Retardation of Signals through the Atlantic Cable.

MESSRS. EDITORS—In a recent number of the SCIENTIFIC AMERICAN, one of your correspondents says, "No advantage would be secured by having, as some have proposed, a separate wire to complete the circuit." I think the contrary can be shown to be the case.

To make my meaning clear, we must look a moment at the cause of the retardation of signals, owing to secondary currents. It is now pretty well understood that it is as follows: the inner, or conducting wire, is in the position of the inner coating of a Leyden jar, the outside iron wires and water forming the outer coating, and the gutta percha representing the glass separating them. When a galvanic current or wave is sent through the inner wire, besides passing through it to the other end, it also charges it in the same manner as a Leyden jar, forming a secondary current, which tries to get to the earth wherever there is a chance; and the time occupied in doing this is the first obstacle experienced. Now, after the wire is so charged, when the circuit is opened at the transmitting office, this secondary current cannot get out at that end, on account of having there no communication with the earth, consequently it proceeds to the receiving office, where the wire is connected with the earth to receive the signals, and there finds its way to the earth, and while flowing out, it affects the instruments at that office after the signal has been received.

If now, instead of the circuit being kept open by the transmitting operator, he wishes to send another signal immediately after the first, and before the secondary current has got out at the other end (which occupies some time), and he closes the circuit for that purpose, thereby connecting the conducting wire with the earth, part of the secondary current remaining in the wire immediately rushes back to the earth by that route, as it can, in that way, reach it sooner than by going to the other end. This, of course, interferes with the wave the transmitting operator is trying to send, as it cannot enter till the secondary current has passed out.

By considering these things carefully, we find that the only interruption we meet with from the secondary current is when any communication is made between the conducting wire and the earth, which, of course, in the present system of working, is done whenever a signal is sent or received. Therefore the only way to avoid that interruption is to keep the conducting wire perfectly insulated at all times from the earth and outside wires of the cable, and this I propose to do as follows:—

Have two cables of one wire each, or one cable of two wires. Let one wire be employed to carry the current across, and one to bring it back, thus doing away with all ground connections. All instruments and batteries placed in this circuit must be perfectly insulated from everything else. The handle of the key used in transmitting signals must be made of glass, or some non-conductor; likewise the connection between the adjusting handle and instrument, if it be a rod; or of silk, if it is a cord.

With cable and instruments thus insulated, it is plain that when the first current is sent through, either one of the following things will occur; the wire will not become charged with the secondary current at all, on account of its having no communication with the earth to obtain it from, or, if it does become charged, it will not discharge itself, on account of there being no route or conductor to convey it to the ground. The conducting wire, then, being always charged with this secondary current, the battery current would require no extra time to charge it, and would pass at once to its destination—being neither lengthened at the other end by the secondary current following it out, or resisted at its entrance the second time by the same current rushing back to the earth.

With reference to the two inside conducting wires inducing currents in each other, on account of running parallel, the induced currents will have no effect on the primary ones, as they would run in the same direction and with less force, and I should think, would be entirely destroyed by the battery current.

I submit this idea to the consideration of those more experienced in cables than I am, as, though it is only an idea which I have no chance of testing by experiment, still, everything should be tried which would render such an important undertaking successful.

G. S.

Montreal, C. E., November, 1858.

Iron Girders.

MESSRS. EDITORS—In the issue for November 6th, and others, of your valuable journal, I read with much interest the articles headed as above, and was not a little surprised at the new theory there advanced, as I had always considered Hodgkinson and Fairbairn unquestionable authority in such matters. The following quotation, however, would throw a doubt on the result of their experiments:—"The pressure of a load on the upper side of a beam must extend downward through its entire depth, producing vertical pressure on every possible horizontal line or plane within its depth, equal to the weight of the load, and finally result in the pressures on the bearings under its ends. This simple statement, so obviously true, ought to be sufficient to dispose of the absurd notion of a neutral axis." Only that to insure its truthfulness, the beam, unlike all other beams, must on no account be permitted to attempt any deflection from the strain of the load, because when it does, the top flange *will* suffer from compression, and the lower one from tension, gradually diminishing in intensity as they approach each other, the point where the two are expended must necessarily be free from strains, and therefore *is* correctly called the neutral axis. The parallel rib and flanged girder alluded to is well known by engineers not to be in strict accordance with the theoretical requirements of strength, but as a general thing, the convenience of the shape for all building purposes, and the facility afforded in the manufacture, especially if of wrought iron, is a sufficient apology for the excess of material.

The mode recommended by your correspondent to convince the doubting of his theory, by dividing "a beam horizontally in two parts, in any line where they suppose the neutral axis to be situated. Then if they will place their hands between the upper and lower parts thus divided, they will become *painfully* impressed with a conviction that the supposed neutral line is not free from pressure." Certainly a very novel way of appealing to their senses, only there is one little difficulty to be overcome before it could be done. The dividing a beam as recommended, would, unfortunately, produce two beams, with two compressing and two extending surfaces, and in putting their hands between the two, they might, perhaps, get them hurt. It is however, hardly likely that the admirers of Hodgkinson and Fairbairn could be induced to submit to such a test.

M.

Baltimore, Md., November, 1858.

Salt as a Fertilizer.

A correspondent writing to us from Kanawha, Va., where the Salt Springs are located, requests some information regarding common salt as a fertilizing agent. He says in reference to it, "that it is no doubt a valuable agent when properly applied, and were the facts generally known, they would be prized by a large class of your readers."

Plants, like human beings, require for their sustenance and growth a certain amount of the constituents of common salt, and these must be furnished from the soil, in order to be taken up by the roots. If the soil in any district contains a sufficient supply of these substances, of course the addition of more salt would be of no avail. Fields along the sea coast generally receive a sufficient quantity of salt from the rain clouds which carry saline matter, and deposit it near the source whence they originate; the lighter rains being free from saline matter are carried to a greater hight and wafted far inland. In localities remote from the sea, salt applied in moderate quantities to the soil is generally beneficial. Agricultural chemists, however, are not fully agreed as to the soils for which salt is most applicable, only that all soils should contain a certain amount of the constituents of salt, for the healthy growth of plants, such as about five hundred pounds to every acre, taken at a depth of six inches. To determine the amount of salt in the soil, the following will be found sufficiently accurate for all common purposes. Take half a pound of dry soil, and wash it with two pints of cold distilled water, then filter it through paper. Now, take a weak solution of nitrate of silver, and pour it into the filtered liquid. If there is salt in it, a white precipitate will be thrown down, which will acquire a purple color on exposure to the light. Dry this precipitate in an oven, and in every ten grains of it there will be four of common salt. If half a pound of dry soil yield one grain of salt it will contain 500 pounds in every acre, six inches deep. On inland meadow lands, especially those which are somewhat old, salt supplied as a top dressing, at the rate of fifty pounds to the acre has been found very beneficial. All farm yard manures contain considerable quantities of common salt, and where these are applied as a top dressing, salt is not generally required. Heavy saline rains from the Atlantic do not generally reach beyond the Appalachian chain of mountains, therefore common salt as a fertilizing agent, we think, may be used with advantage on all lands west of these elevations until we come to the Rocky Mountains.

Purifying Coal Gas.

In manufacturing gas from bituminous coal, sulphureted hydrogen also passes over from the retorts, and this must be removed to render the illuminating gas fit for use. This has always been a difficult and expensive part of the process, but it is so no longer. A very remarkable patent case, in which this question was at issue, was recently tried before Baron Bramwell and a special jury, at Guildford, England. The plaintiff was P. C. Hills; the defendants, the London Gas Light Company. Hills obtained a patent in 1849, for the use of the hydrated oxyd of iron in separating sulphured hydrogen from the gas, also for renovating the oxyd of iron after it had become saturated with sulphur, so that it can be used for the same purpose repeatedly. The defendants admitted the use of this material for purifying their gas, but contended it was not the invention of Hills, but of A. Laming, who had secured a patent in 1847 for effecting the same object. The jury, however, gave a verdict for Hills, it having appeared to them that it was an hydros, nothydrosoxyd, which Laming described in his patent.

We direct attention to this subject principally to suggest to all the gas companies in our country, who use coal containing sulphur that they employ hydrated oxyd of iron as an effectual and cheap purifying agent. The way to prepare it is to dissolve the sulphate of iron (copperas) in hot water, mix it with the milk of lime, allow the precipitate to settle, pour off the clean liquor, and expose the precipitate to the air for a few days. By such exposure it becomes an oxyd, and in a moist state is employed either by itself or mixed with the sulphate of lime. The gas to be purified is passed over the oxyd in a close vessel, either before or after it has been passed through the lime purifyer on its way to the reservoir. This hydrated oxyd will only absorb a certain quantity of sulphur, after which it must be exposed to the atmosphere for some days, or else heated in a furnace until it becomes red hot. This action drives off the sulphureted hydrogen from it, and it can then be re-employed for the same purpose.

Notes and Queries

** PERSONS who write to us, expecting replies through this column, and those who may desire to make contributions to it of brief interesting facts, must always observe the strict rule, viz., to furnish their names, otherwise we cannot place confidence in their communications.

H. C. G., of Philadelphia.—Common indelible ink—made by dissolving nitrate of silver in a minute quantity of ammonia—may answer your purpose for writing on porcelain labels for flowers and plants. Keep it in a dark place or in a blue bottle when you are not using it. If this ink washes out by exposure to rain, try thin black paint.

A. P. L., of Ill.—Air is doubled in volume by a temperature of 491° Fah. A cubic inch of air heated to 300° expands to 1·610 cubic inches.

A YOUNG READER—The reason why rain water is soft, is because it is not impregnated with earth and minerals. It unites freely with soap and dissolves it, instead of decomposing it as hard water does. It is difficult to wash your hands in hard water, because the soda of the soap unites with the sulphuric acid of the hard water, and the oil of the soap with the lime, and floats in flakes on the top of the water.

L. P. S., of Conn.—The helices of magneto-electric machines are made separate from one another.

R. C. D., of Pa., inquires why it is that flame will not pass through the very fine wire gauze used in miner's lamps? Answer: Simply because the metal wire is a very rapid conductor of heat, and when the flame of gas burning in the lamp reaches the wire gauze so much heat is conducted away by the wire that the flame is extinguished.

L. W. B., of Conn.—Your new method of laying out a race course so as to equalize the distance to be run by the horses, would not be the subject matter of a patent; in other words, it is not an invention within the meaning of the statute.

P. M. E., of N. C.—Sharp's rifles will answer for sporting purposes. We thank you for the high opinion you express of this journal. You are one of its oldest patrons.

G. O. E., of New Orleans.—Address F. H. Smith, of Baltimore, Md., upon the subject of brick-making.

J. M. C., of Ohio.—The idea of wrapping the conducting wires of submarine cables around a core of gutta percha is good, no doubt, but you have been anticipated.

J. M. W., of N. Y.—"Dick's Practical Astronomer" will give you such information as you ask in reference to small telescopes.

G. M., Jr., of N. Y.—Your project of making a water light is chimerical. You cannot decompose water in a glass lamp by the action of its flame upon a wire passing down into the liquid.

J. E. B., of Cal.—We have entered your name for one year's subscription. We have no confidence in fish-catching recipes. We consider them mere traps to catch human gulls in.

W. S., of Ohio.—We do not call to mind any decision of the United States Courts in reference to the validity of B. F. Palmer's artificial leg patent. Your drain tile machine seems to be new. You had better send us a sketch and description of it. The subject of draining land will acquire, we think, additional interest every year, and it deserves attention. Experiments are now in progress on some of our southern plantations, where draining is almost a necessity. The earth needs air as well as moisture, and the drain tile assists in this very essentially.

H. H. S., of Ga.—The reason why sap ascends through the tubes of a plant, is because of capillary attraction, assisted by light and heat, and when these lose their power, the juices again descend by the same tubes. It is legal to tender for debts all gold coins at their respective values for any amount; the half dollar, quarter, dime, and half dime for debts of any amount under five dollars; three cent pieces for debts of any amount under thirty cents.

E. G., of Washington City.—The art of drawing is coeval with civilization itself. Oil painting was, however, invented by Van Eyck, a Flemish painter, in 1415. The first oil painting ever made is now in the Cathedral of Ghent, in Belgium; the subject is "The ascension of the saints to heaven." From that time pictures executed by these new processes were in such request from foreign countries that the painters of that country could not execute them fast enough. The art was also extensively practised in Italy in the 15th century.

B. A., of Ohio.—We have carefully examined the sketch and description of your alleged improvement in harvesters, and advise you not to apply for a patent. You will find substantially the same thing illustrated and described in Volume X, page 184, of the SCI. AM. This volume contains a valuable history of this class of inventions. In reference to engravings, we prefer to have our artists prepare them when intended for our paper. We should probably charge less for them than you would have to pay in your place, and they would be superior in quality; besides this, we would publish them in the SCI. AM. free of charge.

CASTING HEAVY GUNS—On page 60, present volume of the SCI. AM., in an item on this subject, we stated that a gun recently tried at Castle Island, near Boston, was made by Messrs. Aller & Co.; we should have said Alger & Co. We might also add that the one tried was selected from thirty others by the officer appointed by the Bureau of Ordnance at Washington, and there is every reason to believe the other twenty-nine are just as strong and good.

J. W. R., of ——.—The blades of the propeller in the Winans' steamship are not fastened to a water tight drum, but on a central shaft, the water having free access all around and about them. Of course she must require less power to propel than to upset, or else she will turn round like a porpoise at play. As you say however, the tendency of the propeller will always be to roll her over, but this could be easily prevented by having two propellers revolving in opposite directions. We are given to understand that her first trip is to be to New York. If she arrives here, we shall assuredly go and see her, and then we will be able to give a more decided opinion of her merits or demerits.

FIRST IRON PATENT.—Lord Edward Dudley seems to have been the first successful patentee in connection with the iron manufacture in England. The gradual exhaustion of the supply of wood from the forests led naturally to the substitution of some other fuel than charcoal. In 1612, King James I. granted a patent to one Simon Sturtevant for making iron with pit coal. He was compelled by the king to publish his discoveries, which he did in a book called his "Metallica." His invention was a failure, and he surrendered it the following year. In respect to Lord Dudley's patent, although he was able to make only about three tuns per week, yet in the celebrated act abolishing the grant of monopolies, his patent was exempted although it met with much opposition.

LETTER WRITING.—We are in the habit of considering ourselves the greatest reading and writing people in the world; we are certainly not the latter, for while every person in the United States sends but 4·9 letters per annum (upon an average of ten years) by mail, the inhabitants of Great Britain send 17 letters each per annum. This is accounted for in some measure by the superior delivery arrangements in large cities, the rate being only two cents, delivery included, all over the kingdom.

J. P. A., of N. Y.—You can obtain black lead crucibles of Joseph Dixon, Jersey City, N. J.

A. T., of Pa.—Use copal varnish for japanning your tin, and dry thoroughly in an oven heated to 180°, and you will be successful. The reason why your japan is so easily scratched with the finger nail is owing to its not being sufficiently dry, or perhaps you have used too much turpentine in it. Varnishes may be colored with any of the pigments used in oil painting.

H. D. T., of N. Y.—To "case harden" iron, make a paste with the prussiate of potash and a little water; apply it to the surface of the article, allow it to dry, then insert it in a clear fire until it assumes a low red color, when it should be taken out and dipt in cold water. This process converts the surface of iron into steel. Iron is burnished with a polished steel tool called a "burnisher," which is rubbed hard over its surface. The file marks on the article must be previously removed with emery. Etching, not engraving, is executed on steel and copper plates with dilute nitric acid. The outlines of pictures only are thus traceed to assist the engraver.

O. M., of Eric, Pa.—The common rule for calculating the horse power of a steam engine is to multiply together the area of the piston in inches, the number of pounds pressure of steam per inch in the boiler, minus four pounds deducted for friction of engine, and the velocity of the piston in feet per minute, and divide the product by 33,000, which is the number of pounds a horse is capable of raising one foot per minute. The power of your engine thus calculated would be 78½ (inches, area of piston) multiplied by 46 (pounds pressure of steam) multiplied by 320 (speed of piston in feet per minute) divided by 33 000, equal 34¾ horses power. It is proper, however, to state that, owing to the difference of pressure in the boiler and cylinder, this is a very unsatisfactory calculation, though the best that can be made without an indicator, which is an instrument for taking the pressure of the steam in the cylinder throughout the stroke. The average of the pressure thus found being used in a similar calculation to that above given in the same way as the boiler pressure, gives the most correct estimate of the power of an engine that can be obtained by any other means than a dynamometer. The proportion of grate surface commonly employed in small boilers is about a square foot per horse power, and a square yard of flue surface. In boilers of large power a less proportion of grate surface is used.

J. A. H., of Md.—To remove dried plaster from glass, use warm soap suds.

O. O. B., of Ill.—We cannot advise you to make any such desperate attempt to procure a patent on an invention of doubtful novelty as to risk all your hard earnings on the result, and unless you can find some one to advance the funds, you had better defer the matter.

C. G., of Tenn.—For information about a bolt and rivet machine address Bassett & Bateman, of Cincinnati, Ohio. We believe they have a good invention for this purpose.

Money received at the Scientific American Office on account of Patent Office business, for the week ending Saturday, November 20, 1858:—

W. M., of Md., $30; G. W. P., of L. I., $30; C. A. B., of N. Y., $20; W. Y. G., of Ky., $10; N. D., of N. J., $15; N. W., of Wis., $10; L. F. M., of N. Y., $30; H. M., of Ky., $30; J. D. F., of Ala., $30; R. B., of N. Y., $25; T. H. M., of La., $25; G. W. F., of Mass., $37; D. W., of Mass., $25; J. C., of L. I., $30; J. Y., of Pa., $25; B. B., of Md., $30; H. Z. & Co., of Ohio, $55; J. L. W., of N. Y., $25; J. M., of L. I., $30; S. E. T., of N. J., $37; W. W. L., of Ohio, $250; G. S., of N. H., $30; J. T., of Ohio, $25; R. G., of Md., $107; C. & F., of Me., $30; G. G., of Ill., $55; J. F., of Pa., $30; H. F. W., of Ill., $30; E. O'C., of N. Y., $30; O. S., of N. Y., $50.

Specifications and drawings belonging to parties with the following initials have been forwarded to the Patent Office during the week ending Saturday, Nov. 0, 1858:—

T. H. M., of La.; T. R. Van G., of Pa.; T. T., of Ohio; C. A. B., of N. Y.; J. Y., of Pa.; H. B. T., of Wis.; G. W. F., of Mass.; N. D., of N. J.; R. G., of Md.; A. K., of N. Y.; O. S., of N. Y. (two cases); G S., of Ill.; J. L. W., of N. Y.; T. & M., of N. J.

Literary Notices.

THE BOOK OF MORMON. Translated by Joseph Smith, Jr. New York: J. O. Wright & Co., 377 Broadway. This is a new American edition of this most remarkable work, perhaps, from its astounding effects, the greatest literary curiosity of the age. The introduction gives all the arguments, *pro* and *con*, for its authenticity, and as a matter of history as representing the grandest delusion of the nineteeth century, it is certainly worth a perusal by all. We, of course, do not recommend the deductions which are made from it, but simply think it is worth a reading from the astounding moral phenomena of which it has been the cause.

BERTRAM NOEL. A Story for Youth, by E. J. May. New York: D. Appleton & Co., Broadway. This is a pleasant story and well told, and the principal character and hero of the tale is a good model for the youth of both sexes. The characters are well drawn, and if there be the slightest fault to find, it is that it terminates too abruptly, and there is not enough of it.

THE EDINBURGH REVIEW—L. Scott & Co., 79 Fulton street, New York.—The Octobor number of this fine old magazine contains a number of able reviews, the one on "Gladstone's Homer and the Homeric Age" being a chef d'œuvre of classical criticism.

THE WESTMINSTER REVIEW—L. Scott & Co., 79 Fulton street, New York.—The current number has a splendid article on "Indian Heroes," and another on "F. Newman, and his Ecclesiastical Critics," in which the orthodoxy of English theological schools is completely demolished.

ILLUSTRATED ANNUAL REGISTER OF RURAL AFFAIRS FOR 1859. 144 Engravings. Price 25 cents. T. Tucker & Son, Albany, N. Y. This valuable farmers' almanac is full of useful information and pleasant facts, good advice on moral subjects, and plenty of valuable knowledge. Every agriculturist should have one.

HALL'S JOURNAL OF HEALTH. No. 3 Everett House, New York. This popular journal still keeps up its interest, and the practical medical advice which its colums contain recommend it to every one as one of the most entertainly useful periodicals published.

A WORD TO OUR PATRONS.

RECEIPTS—When money is paid at the office for subscriptions, a receipt for it will always be given; but when subscribers remit their money by mail, they may consider the arrival of the first paper a *bona fide* acknowledgment of the receipt of their funds. The Post Office law does not allow publishers to enclose receipts in the paper.

BACK NUMBERS.—It has been our custom in years past to send the back numbers of our paper to all who subscribe during the first quarter of the volume. This system has given satisfaction heretofore, and we shall continue it on this volume, unless the party subscribing orders to the contrary when he remits. Those who do no not care for the back numbers, to render their volumes complete, can have their subscriptions commence at the time of remitting by signifying such a desire.