not in the least care to have fresh air to be awake in, it seems, for they are content to have their furnace draw all its supplies from the tightly sealed cellar, and from the stale atmosphere of the ash boxes and vegetable bins in that subterranean apartment. And these breathers of cooked, soiled, devitalized, and debilitating air, wonder why it is they take cold so easily! The writer suggests that when people learn to live in fresh air within doors as without, with its proper proportion of moisture for the skin and breathing apparatus to keep up their healthy tone, it is likely they will have found out one way at least of how *not* to take cold.

Oxide of Zinc in Diarrhea.

The value of oxide of zinc in diarrhea has long been known, but is apt to be overlooked. Some recent reports on the subject have been made by Dr. Tyson, of this city, and Dr. Bonamy, of Nantes. The formula which the latter uses is:

℞. Zinci oxidi........................	54	grains.
Sodæ bicarb........	7½	"

In four packets, one to be taken every six hours.

In all the cases which he observed oxide of zinc produced rapid cure of diarrhea. In fourteen cases observed by Puygautier the cure was even more rapid, since in only one case were three doses of the medicine required. The results are considered to have been more satisfactory, inasmuch as in several cases the malady had endured from one to many months, and other methods of treatment had not produced any improvement. Thus he concludes that, although by no means to be held as exclusive treatment, the employment of oxide of zinc deserves to be more generally known as useful in diarrhea.—*Med. and Surg. Reporter.*

Antimony in Galvanic Batteries.

Nuhn calls attention to the use of metallic antimony for galvanic batteries in the place of the carbon or platinum as negative element, especially when sulphuric acid is the liquid employed. He has used it for five years for medical purposes with satisfactory results. It has the advantage of cheapness, does not scale off, or break, or crumble; the piece retains at all times its market value, and can be fused over again at any time. The chief advantage is that the antimony begins to act as soon as it is immersed, which is seldom the case with carbons. On the other hand the chief disadvantage is that thin plates of cast antimony break easily, but this can be avoided by casting it around a core of tough metal, like copper, or by alloying it with a few per cent of a tenacious metal. Although it is not as good a negative element as carbon, its greater conductivity and other advantages make it probable that antimony may frequently prove useful as a galvanic element. Antimony melts at 425° C. (797° Fah.); in other words, it is a comparatively easily fusible metal, a little higher than lead, but, like zinc, will burn if exposed to the air while melted. Bismuth can probably be employed for the same purpose, standing very close to antimony in the electrical series.

Sewing Silk Manufacture.

But few persons who use sewing silk know the various and intricate processes the material has to undergo to produce the even thread and beautiful colors which they purchase at our stores for a few cents a spool. A recent visitor to a sewing silk factory, at Clinton, Mass., describes on another page the process of its manufacture. We invite the reader's attention to the article.

AT a recent soiree of the Union League Club, in this city, during a promenade in the picture gallery, a piece of white hot carbon dropped from an electric light upon the costly silk train of a lady visitor, and instantly burned through the fabric. The coal was quickly extinguished. No damage except to the dress.