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NEW YORK, SATURDAY, SEPTEMBER 3, 1859.

MAGNETISM ON RAILROADS.

MAGNETISM is one of the most subtile and wonderful agencies of nature, and the genius of man has been exercised in a thousand modes to render its power subservient to his purposes. In this he has been successful in applying it to the compass for navigation and surveying, and to the magneto-electric machine, which is employed to a very limited extent in England for electro-plating. The usefulness of the compass depends upon its needle assuming a position by which its poles are attracted to point continually north and south, being thus directed by the great magnetic currents of the earth. In itself the magnet possesses a great attractive force for drawing certain metals towards it and retaining them in contact, and it was by this peculiar property originally known. It was supposed by some nations, during the dark days of superstition, that a spirit dwelt in the loadstone, which, in certain cases, exercised its power for evil purposes, and many shipwrecks were once attributed to its influence. Imagination fixed huge magnetic rocks in several dangerous seas, which drew out every spike and fastening from all vessels that came within their influence, and down went every one on board to the bottom of the deep. The story of "Sinbad the Sailor" and his shipwreck at the loadstone mountain is founded upon actual tradition.

The inherent attractive force of the magnet, as it costs nothing, has been frequently the subject of study to inventors, as affording a probably, cheap and constant power for moving machinery, and also for securing perpetual motion. This never can be effected; neither a constant rotary nor reciprocating rectilinear motion in machinery can be produced by permanent magnets, as the attractive force requires to be nullified or suspended in order to produce motion in an opposite direction. There is another kind of magnet, however, by which machinery may be moved; but this is owing to a totally opposite principle in it from the loadstone. The magnetism of the latter is permanent, that of the former is temporary—it is a powerful magnet this instant, a piece of inert iron the next. This is the electro-magnet. It is composed of a piece of very pure soft iron forming the core for a helix of insulated copper wire wrapt around it. When the ends of the helical wire are placed in the circuit of a voltaic battery, the soft iron at once becomes a powerful magnet; but when the circuit is broken, the iron as suddenly ceases to attract. By placing a series of such magnets in a circle or in a line, and throwing the voltaic current alternately from one to the other by keys, to attract a wheel or a piston, rotary and reciprocating electro-magnetic engines, like those of Professors Page, Vergnes, and others, have been produced. Such motors are too expensive for operating machinery, in general, in comparison with steam and water power; but for some situations and purposes, such as for small machines like those used for sewing, which require to be frequently stopped and set in motion, they may yet be applied with convenience and economy.

Another application of such magnetism has recently been brought in a very prominent manner before our people, viz.: magnetizing the driving-wheels of locomotives to increase their traction on the rails, as noticed in our last issue. The paper read on this subject before the late meeting of the Association for the Advancement of Science, related the experiments of E. W. Serrell, C. E., in testing the efficacy and utility of such magnets for this purpose. With two batteries of intensity, containing 16 cups each, having 300 square inches of zinc surface, a magnetic attraction, equal in power to 38 pounds of steam pressure on the square inch of piston area, was obtained between the rails and the wheels, or, as has been stated, an additional adhesion of seventy-five per cent. The lower segments of the two driving-wheels were fitted with insulated helices of No. 8 copper wire, each 2,700 feet long. The wheels were four and a half feet in diameter and weighed 1,100 lbs. each; one wheel had south and the other north polarity. On a very slippery rail 19 lbs. of steam per inch slipped the wheels without magnetism; under the same conditions 35 lbs. were required to slip them when magnetized. On a very clean rail and everything being favorable, 50 lbs. of steam were required without any magnet, and 88 lbs. when magnetized.

This application of electro-magnetism was stated by Mr. Serrell not to be new, but that, from previously ascertained facts, all that had been done before him was of a discouraging character; and it was against "a unanimous *no*," to the probabilities of success, that he persevered and obtained such favorable results. In 1852, a German mechanic, named Nickles, tried similar experiments, and it was stated in *Chambers' Journal* that these had been made with large locomotives in full operation, and that they were quite successful. If they were, however, it is remarkable that they fell to the ground as undeserving the attention of engineers, and if the experiments of Mr. Serrell have been as effective and useful as it has been stated they were, we certainly have arrived at a new achievement in railroad operations deserving the attention of all men. It is calculated that $26,000,000 per annum is the cost of depreciation in our railroad structures, principally caused by the use of heavy locomotives, their great weight being required to produce the necessary traction. From this it has been inferred that, with locomotives of 20 tuns weight, having magnetized wheels, as much work can be done as with other locomotives weighing 40 tuns, and thus save a great amount of wear and tear in the rails and permanent way. Our opinion is at variance with such a conclusion, and we base our views upon the nature of the electro-magnet. The increased adhesion of a magnetized locomotive wheel is caused by inducing polarity in the rail, and it must take as much power to break the magnetic contact between the wheel and rail as that which induced their mutual attraction. According to this view, whatever is gained by increased adhesion is at the expense of steam power. While this is our opinion, we think Mr. Serrell deserves great praise for what he has done to test the question, and further experiments (which we understand are to be undertaken) may prove that his application of electro-magnetism may be profitably applied to every locomotive in our country. A correspondent (O. H. Needham, M.D., of this city) states, in a letter to us, that if he had been worth a few thousand dollars five years ago, his electro-magnetic brake, combined with an electro-magnet tractor, would now be embodied in all the locomotives running. He has perfect confidence in the utility, economy and adaptability of electro-magnetism to locomotives for producing new and important results.

THE LABOR QUESTION.

One of the greatest struggles that has ever taken place between employers and their workmen has lately been going on in London. As we understand the question, all the operative builders of that city resolved some time ago to obtain a reduction of the hours of labor from ten to nine, daily; and, in order to secure this result, they planned a campaign of aggression upon the most scientific strategetical principles. Their mode of operation was to demand their terms from each master-builder in succession, and to "strike" against only one at once, and those remaining at work were to support those on strike, until all the employers were vanquished in rotation. The master-builders having been informed of this skillfully-planned design, resolved to prevent the result which might flow from it by forming a counter combination, and demanding that all the operatives should abandon their position. This they refused to do; and the whole question, as it now stands, resolves itself into the simple fact, that the master-builders of London have struck against their operatives—about 90,000 in number—to prevent an anticipated reduction of the hours of daily labor. The journeymen-builders of London work 10 hours during the first five days of the week, and only eight on Saturday, and their wages is about $1.32 per day. Their employers waited upon the Home Secretary, Sir G. C. Lewis, in order to solicit his influence, and that of the House of Commons, against their workmen; but the Home Secretary snubbed them, and said "the government made no distinction between classes." He told them that if it were wrong, as they had expressed themselves, for the workmen to form combinations, it was equally wrong for them, as employers, to do so. The employers contend that the claims of the operatives are unreasonable and unjust; the latter retort, and say the same opposition and arguments were used in former times against reducing the hours of labor from 14 to 12, and from 12 to 10, "and if bank and government clerks work only six, seven and eight hours daily, why should mechanics, whose pay is smaller and labor more severe, work 10 hours per day?"

Public opinion in London and the whole kingdom appears to be on the side of the operatives, and it is believed that a compromise will soon be effected between them and their employers, as the subject has been taken up in the House of Commons, and a bill brought in to establish equitable councils of conciliation between such parties.

In the city of Albany, N. Y., a very extensive strike among the molders has been going on for some months, and far more to the injury of the employers than the operatives. Both parties are formed into opposing combinations, and each employer, it is stated, is pledged to a forfeit of some thousands of dollars if he submits to his molders' demands without the consent of all the other employers. In the neighboring city of Troy, N. Y., the master-molders acquiesced in like demands that were made by their operatives, and, as a consequence, they have large orders to fill which otherwise would have been executed in Albany; and much business has thus been diverted from the latter city.

The coal-miners in Pittsburgh, Pa., and its neighborhood, to the number of 3,000, are also out on a strike at present. They demand that the coal which they mine shall be weighed at the mouth of the pit, and not measured, according to the practice heretofore pursued. They assert that the cars by which their coals have been measured have been enlarged in size, and that they have to furnish more coal for the same compensation. The employers assert that it would be a great increase of their expenses to weigh the coal, and that it would be of no benefit to either party.

Several other minor strikes are now going on in various parts of our country, and the labor question appears to be assuming greater importance than it has done for a great number of years past. Those conflicts between capital and labor, which we call "strikes," are to be deplored, because they do injury to all parties. We would greatly rejoice if some means, such as courts of conciliation, were organized to prevent them by settling disputed questions upon equitable principles.

HINTS TO THINKERS.

In this world there are two lines of knowledge, two trains of thought the mind can follow, two roads on which the inquirer can travel—the positive and the speculative. Although they both start from the same point, yet like the boundaries of an angle, they continually diverge and lead in very opposite directions, to very different results. The starting point may be said to be, the God-implanted spirit of inquiry, and the results are, respectively, firm unshaken truth and doubtful wavering error. These are the extremes, the happy medium lies in the bi-section of the angle, hard fact enjoyed in conjunction with a regulated imagination. On this line lies what we call the poetry of science, the dignity of labor, and the majesty of toil. To illustrate:

The strata which is below the coal beds was particularly adapted for the growth of certain kinds of plants, which when they decayed or were imbedded, by slow decomposition have formed coal. This is the simple fact. But geology's poet—Hugh Miller—has brought the very scene before our eyes, has made us actors in the very epoch, and while scientifically accurate, has placed a halo of romance around this operation of nature. He blended actual fact and a vivid imagination, always (as he

should) making the latter subservient to the the former.

Again, we talk of the dignity of labor, and the majesty of toil. Which of us while at our avocation, whether of brain or hand, think, at the time the mental energy or physical strength is in use, that it is anything but work; work the necessity, not the pleasure. But when the book is written, the money made, the end accomplished, the rail-road built, the machine erected or the land tilled, and we see the results of our work and exertion, in the period of our recuperation, it is then that we feel that we are dignified, are majestic, and we feel grateful to the toil and labor which has made us so.

To moralize: No man should learn hard facts alone, let him acquire those which especially apertain to his business, and the comforts and affections of home, or the excitement of travel will balance these; but should he from inclination or ambition strive to acquire more, in order to keep on the line that bi-sects the angle, he must estheticise his knowledge, that is to say, he must find a poetry in the facts and a broad meaning for the worlds' good, in the phenomena. There must be a tendency to ponder and moralize, as well as to investigate, and the results of his moralizing must be based on a perfect knowledge of the premises. The want of this has caused the many errors of the day; the desire to strike out something new—to be original—being strong in man. The most original thinkers have been the most surprised at their own thoughts. With tyros (for whom we now especially write) this is a common fault. Learn well, first as a study; then speculate, as a recreation; and "isms" in knowledge will cease and wither before the overwhelming tide of common sense.

These may be called platitudes, but it is necessary now and then to reiterate them in order to regulate the investigations and thoughts of the day. Everyone will not take the trouble to read large books on the discipline of the mind, and a few remarks thereon are often useful to such thinking men as form the readers of the journals and periodicals of the day.

THE ATLANTIC TELEGRAPH & INVENTORS.

The secretary—Mr. George Saward—of the Atlantic Telegraph Company, invites inventors, patentees, and manufacturers of submarine cables to send plans or specimens of their cables calculated for laying across the Atlantic, to him at the office, 22 Old Broad-street, London. Accompanying this invitation, which has been advertised in the London papers, he states that the object of soliciting specimen cables and plans is to submit them to the consulting committee of the company "for examination, testing and experiment."

The names of those who compose the *Consulting Committee*, are not given in the advertisement, but we will give them for the benefit of those who may have the curiosity to know who they are. R. Stephenson, M. P., C. E.; I. K. Brunel, F. R. S.; E. Clark, C. E.; G. P. Bidder, C. E.; J. Hawkshaw, C. E.; J. Longridge, C. E.; Professor Wheatstone, F. R. S.; W. A. Miller, F. R. S.; Professor Morse; Professor Henry, Washington; Professor Bache, U. S. Coast Survey; Lieut. Maury; and W. E. Everett, C. E. Among this number there is not one to whom exception can be taken as a man of science, but excepting Wheatstone, Henry and Morse, we never heard of any of them be ingdistinguished, theoretically or practically in electric engineering. It would have been well had there been fewer civil engineers and more practical telegraphic operators in the consulting committee. There is something, no doubt, to be gained in influence, by presenting the names of such distinguished men, but at the same time it appears to us that these names have been obtained more for the purpose of giving dignity to the company, so as to give confidence to the public, than for the purpose of working out the best means of operation, both for testing the cable and laying it. The honorary consulting electrician is Professor Thomson, of Glasgow, the regular consulting electrician is C. F. Varley, London—both able men. No contract to commence operations for making a new cable will be made until $1,500,000 are subscribed, and if this sum is not obtained the deposits that may be paid in will be returned to subscribers. The company is guaranteed a sum of $170,000 from the British and American governments if the cable is laid and worked successfully. The new capital will consist of 120,000 shares at £5 (about $25) each; this is called *preferential*, because the subscribers to it are to be first paid 8 per cent from the profits, then, if there are any dregs left, the old shareholders are to get them. Old friends are generally the sufferers in such enterprizes, like the original subscribers to the New York and Erie Railroad. We really hope, however, that the requisite amount for constructing and laying a cable will be obtained, and that at no very distant day from this. It has been stated that a proposition was made to raise the old cable and use all the parts of it that are sound; but we hope no attempt will be made to carry out such a preposterous idea. The old cable was totally defective in nature and construction, and the gross want of science displayed in its selection has left a very unfavorable impression on the public mind regarding the company—its directors, secretary, and all its officers.

A SPLENDID NUMBER OF THE SCIENTIFIC AMERICAN!

We are now preparing, and shall publish in the course of two or three weeks, the largest and most splendid number of the SCIENTIFIC AMERICAN ever issued. It will contain eight pages more than the regular issue, making in all 24 pages, with about 25 engravings executed in our usual style. As we announced at the beginning of the New Series, we shall spare neither time, talent nor expense in keeping the SCIENTIFIC AMERICAN what it is recognized to be—*the most useful and best conducted journal of its kind extant.*

We trust that our friends will use their endeavors to promote the circulation of our journal, thereby not only favoring us, but at the same time greatly benefiting every branch of industry in our country. As a practical commentary upon this suggestion, we present herewith a notice taken from the Brooklyn *Daily Times*:—

THE SCIENTIFIC AMERICAN.—We were conversing with a tradesman the other day, who assured us that he would not miss taking the SCIENTIFIC AMERICAN on any account, and referred particularly to one improvement which he had been able to make in his business from a hint given in its columns, which added largely to his profits. Among the useful contents of this week's number is full information relative to patents as well as to all the matters interesting to the mechanical and scientific world. We notice a preventive of the frequent casualties by burning fluid which distress our readers and occupy our columns. If a garment be steeped in a mixture of phosphate of ammonia and sal-ammoniac, it is rendered as nearly fireproof as can be desired. All ladies who use burning fluid should try this recipe.

INVENTORS' EXCHANGE.

We have been often solicited to connect with our business, as solicitors of patents, an office for the purchase, sale and exchange of patents and patent property. We have always taken the ground that it was not compatible to connect the business of soliciting of patents and the sale of inventions together, for many reasons obvious to the understanding of inventors. We have, therefore, always declined to take any pecuniary interest in inventions; and so long as we continue to act as attorneys for soliciting patents for others, we shall refuse to become interested in any patents or inventions, so that no person can have a pretense for accusing us of neglect or imputing to us unworthy motives in conducting his business. In this respect we are bound to take the Bible doctrine, and abstain from all appearance of evil. In connection with these remarks, however, it is proper to inform inventors that an Inventor's Exchange has recently been opened by Messrs. S. A. Heath & Co., on the same floor with our extensive offices (but in no way, directly or indirectly, connected with the SCIENTIFIC AMERICAN Office); and those of our readers who desire an agent in this city to dispose of their patents, or to purchase for them good inventions, are recommended to correspond with Messrs. Heath & Co. direct. Messrs. H. & Co. inform us they have made extensive arrangements for exhibiting machines and models at the coming fair of the American Institute, and desire us to state that they will have efficient persons in attendance to describe the operation of the machinery which they will exhibit, and make sales of territorial rights, or solicit orders for machines, as the parties employing them may direct.

BURNHAM'S WATER WHEEL.—We learn since writing the description published on page 56, present volume, SCIENTIFIC AMERICAN, that at one mill it drives two pair of five feet corn stones and one pair of five feet wheel burrs, and grinds 21 bushels of grain per hour, besides driving all the machinery in the mill. The wheel is six feet in diameter and works under a six-foot head and face of water.

FOREIGN SUMMARY—METALS AND MARKETS.

The great prominent event of the week is the completion of the *Great Eastern* on the 8th ult.—the time specified for this result in J. Scott Russell's contract. On the subsequent day this achievement was celebrated by a grand banquet on board, at which there was quite an array of great men. There are two steam cranes on the decks for loading and unloading, and 5,000 tuns of coal can be put into the bunkers in 24 hours. The fittings of the main saloon are magnificent, but several minor rooms are not to be completely furnished until the first voyage is made; still they are very neatly arranged. All the rooms and cabins are very lofty in the ceiling, being about 15 feet in the clear, which will make them exceedingly pleasant. The engines were tried before the invited guests sat down to dinner. She has separate sets for the two side-wheels and the stern propeller. The former were built by Boulton & Watt, the latter by Scott Russell; and great interest was excited in regard to their performance. Those for the side-wheels consist of four oscillating cylinders, each of 74 inches diameter and 14 feet stroke. Each forms a complete engine in itself, capable of easy connection and disconnection, and when united, they make four entire combined engines. Those for the screw are also four in number. Each cylinder is 84 inches bore and only four feet stroke, so as to work at the rate of 45 strokes per minute, with steam at 15 lbs. on the square inch, cutting off at one-third the stroke. The united power of the two classes of engines is 12,000 horse. Of course this power must be generated in the boilers, which are said to be very strong and sufficient to supply the requisite amount of steam. When loaded, this vessel will weigh about 30,000 tuns, and, when driven by the 12,000 H. P. engines, a speed of 22 miles per hour is expected to be attained. In 1641—two hundred years ago—the navy of England consisted of 42 ships, the aggregate tonnage of which was 22,511 tuns; now, what do we see in the progress of two centuries in England? One single steamship, belonging to the merchant navy, of a greater capacity than the whole fleet of the kingdom in the days of Cromwell. The engines of this great ship worked beautifully when put in operation, and the result was considered by all the engineers on board to be satisfactory in the highest degree and beyond what could have been expected. It is stated that her first ocean voyage will be to Portland, Maine; but she was built for the East India trade, and this is to be her ultimate destiny. In cases of emergency she can carry 10,000 soldiers, besides her crew, with all their equipments of war, and will be able to run down the largest frigate in the world as easily as one of our river steamers can run down a row-boat. This is the grandest experiment in ship-building ever attempted since the Deluge, and nowhere out of London, we believe, could the men and money have been secured for such a gigantic venture.

R. Mushet, the well-known metallurgist, has recently obtained two patents for new alloys of metals. One is for a compound of cast-iron and metallic tungsten; the other for combining a small portion of tungsten with cast-steel, whereby the quality of the latter is stated to be greatly improved.

Mr. C. Beslay, of Paris, has lately secured a patent for coating articles of iron or steel with tin, zinc or lead, or alloys of these metal, by electrical deposit. In the galvanic batteries which he employs for depositing these metals on the iron or steel, such as knives, &c., he employs a solution of caustic soda or potash instead of acids. The alkaline solution dissolves the tin and lead to form the coating without engendering any tendency to oxydise the metal which is to be coated, and thus a very permanent and adhesive deposit is made.

At a late meeting of the Electric and International Telegraph Company, held in London, a dividend of 6½ per cent per annum was declared. R. Stephenson, M. P., acted as chairman, and in making some remarks, he recommended a large reserve fund to meet the expense of wear in the cables. He stated that some submarine cables were worn out in five years, others in ten, and as the company had expended £140,000 in cables, £14,000 should be laid past as a reserve every year to renew their cables in ten.

THE DEMAND FOR COTTON.—The efforts of the Manchester Cotton Supply Association seem to be producing some good results in spreading the cultivation of cotton,