[For the Scientific American.]

The Electro-Magnetic Engine.

MESSRS. EDITORS—The article which appeared in your valuable paper of the 13th inst. on my electro-dynamic engine, exhibited in the Crystal Palace a few days since, brings into view the main issue on which must finally depend the decision to be made by capitalists, and others, as to the practical value and availability of my invention. Its superior simplicity of construction, economy of space, freedom from explosion, and continuity of action, when brought into comparison with the steam engine, will hardly be contested. The consideration commending itself to your judgment relates to the comparative economy of electricity thus employed with steam for a motive power. In view of all previous efforts to render electricity available, some doubt might be reasonably entertained on this score. The working cost of the engine on exhibition does not exceed two dollars per day, a sum which might easily be lessened, by the disposal of the sulphate of zinc produced by the action of the galvanic battery, as well as the residuum of the acid. Admitting your estimate that a steam engine of 10 horse power consumes but one dollar per day of ten hours, it can be shown that my engine is more economical, even were the cost of running it three times the present amount. Let us suppose the two applied to navigation. A small vessel with the steam engine on board, and intended to run, say from New York to New Orleans, will have all her remaining space taken up with coal, leaving no room at disposal for merchandize; whereas on a vessel of similar tunnage using my electric engine, the demand of the stowage required by the nitric acid (the only fuel to be stowed) would be so limited, that the assumed increase of cost would be more than compensated in this respect. Indeed, so great would be the advantage that even the electric engine already exhibited by me, could be thus at once advantageously adopted. The contrast between the economy of the two motor powers will be yet more strikingly evident, by a supposed enlargement of the vessels to any wished for extent, furnished with proportionately sized engines; for, if the new steam engine be found to cost one hundred times more than the former, that is to say, should cost one hundred dollars in ten hours, it certainly will not yield one thousand horse power; whilst on the other hand, at a cost of sixty dollars per day, my electric engine would yield 2500 horse power.

The experiments made at the Crystal Palace on the two electric engines have already proved that the larger one, with twenty times the amount of electricity supplied to the smaller one, produces over five hundred times the power. Accepting this as a basis of calculation, the above follows as a result. Thus, with an expense of less than two-thirds of that of the steam engine of the above stated dimensions, the electric engine is found to yield a power more than double. The advantage of applying this electric engine to navigation, whether to large or small vessels, is thus rendered apparent; this advantage must increase in an enormous ratio with the size of the hull to be propelled, in respect to any electric engines adapted to it. Extraordinary as this result may appear, it may easily be conceived, when one takes into consideration the fact, that electricity permeates the whole mass of ponderable bodies submitted to its action, and does not merely act on the surface as steam does. It follows that the mass is the direct measure of the pressure of electricity, whilst its comparative working expense proceeds on a decreasing scale, this being measured by the *surface of the battery.* Steam, on the contrary, acts only on the surface of the body to be set in motion, and the measure of its pressure is necessarily restricted to this surface, whilst the cost is represented by the *mass* or cube of the dimensions; thus the inertia of the mass, increases at such a rate as to set a limit to the size to which a steam engine can be advantageously constructed or economically worked.

Finally, I would observe, that in electricity the *expense* is measured by the *square* of the homologous dimensions, and the *power* by the *cube* of the homologous dimensions, whereas in steam, the expense is measured by the cube, and the power by the square of their homologous dimensions. M. VERGNES.

New York, June 18, 1857.

[We will present our views briefly on the only point which we think deserving consideration, namely, the possibility of the above engine becoming a useful motor like the steam engine. Prof. Vergnes' states that the "main issue on which must finally depend the decision to be made by capitalists, and others, as to the practibility and availability of the invention," is "its superior simplicity of construction, economy of space, freedom from explosion, and continuity of action when brought into comparison with the steam engine," and these advantages, he says, "will hardly be contested."

We widely differ from him in this opinion. We admit that no explosion can take place in the batteries of his engine, as with a steam boiler; but his engine is neither as simple nor compact as a steam engine, taking the latter with all its appurtenances. His large electro-magnetic engine in the Crystal Palace, which is not claimed to exert more than 10 horse power, (and which, we believe, from mere inspection of its operation, is not five,) with 128 cups of battery, occupies more space—engine and battery—than many steam engines working up to 20 horse power. It is a mistake to consider the steam engine a complicated machine; it is a most simple motor. We had no means of measuring the length of the arms of the electro-magnetic engine; but, judging by the eye, they form the spokes of a revolving wheel not less than eight feet in diameter, and the engine is only 10 horse power. We are positive that it is impossible to run large engines of this character, for they would soon shake themselves to pieces by the centrifugal action generated.

It would be gratifying to us were electricity harnessed so as to operate economically as a motive agent, and thus become a substitute for the steam engine, but electrical engineers, in our opinion, are still very far from the attainment of such a result. If electricity could be applied as a practical motive agent, we can easily conceive the many advantages it would possess over steam. From a grand reservoir of batteries the electric fluid could be supplied through insulated wires to work engines in every part of a city, in the same manner that gas is furnished to support illumination in stores, houses and workshops.

In the experiments made at the Crystal Palace, every manifestation of an increase of power in the engine was only obtained by a similar increase of battery expenditure, just as in the steam engine. It is not by experiments like those alluded to, that we, or any mere looker-on, can investigate correctly the claims set up for this engine; nor are such experiments satisfactory in comparing its expenditure with that of the steam engine. Let a locomotive upon the same principle be built and tested with a steam locomotive, and then we can have a basis for comparing the merits of the two; or on a smaller scale, let the engines in the Crystal Palace be fairly tested with a steam engine in driving machinery, performing constant, every-day labor, such as printing presses. If this is attempted, we have no hesitancy (judging from mere inspection) to predict that it will not do as much work with twice the expenditure as a 5-horse power steam engine. At some future period Prof. Vergnes may (and we hope he will, for we wish him all success) so perfect his electro-magnetic engine that it will stand forth as the grand invention of the age. He is working in a hopeful field.

Who Invented the Menai Tubular Bridge?

MESSRS. EDITORS—Sir I. K. Brunel had nothing to do with the design or construction of the above wonder of the world. I notice, however, that in your correction of the Philadelphia *Ledger* on the subject, you have omitted the name of one of England's greatest engineers in connection with this matter, viz., Robert Stephenson. To him alone is the world indebted for the original idea of employing a hollow wrought iron tube for the purpose of carrying the Chester and Holyhead Railway over the Menai Straits. To William Fairbairn belongs the credit of having conducted the vast and costly experiments which were necessary before deciding on the *details* of this mammoth structure. It would be hardly fair to call Mr. Fairbairn the *inventor*, neither would it be just to give all the credit to Mr. Stephenson. The Menai bridge may be considered as their *joint production.* The Brunels, both father and son, have glory enough (not the bloody glory of the battle field) of their own, without crediting to them the works of others. E. M. RICHARDS.

Lebanon, Pa., June, 1857.

MESSRS. EDITORS—I perceive from a paragraph in your last issue on the subject of the tubular bridge over the Menai Straits, that you claim the merit of that magnificent invention of modern genius for William Fairbairn. Allow one of your constant readers and admirers (who finds your journal one of the most attractive features in our public library, over which I have the honor to preside,) to say that your judgment on that point does not coincide with that of the author of an elaborate article in the London Quarterly Review, nor with that of Jas. D. Fownes, D.C.L., F.R.S., Sec. R. S., and author of the Sixth Dissertation prefixed to the eighth edition of the Encyclopedia Britannica, on the progress of the mathematical and physical sciences. In this Dissertation (which has accompanied the twelfth volume of the Encyclopedia Britannica) page 877 of Dissertation, you will find as follows :—

"To Mr. R. Stephenson is clearly due the credit of undertaking, on his sole responsibility, a project of equal boldness and novelty, and of contriving, not perhaps in every detail, but in its totality, the means by which so signal a triumph of art and science was carried into effect, an honor to his own age and a lesson to posterity."

The remainder of the paragraph, while acknowledging the signal merit of Messrs. Fairbairn and Hodgkinson, as assistants, still claim the responsibility and the honor of the plan, as a whole, for Robert Stephenson. I am aware of the labored attempt of Dr. Brewster, or some other able writer, in the North British Review, to detract from the high merit of Mr. Stephenson; but I must confess, after a candid perusal of both articles, and careful reflection, that I still regard Robert Stephenson as entitled to the immortal honor of conceiving and developing the first grand idea of that magnificent work of art and genius, although greatly dependent on the amazing practical skill and constant aid of Messrs. Fairbairn and Hodgkinson.

Hundreds and thousands of practical men will take their opinions from you, and it behoves you to deal out fair and exact justice between man and man.

You will excuse this note, as your opinion has excited a little controversy among your readers in our rooms. Will you please let us know the grounds of your opinion, and if hastily formed, perhaps you may see reason to change or modify it. F. J. JUDSON.

Library Rooms, Bridgeport, Ct., June 16th.

[As early as 1802, Mr. Rennie proposed to construct a fixed cast iron bridge over the Menai Straits of one single span 450 feet, and 100 feet above the water. His plan was not adopted—that of Telford (a suspension bridge) was substituted. Forty years afterwards, when the Chester and Holyhead railway had to be carried over the Straits, Mr. Robert Stephenson—who was chief engineer—acting on Mr. Rennie's idea, proposed to build a cast iron arched bridge of two spans, each 450 feet, 100 feet from the level of the water to the crown of the arch, and 50 feet from the spring of the arch to the water. The Commissioners of the Admirality refused to permit the erection of this bridge—they required a clear water way of 100 feet. Mr. Stephenson then abandoned his first plan, and proposed a hollow girder or tube of wrought iron, and suggested the elliptical form as the best; but he did not go on and carry out the idea. Not relying upon his own knowledge in such matters he wisely determined to call Mr. Fairbairn to his assistance. Why did he select him? He might have gone on unassisted and completed the Britannia tubular bridge; and the reasonable conclusion is that he would have done so if his plans had been perfected. Mr. Fairbairn was sel ected, because he was the inventor of the wrought iron hollow girder, which he had applied in constructing floors as early as 1832, and because he was better acquainted with the strength and combinations of wrought iron plates for building purposes than any man in England. Mr. Fairbairn's experiments, which were conducted at the request of Mr. Stephenson, resulted in the discovery of that form of the tubular bridge adopted—not that first suggested by Robert Stephenson—and he secured a patent for his method of constructing hollow wrought iron girders October 8, 1846, eight months before the first tube for the Britannia bridge was commenced—which was in June, 1847—and since that bridge was put up he has constructed several railroad bridges on his hollow girder principle.

In what we have said now and in the note which called forth the above letters, we have not used a single word that could be construed into a disparaging remark towards Robert Stephenson. Our language in the article referred to was, "William Fairbairn, C. E., discovered the best form of bridge, and he certainly is the inventor of it, as it is now constructed." Our correspondents have not adduced a single fact to prove the incorrectness of our statement, which does no discredit to Mr. Stephenson, nor ruffles his well earned laurels as the chief engineer of the Menai Tubular Bridge.—ED.

Inventor of the Mexican Barometer.

MESSRS. EDITORS—By referring to Thomas Jefferson's letter to Mr. Vaughan, dated at Paris, December 29, 1786, a very full description will be found of an instrument that has been going the rounds of the newspapers a few weeks past as a Mexican barometer of recent invention. It is spoken of in the letter as a hygrometer invented by Mr. Rittenhouse. C. H.

Detroit, Mich, June, 1857.

[We are glad that our correspondent has directed our attention to this circumstance in connection with the name of David Rittenhouse, who was one of the most skillful and ingenious mechanics and philosophers our country has produced. He was born at Germantown, Pa., 1732. He taught himself geometry and discovered fluxions before he was aware that this had been accomplished by the great Newton. He united operative skill with high scientific qualifications, made chronometers, telescopes, and mathematical instruments, and was the first American astronomer in his dy. He constructed a planetarium in 1770, which raised his reputation as a mechanic, mathematician, and astronomer to the highest grade. In 1795 he was elected a fellow of the Royal Society of London; and his life is an example worthy of being copied by every young American mechanic.

Treating Wood for Violins.

MESSRS. EDITORS—I saw in the SCIENTIFIC AMERICAN a few weeks since an article on violins. I made one about six years ago with a curled maple back and hemlock top. The wood was very well seasoned, but I also put it in a steam box placed on the exhaust of an engine, and left it for about eight hours. In about three weeks after this treatment of the wood I commenced to make the violin, and before gluing the pieces together, I made some very weak glue water, and washed their inner surfaces. It is considered to be the sweetest toned violin in this place by those who have played on it. I think wood becomes more solid by being steamed. This is the reason why my violin has such an excellent tone. H. STRAUCH.

Pottsville, Pa., June, 1857.

Comparative Speed of Horses and Oxen.

A bet was made recently between two farmers in France about the speed of horses and oxen with a heavy load the same distance—about twelve miles. A four horse team was put to a wagon loaded with 10,000 pounds of beet root pulp. The oxen were two or a double yoke, with the same amount of load. The horses beat them only seven minutes. Time, 3 hours 6 minutes; 3 hours 13 minutes.