expensive or cumbersome accessories, such as a lantern to project a magnified image of the galvanometer needle and scale on a screen, in order to render the deflections more evident.

The chief part of this apparatus is a balance beam, A B, of magnetised steel poised on knife edges, as in a common weighing balance. At right angles to this beam is fixed a long pointer, D, the point of which can be adjusted at zero by means of two thumb screw weights m, m^1. The sensibility to motion of the beam can be rendered greater or less by screwing up or down the weight m^2.

The magnetized beam is placed in the center of a bobbin ring, F F^1, of dimensions sufficiently large to render the action of the current on the beam practically the same at whatever angle the beam may have turned through. The sensibility of this instrument will be seen when it is mentioned that the current produced by merely bringing the hand near a thermopile will give a very large deflection. The beam of the instrument can be removed and remagnetized with great facility if its polarity by any means becomes destroyed or reversed. It is necessary, in setting up the instrument, to place it in such a position that the vertical plane passing through the beam may cut the magnetic meridian. It is sufficient if the part of this plane which contains the south pole of the beam makes, with the south pole of the dipping needle, a less angle than 90°.—*Mechanic's Magazine.*

Telegraphy without Insulation.

Mr. H. Highton recently read a paper on this subject at the meeting of the Society of Arts in London. He showed by experiment that water itself is for electricity of low tension so perfect an insulator, that a long wire on a plate of copper charged with electricity of low tension will retain the charge even for hours; indeed quite as obstinately as the glass of a Leyden jar retains a charge of high tension. The instrument he proposed to use for submarine telegraphy is a light slip of gold leaf, weighing from one 500th to one 2000th part of a grain, acted on by a powerful electric magnet, and with its motions optically magnified. The delicacy of this is so great that simply looking at a thermopile will transmit a visible signal through the resistance of the Atlantic cable, and a kiss or grasp of the hand a very strong signal. So that a modern Pyramus and Thisbe might exchange salutations not through a hole in the wall, but through the breadth of all the waves of the Atlantic. The use of this instrument gives an opportunity of using electricity of the very lowest tension which, besides its other advantages, has a much less tendency to escape by faults in the wire. It was shown that a fault which caused the disappearance of all visible signals through Thomson's speaking galvanometer, with a resistance of 500 units, or about 125 miles of the Atlantic cable, would still allow intelligible signals to be transmitted on this instrument with 10,000 units, or 2,500 miles of resistance. The other advantages were the absence of all swing, such as there is in a needle, and an instantaneous movement, in spite of electrostatic induction. Where it requires two or three seconds for the wire to accumulate sufficient charge, to overcome the initial friction in any instrument where there is any friction, however slight, it moves at intervals of seconds by jumps, but the gold leaf, having no friction, begins to move instantaneously and proceeds by an equable motion. Again, where increased sensitiveness is required, the only thing necessary is to increase the force of the electro magnet at the receiving end. The conclusion the author drew from his experiments was that, instead of the hundreds of thousands of units of insulation of the present cables, it would be quite feasible to work through a cable having only a single unit of insulation; or if greater insulation were desirable, a wire might be used presenting much more resistance to the currents, such as a steel wire, possessing more strength and cheaper than copper, and that electrostatic induction being less injurious, much cheaper, with less gutta percha, cables might be used costing some fifth or sixth of the present prices, and that thus telegraphy might be made much cheaper and more available for hundreds of thousands of poor emigrants, instead of being the luxury of rich merchants, or speculators, or government officials. £50 a mile ought to provide a wire, sufficient for all purposes, of any required length.

Vitrified Marble.

The material itself results from the admixture, and melting together in a furnace, of equal parts of certain vitreous and silicious substances in about equal proportions, to which are added, at a suitable stage and in the requisite quantities, such coloring materials as will produce the desired effects, either as a plain body color equally diffused throughout the mass, or in veins of one or more colors with or without ground. When in a semi-fluid state, while yet hot, small or large masses of this plastic matter are cut off and pressed into iron or steel molds carefully formed to the desired shape. In this manner decorative objects of any size, shape, or appearance can be produced with the utmost facility and rapidity of execution.

The manner in which natural materials of all kinds can be imitatively reproduced is extraordinary; ordinary marbles, veined and other, porphyry and malachite, jade, lapis lazuli, etc., thus prepared are, if anything, more real than the genuine objects themselves, and have the advantage of being in forms that could only be obtained out of the originals with great labor, waste, and cost. They can also be obtained and applied in bulk and solid masses, as for vases paper weights, inkstands, table tops, etc., or in minuter portions, such as pateræ and tesseræ, or amorphous pieces for mosaic work in every variety, suitable for dadoes, pavements, etc. For the latter purpose, the vitrified marble paving possesses an important advantage over marble and encaustic tiles, in relation to the surface, which is rougher and more safe and pleasant to tread upon, giving good foothold and equable wear, while lending itself to every pattern, regular or the reverse. And it is not only in respect of mere surface patterns, but also of raised designs and molded forms of every species, that this material is susceptible of adaptation. Indeed, the sharpness of definition and accuracy of detail, of which it admits, are alike noteworthy.

It cannot, moreover, be said of this invention, as of so many others, that the fairness of its promise in conception is marred or belied in practical application. On the contrary, it is sufficient to say that the most eminent architects of the day have given their testimony, in evidence of its merits, by adopting it in leading works, which are alike monuments of their skill and of national objects. Mr. G. Gilbert Scott, for example, has made use of it largely in the bosses and gems for the decorative work of the Royal Albert Memorial in Hyde Park; and nearly 2,000 of these ornaments have been introduced therein, studding and decorating the work with equal brilliancy and effect. Jesse Rust, of 15 Coleman street E. C., London, England, is the patentee of the above material.

Correspondence.

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

Petroleum and Coal.

To the Editor of the Scientific American:

I find, in your paper of May 25th, an article copied from the *Petroleum Monthly*, in which the statement is made that no coal beds, capable of being worked, are to be found within fifty miles of the oil producing territory. This, to the oil men of West Virginia, is indeed a startling assertion, as we obtain all our fuel from the same hills on which the wells are located; and, within the present month, an instance occurred wherein a party engaged in boring struck, as they supposed, a crevice of five feet, and knew no better until a miner came up and informed them that their auger had come through and, barely missing the mule, had disabled their car by falling through it; in another instance, a well, deserted as non-paying prior to the introduction of torpedoes, was leased by other parties; and in attempting to tube it, the hole was found obstructed and a man was sent into the coal bank about 100 feet below; and it was found covered with a pile of slates. In both these cases, the vein was about five feet thick and of a very good quality of bituminous coal. All the wells located on the hills pass through at least one vein of coal, and most of them through two veins; in some cases these amount in all to nine feet in thickness. It seems incredible that any one should undertake to write on a subject in which he is so lost as to assert that "in boring for oil, no coal has ever been found even in the smallest quantities." Again, the writer asserts that there is no evidence that petroleum is not derived from bituminous coal by distillation. If such were the case, could we not reasonably expect to find at least a trace of petroleum in the rocks adjacent to the coal? But the facts are that at least one hundred feet of strata intervene before we reach the first rock in the least impregnated with petroleum. Nor do we have any reason to believe that it is derived from the limestone, as we have the best authority that limestone under high pressure does not part with its carbon on being heated, no matter how intense the heat; and we do not find the oil in the limestone, but above it, in the sand rock. He admits, also, that carbon does enter into the composition of petroleum; but does hydrogen, to any extent, enter into the composition of coal or limestone? And if not, whence is derived the hydrogen to constitute the hydrocarbon? He then asserts that "petroleum is certainly a mineral oil," an assertion which the facts do not warrant, as geologists agree that coal is of vegetable origin. Again, as to the reproductive power of wells; if he will take into account the increased experience and facilities, added to the fact that, in all territory where surface water is not allowed to flood the wells, the salt water is becoming exhausted, and oil which was held back is allowed to flow down to the bed rock and reach the wells, also the fact that much of the oil is not in crevices but merely confined in the porous sand rock, and, as the cavities are emptied, it oozes out where it reaches the pump, he can readily account for this "reproductive power." I am not in the habit of catching folks on pin hooks, but when I see an article going the rounds of the scientific papers, so at variance with the plain facts of the case, I feel called upon to refute it, as my idea of science is that it is "truth demonstrated."

As one who has spent years in the oil regions and tried to arrive at the facts, I might say much that would at least have the merit of being scientifically correct, but I defer for the present, being firm in the conviction that enough has not been said to arrive at the "Origin of Petroleum," a knowledge of which would assist, as well in the location as in the working of the wells. G. W. S.

The Rubber Tip Pencil Case.

To the Editor of the Scientific American:

My attention having been called to-day to your editorial on the decision of Judge Benedict in case of the Rubber Tip Pencil Company *vs.* S. D. Hovey *et al.*, I desire to correct several errors therein contained. First, this case is wrongly reported both in your paper and the Patent Office *Official Gazette.* Judge Benedict declined to hear the above case, and it came before Judge Blatchford in April, who dismissed the bill with costs. The only case heard or decided by Judge Benedict was the case of the Rubber Tip Pencil Company *vs.* Howard, Sauger & Co., which was materially different from the case against Hovey, as it contained no question of estoppel and was decided nearly two months prior to Judge Blatchford's decision. Your most serious error, however, is in construing Judge Benedict's decision into an opinion that attaching rubber to a pencil for erasing purposes, for convenience, is not patentable; for the learned Judge says nothing which can possibly be construed into such an opinion. Blair did not claim to be the inventor of attaching rubber to pencils for erasing purposes, but only claimed to be the first inventor of a rubber cap or tube (or as Judge Benedict describes it, "a piece of rubber with a hole in it") which could be applied to a pencil. If Blair had contented himself with claiming rubber on a pencil, the result might have been different, but in claiming it broadly, off or on, he claims nipples and every style of rubber with a hole in.

As I fully agree with your views as to the patentability and importance of the invention of combining rubber with a pencil for convenience in erasing, and as I believe Judge Benedict has the same views, I deem it but justice to him to correct these errors, into which almost every casual reader of this decision has fallen. SAMUEL D. HOVEY,

President of Goodyear's Rubber Head Pencil Company, 205 Broadway, New York.

Novel Method of Indicating a Hot Journal.

To the Editor of the Scientific American:

My ingenious and able colleague, Dr. Mayer, has recently been experimenting, during the course of an interesting investigation, upon a number of substances which change color on raising their temperature and regain their original hue when cooled.

Iodide of mercury is one of these substances, and he suggests that if a bearing, to which access is difficult while machinery is in motion, or which, for other reasons, cannot be conveniently reached by the hand and its condition thus known be painted with iodide of mercury or some such material of changeable color, its darkening when the journal heats, may make it a valuable indicator. Its change—from bright red to black at about 70° C.—would attract attention from a considerable distance.

I have sent you this suggestion, as I have no doubt that it may prove very useful to some of the readers of the SCIENTIFIC AMERICAN. R. H. THURSTON.

Stevens' Institute of Technology, Department of Engineering, Hoboken, N. J.

Sea Sickness.

To the Editor of the Scientific American:

In your issue of May 18th, you have an article on sea sickness which attempts to give a philosophical explanation of the phenomenon, namely, pressure of blood upon the brain during the forward pitch of the vessel. Sickness from swinging is referred to the same cause. The proper position to lie on board a pitching vessel is given as being with the head toward the bows, etc. In all the cases referred to, the motion was either rising and falling, or gyrating.

I was a witness and a sufferer in a case of sea sickness, wherein the conditions were so different from all other cases I ever heard of that I thought them worth the consideration of those who wish to account for sea sickness, especially as I could not see how the above explanation could account for this case.

Some time ago, while riding in the cars between Cleveland and Columbus in Ohio, one side of the engine became disabled and all the work fell upon one cylinder. All went well enough till we came to an up grade, when the engine stopped with piston at the dead point. The engineer contrived to start again, but the motion, for every revolution of the drivers, was alternately fast and slow, being almost nothing at the dead point, *crescendo e diminnendo*. In a few minutes I began to feel sick, and as the train did not move faster than I could conveniently walk, I got out and kept along with it. I was soon joined by others who said they were sea sick, and I suppose that half the passengers in the car I was in felt the symptoms of sea sickness, which lasted as long as the irregular motion. Now this motion was straightforward, no pitching, rolling, swinging, or turning, and no position that could be assumed would avail against its unpleasantness. There was nothing about it to determine the blood to the head rather than anywhere else, as far as I see. I submit the case to those whose business it is to explain it. A. E. DOLBEAR.

ANOMALOUS SPECTRA.—A recent number of Poggendorff's *Annalen* contains a short but interesting paper by Christiansen of Copenhagen, in which he states that a hollow prism filled with the alcoholic solution of fuchsin produces a highly anomalous spectrum, which, instead of proceeding regularly from the red to the violet, like the ordinary solar spectrum, stops at a certain point, returns backward, then stops again, and resumes a direct course to the end. Kundt finds that anomalous spectra are given by all the anilin colors, and by permanganate of potash. Such spectra generally turn back upon themselves, having the green at one extremity, the blue being situated between the green and the red.

PUBLIC CLOCK REGULATORS AT PARIS.—In the various squares and public places of Paris, instruments are being put up for the regulation of clocks and time pieces. This little invention of M. Detouche, the well known clockmaker, called the equatorial quadrant, appears to be a complete epitome of practical astronomy, as by it the true mean solar time can readily be determined anywhere, on the spot. M. Detouche has supplied numerous models of his invention, adapted for a variety of situations, and the little instrument is said to be coming into very general use.