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Contents:

(Illustrated articles are marked with an asterisk.)

A SCIENTIFIC AND TECHNICAL AWAKENING.

Our English cotemporary, *Engineering*, appears to have seriously exercised itself in the perusal of our good-natured article on "English and American Scientific and Mechanical Engineering Journalism," which appeared in the SCIENTIFIC AMERICAN, February 4th; at least, we so judge from the tenor of an article in response thereto, covering a full page of that journal. The article in question is a curiosity in literature. It deserves a much wider circulation than *Engineering* can give it, and we would gladly transfer it to our columns, but for its exceeding length—a serious fault generally, not only with *Engineering's* articles, but most other technical journals published in England. It would scarcely do for them to be brief in their discussions, and above all other things, spice and piquancy must always be excluded. *Engineering* evidently labors under the conviction that the heavier it can make its discussions, the more profoundly will it be able to impress its readers. Hence, we are equally astonished and gratified to find a gleam of humor flashing out from the ordinary sober-sided composition of our learned contemporary. The article came to us just as we were laboring under an attack of dyspepsia, and its reading fairly shook our atrabilious *corpus*. We said to ourselves, "can it be possible that *Engineering* is about to experience the new birth, to undergo regeneration, and a baptism of fire?" The article is really worth reading, and we begin to indulge the hope that at least one English technical is going to try to make itself not only useful, but readable and interesting. And what is most perplexingly novel in this new manifestation, is the display of a considerable amount of egotism, which we had always supposed to be a sinful and naughty thing in technical journalism. And, as if to magnify this self-complaisance, it actually alludes to its "*own extensive and ever-increasing circulation in America.*" Now to show how small a thing can impart comfort to the soul of our cotemporary, we venture to say that the circulation of *Engineering* in this country cannot much exceed three hundred copies per week.

It evidently amazes our English cotemporary that a journal like the SCIENTIFIC AMERICAN, which, according to its own notions, is chiefly the work of "scissors and paste," should circulate so widely; and it even belittles our weekly circulation by several thousand copies, in order to give point to its very amusing, and, we will also add, generally just criticism.

The writer in *Engineering*, whoever he may be, appears to be a sort of literary Rip Van Winkle, just waking out of a long sleep; and he cannot get the idea through his head that it is possible that a technical journal can become a vehicle of popular information to the mass of mankind, instead of being the organ of a small clique of professional engineers or wealthy manufacturers, such as seems to hold control of the columns of *Engineering*, and who use it either to ventilate their own pet schemes and theories, or to advertise, by illustration and otherwise, in the reading columns, a repetition of lathes, axle-boxes brakes, cars, and other trade specialities, which can lay little or no claim to novelty. It is, furthermore, a crying sin in the estimation of our English critic that American technical journals do not separate their advertisements from the subject matter; and he thinks that when Yankee editors learn that trade announcements are out of place in the body of a journal, they will see how to make their journals pay by making them higher priced. Now we venture to say, without intending to give offence, that Yankee editors understand their business quite as well as do English editors; and it is presumable, at least, that they know what suits their readers on this side, much better than do English editors. We venture to suggest—modestly, of course—that journalism in the two countries is not the same, and should the editor of *Engineering* undertake to transfer his system of intellectual labor to this side of the Atlantic, he would not be long in making the discovery that those wandering Bohemian engineers, who, he tells us, are in sorrow and heaviness over the short-comings of American technical journals, would turn out after all to be slender props for him to lean upon. We think it probable, however, that with a little more snap, a journal like *Engineering* might possibly attain a circulation, in this country, of 500 or 1000 copies weekly.

Why, American engineers have scarcely yet been able to organize themselves into an association for mutual advancement in their profession, much less to give the reading public the benefit of their experience and labors! This fact alone ought, of itself, to satisfy *Engineering* that no such journal could profitably exist in this country. Whenever our American engineers are ready to support such a journal, there will be no difficulty in finding a publisher.

Engineering, in its casual reference to the various technical journals of America, omits to name our leading scientific monthly, but introduces with just commendation a venerable cotemporary, now upwards of three score years of age. Now, it is no disparagement of this really modest monthly to say, that perhaps there are not sixty hundred people in the States who know it, even by name; and so far as the use of "scissors and paste" are made available in our technical journals, we venture the assertion that the editorial staff expenses of the SCIENTIFIC AMERICAN are as great, if not greater, than those of *Engineering*. The question, however, is not so much one of original outlay, but which of the two journals gives most for the money. In this very essential particular, and with no intention to depreciate the value of *Engineering*, we assert, with becoming modesty, that the SCIENTIFIC AMERICAN occupies a position which *Engineering* will never be able to attain.

THE SHERMAN PROCESS.

When people boast of extraordinary successes in processes the details of which are kept profoundly hidden from public scrutiny, and when the evidences of success are presented in the doubtful form of specimens which the public has no means of tracing directly to the process, the public is apt to be skeptical, and to express skepticism often in not very complimentary terms.

For a considerable time, the public has been treated to highly-colored accounts of a wonderful metallurgic process, whereby the best iron and steel were said to be made, from the very worst materials, almost in the twinkling of an eye. This process has been called after its assumed inventor, or discoverer, the "Sherman Process." The details of the process are still withheld, but we last week gave an extract from an English contemporary, which throws a little light upon the subject.

The agent relied upon to effect the remarkable transformation claimed, is iodine, used preferably in the form of iodide of potassium, and very little of it is said to produce a most marvellous change in the character of the metal.

A very feeble attempt at explaining the rationale of this effect has been made, in one or two English journals, which we opine will not prove very satisfactory to chemists and scientific metallurgists. The *Engineer* has published two three-column articles upon the subject, the first containing very little information, and the second a great number of unnecessary paragraphs, but which gives the proportion of the iodide used, in the extremely scientific and accurate formula expressed in the terms "a small quantity."

Assertions of remarkable success have also been given. Nothing, however, was said of remarkable failures, of which there have doubtless been some. A series of continued successes would, we should think, by this time, have sufficed for the parturition of this metallurgic process, and the discovery would ere this have been introduced to the world, had there not been some drawbacks.

We are not prepared to deny *in toto* that the process is all that is claimed for it; but the way in which it has been managed is certainly one not likely to encourage faith in it.

The very name of "process" implies a system perfected, and if it be still so far back in the experimental stage that nothing definite in the way of results can be relied upon, it is not yet a process. If, in the use of iodine, in some instances, fine grades of iron or steel are produced, and in as many other experiments, with the same material, failures result, it is just as fair to attribute the failures to the iodine, as the successes. A process worthy the name is one that acts with approximate uniformity, and when, in its use, results vary widely from what is usual, the variation may be traced to important differences in the conditions of its application.

On the whole, we are inclined to believe Mr. Sherman's experiments have not yet developed a definite process, and we shall receive with much allowance the glowing statements published in regard to it, until such time as it can face the world and defy unbelief.

The patents obtained by Mr. Sherman seem to cover the use of iodine, rather than the manner of using it, and throw no light upon the rationale of the process.

A patent was granted by the United States Patent Office, Sept. 13, 1870, to J. C. Atwood, in which the inventor claims the use of iodide of potassium in connection with the carbons and fluxes used in making and refining iron. In his specification he states that he uses abont *fifteen grains* of this salt to eighty pounds of the metal. This is about $\frac{1}{373}$ of one per cent. He uses in connection with this exceedingly small proportion of iodide of potassium, about two ounces of lampblack, or charcoal, and four ounces of manganese, and asserts that steel made with these materials will be superior in quality to that made by the old method. These claims we are inclined to discredit. Certainly, we see no chemical reason why this small amount of iodide should produce such an effect, and the specification itself throws no light upon our darkness.

If the experiments in these so-called processes have no better basis than is apparent from such information as at present can be gathered respecting them, it is probable we shall wait some time before the promised revolution in iron and steel manufacture is accomplished through their use.

RUBBER TIRES FOR TRACTION ENGINES.

When it was first discovered that a smooth-faced driving wheel, running on a smooth-faced rail, would "bite," the era of iron railways and locomotive engines may be said to have fairly commenced. The correction of a single radical error was, in this case, the dawn of a new system of travel, so extensive in its growth and marvelous in its results, that even the wildest dreamer could not, at that time, have imagined the consequences of so simple a discovery.

A popular and somewhat similar error regarding the bite of wheels on rough and uneven surfaces, has also prevailed. We say popular error, because engineers have not shared it, and it has obtained, to any notable extent, only among those unfamiliar with mechanical science. The error in question is, that hard-surfaced wheels will not bite on a moderately rough surface, sufficiently to give an efficient tractile power. It seems strange that this error should have diffused itself very extensively, when it is remembered that a certain degree of roughness is essential to frictional resistance. The smoothness of the ordinary railway track is roughness compared to that of an oiled or unctuous metallic surface; and it has been amply demonstrated that the resistance of friction, of two bearing surfaces depends, not upon their extent, but upon the pressure with which they are forced together. A traction wheel, of given weight, resting upon two square inches of hard earth or rock, would develop the same tractile power as though it had a bearing surface of two square feet on similar material.

On very rough and stony ways, however, another element: practically of no importance on moderately rough ways, like a macadam surface or a concrete road, where the prominences are nearly of uniform hight, and so near together as to admit between their summits only very small arcs of the circumference of the wheel; comes into action. This element is the constantly recurring lifting of the superincumbent weight of the machine. Even this would not result in loss of power, could the power developed in falling be wholly applied to useful work in the direction of the advance of the engine. The fact is, however, that it is not so applied, and in any method of propulsion at present known to engineering science, cannot be so applied. Above a certain point, where friction enough is developed to prevent slip, the more uneven the road surface is, the greater the power demanded for the propulsion of the locomotive. And this will hold good for both hard and soft-tired wheels.

What then is the advantage, if any, of rubber-tired wheels? The advantages claimed may be enumerated as follows: Increased tractile power, with a given weight, secured without damage to roadways; ease of carriage to the supported machinery, whereby it—the machinery—is saved from stress and wear; and economy of the power, expended in moving the extra weight required by rigid-tired wheels, to secure the required frictional resistance. The last-mentioned claim depends upon the first, and must stand or fall with it. The saving of roadway, ease of carriage, and its favorable results upon the machinery, are generally conceded.

A denial of the first claim has been made, by those interested in the manufacture of rigid-tired traction engines, and others, in so far as the rubber tires are employed on comparatively smooth surfaces; although the increased tractile power on quite *rough* pavements and roads is acknowledged.

This denial is based upon results of experiments performed on the streets of Rochester, England, between the 9th October and the 2nd November, 1870, by a committee of the Royal Engineers (British Army), with a view to determine accurately the point in question.

Care was taken to make the circumstances, under which the trials took place, exactly alike for both the rubber and the iron tires. The experiments were performed with an Aveling and Porter six-horse power road engine, built for the Royal Engineers' establishment. The weight of the engine, without rubber tires, was 11,225 pounds; with rubber tires, it weighed 12,025 pounds. Without rubber tires, it drew 2·813 times its own weight up a gradient of 1 in 11; with rubber tires, it drew up the same incline 2·763 times the weight of engine, with the weight of rubber tires added, showing that, although it drew a little over 2,200 pounds more than it could do without the rubber tires, the increase of traction was only that which might be expected from the additional weight.

It is claimed, moreover, that the additional traction power, and superior ease of carriage on rough roads, secured by rubber tires, is dearly bought at the very great increase of cost, of an engine fitted with them, over one not so fitted.

This is a point we regard as not fully settled, though it can not long remain in doubt. There are enough of both classes of wheels now in use to soon answer practically any question there may be of durability (upon which the point of economy hinges), so far as the interest on the increased cost of the rubber tires, is offset against the greater wear and tear of iron rimmed wheels. It is stated, on good authority, that a rubber tired engine, started at work in Aberdeen, Scotland, wore out its tires between April and September, inclusive; and when it is taken into consideration, that the cost of these

tires is about half that of other engines, made with solid iron rimmed driving wheels, it will be seen that, unless very much greater durability than this can be shown for the rubber, the advantages of such tires are very nearly, if not more than, balanced by their disadvantages.

The fact that one set of tires wore out so soon does not prove a rule. There may have been causes at work which do not affect such tires generally, and it would be, we think, quite premature to form favorable or unfavorable judgment, of relative economy from such data as have been yet furnished.

The difference in the current expenses of running the two most prominent types of engines, with hard and soft tires, now in use, does not affect the question of rubber tires, unless it can be shown that these tires necessitate, *per se*, such a form of engine as requires a greater consumption of fuel, and greater cost of attendance, to perform a given amount of work.

CENTRAL SHAFT OF THE HOOSAC TUNNEL.

As many of our readers have evinced much interest and ingenuity on the question of the propriety of placing reliance upon the accuracy of dropping a perpendicular from the top to the bottom of a shaft 1,030 feet in depth, by means of an ordinary plummet, we take the earliest opportunity of settling the matter beyond dispute, by reporting the results lately obtained, through a series of experiments by the engineers in charge, for the ultimate purpose of laying down the correct line for the tunnel.

The perpendicular line has, of course, been dropped many times, and the main result taken. The plummet used is made of steel, properly balanced and polished, in shape something like a pineapple, and of about the same size, weighing fifteen pounds. It was suspended, with the large end downwards, by a thin copper wire, one fortieth of an inch in diameter, immersed in water, and, after careful steadying with the hand, occupied about an hour in assuming its final position or motion, which, contrary to the expectation and theories of many, resulted in a circular motion around a fixed point, the diameter of the circle being a mean of one quarter of an inch. The suspending wire in these operations was not quite the entire length of the shaft, being only 900 feet; and before the plummet had settled, the wire had stretched nearly twenty feet.

The suspension of the plummet in water was not considered necessary for any other reason than that water was continually trickling down the wire, and dropping on the plummet. The experiments so far have not been of the perfect character it is determined to attain, when the final allignment is made, as, until the headings east and west of the shaft have advanced to a considerable distance, any slight error would be of no account.

A neat and ingenious instrument has been constructed for determining the variation of the plummet, and will be used when great accuracy is desired; the plummet will also be suspended in oil.

The bearing of the tunnel is about S. 81° E.; but, independently of its near approach to the line of revolution described by the earth, it is not considered necessary to take into account any motion it may derive from this cause. In fact, the opinion is, that the motion of the earth will not practically have any effect.

On the whole, after the still imperfect experiments which have been made, enough is established to show there is no difficulty to be encountered, other than the accurate and delicate manipulation of the plummet and its attachments.

The shaft headings are progressing favorably. The rock is not so hard or varied as that met with at the west end workings. Already nearly 300 feet have been taken out, and, with the proved energy of the contractors, this great work will doubtless be prosecuted steadily and surely to completion, within the contract time expiring March 1, 1874.

A MUSEUM OF ART AND NATURAL HISTORY.

Our recent articles on "Scientific Destitution in New York" and "The Scientific Value of the Central Park," have called forth numerous letters from correspondents, and have been extensively noticed by the press. We now learn that the Legislature of the State has taken the matter in hand, and there is some prospect, with an honest administration of the appropriations, of something being done to relieve our city from the opprobrium that rests upon it. A bill is pending, before the Senate, authorizing the Park Commissioners to erect, equip, and furnish, on Manhattan Square, or any other public square or park, suitable fire-proof buildings, at a cost not exceeding $500,000 for each corporation, for the purpose of establishing a museum of art, by the Metropolitan Museum of Art, and of a museum of natural history, by the American Museum of Natural History, two societies recently incorporated by the Legislature. This is a million dollars to begin with, and an ample site, without cost, to the aforesaid corporations.

Manhattan Square extends from Seventy-seventh to Eighty-first streets, and from Eighth to Ninth avenues, and contains about eighteen acres. Until it was set apart by the late Board of Commissioners, for the purposes of a Zoological Garden, it was proposed, by a number of enlightened citizens of New York, to devote it to the uses of four of our leading corporations, giving to each one a corner, and an equal share in the allotment of space. The societies were, "The Academy of Design," for art, "the Historical Society," for public records and libraries, "the Lyceum of Natural History," for science, and "the American Institute," for technology. These have been incorporated for many years, and are known to include the leading artists, men of letters, science, and the arts, of the city, on their lists of members. The committee went so far as to have plans of the building drawn by competent architects; but, like many other well-meant schemes, want of money compelled the originators of the plan to abandon any further attempts. In the meantime, the Legislature chartered the American Botanical and Zoological Society, and gave the Commissioners of the Park authority to set apart a portion of it, not exceeding sixty acres, for the use of the Society, for the establishment of a zoological and botanical garden. This society was duly organized under the act, and Mr. Hamilton Fish was made its president, and considerable sums of money were subscribed. But, according to the sixth annual report of the Board of Commissioners, "the society never manifested its desire for an allotment of ground." It appears to have died, and made no sign. Some of our citizens, fearing that the Central Park would go the way of every other public work in the city, made strenuous effort to revive the Zoological Society, for the purpose of obtaining a perpetual lease of a suitable site, on which to establish a zoological garden, similar to those in London, Paris, Amsterdam, and Cologne. Their object was to remove this part of the Park beyond the reach of political intrigue. Subsequent events have shown that the fears of these gentlemen were well founded. The Legislature of the State, on the 25th of March, 1862, gave ample powers to the New York Historical Society to establish a Museum of Antiquity and Science, and a Gallery of Art, in the Central Park. They have submitted designs for a building, but, for some reason, no decisive steps have been taken towards its construction.

The Lyceum of Natural History was also negotiating with the Commissioners, for the use of the upper rooms of the arsenal for its collections, and there is no doubt that an arrangement to this effect would have been made, if a fire had not destroyed the entire collections of the Lyceum. The Lyceum made great effort to raise money to purchase a new collection, but without avail; and, although this is the oldest scientific society in New York, and has inrolled in its list of members, nearly every professional scientist of the city, it is probably the poorest, in income and resources, of any academy of sciences in the world. We do not know that the Academy of Design has ever applied for a home in the Central Park; and we cannot speak for the American Institute, nor for the Geographical Society, in this particular. As we stated in our former article, the old Board of Commissioners appears to have become weary of the unsuccessful attempts on the part of numerous societies to divide up and apportion the Central Park, and they applied to the Legislature for authority to conduct matters in their own way. An act was duly passed, authorizing the Board "to erect, establish, conduct, and maintain, on the Central Park, a Meteorological and Astronomical Observatory, a Museum of Natural History, and a Gallery of Art, and the buildings therefor, and to provide the necessary instruments, furniture, and equipments for the same."

Here would seem to be ample power for the establishment of museums of science and art, but nothing is said about the manner of raising the money. One would suppose, however, that, by means of the "Central Park Improvement Fund," abundant means could have been raised. The bill now before the Legislature puts matters in a new light. If it does not conflict with previous enactments, nor destroy vested rights, it has the appearance of being a thoroughly practical way of solving the question of art and science for the city. The Metropolitan Museum of Art and the American Museum of Natural History are in the hands of the most respectable citizens of New York. It would not be possible to find a body of men of more unimpeachable integrity and greater worth, than the gentlemen who have founded these two societies. It is impossible that they should lend their names to anything that will not bear the closest scrutiny; hence the proposition, now before the Legislature, to put up buildings for them, at a cost of a million dollars, must attract unusual attention. If the State would appropriate the money to these corporations, giving them the control of its expenditure, we should have considerably more confidence in its honest administration than, we are grieved to say, we can feel under the present circumstances; and if we knew what other institutions are to have the remaining portions of Manhattan Square, it would be a great relief to our minds.

"We fear the Greeks bringing gifts," but are willing to accept the gifts, if the officers of the two organizations are certain that it is all right.

The need of a Museum of Natural History, and of a Gallery of Art, in New York, is so pressing that there is some danger of our accepting the appropriations without a proper regard to consequences. The Court House is not yet finished, and the foundations of the Post-office are scarcely laid.

REPORT OF THE JUDGES OF GROUP 1, DEPARTMENT V. OF THE EXHIBITION OF THE AMERICAN INSTITUTE FOR 1870. THE ALLEN ENGINE.

The labors of the judges in this department were much lighter in the last exhibition than in the preceding one, and we are happy to say, were, in our opinion, so far as the award of premiums is concerned, much more fairly performed. The award of two first premiums to two competing engines could scarcely be repeated this time, as there was in reality no competition. The Allen engine was the only important one entered, and of course received the first premium. The engine is, however, one that evidently could have competed favorably with those previously exhibited.

We are in receipt of advanced sheets of the judges' report pertaining to the critical examination of this engine, being a record and account of experiments performed under the supervision of Washington Lee, C. E. The experiments were very comprehensive, and comprised approved tests, of each important detail, usually made by expert engineers.

The report is too voluminous for reprint or even for condensation in our columns. In looking it through, we are satisfied that the experiments were accurately made, and that the engine exhibited great working efficiency and economy.

As the engine has been recently illustrated and described in our columns, we deem it unnecessary to dwell upon the details of its construction. The water test of the previous exhibition was employed, the water being this time measured, with indisputable accuracy, in a tank, instead of by a meter as before.

The voluminous comparison of this engine with those previously exhibited, seems unnecessary, and we think not in good taste in such a report, however much it may possess of scientific interest. Moreover, the circumstances under which the trials were respectively performed, render the comparison difficult, if not unfair.

Mr. Lee concludes his report with a thorough endorsement of the theory of Mr. Porter upon the action of the reciprocating parts of engines, as set forth by the last named gentleman in recent articles in this journal. He says:

"Under the resistance of 128·375 horse powers at the brake, the motion of the engine was remarkably uniform; not the least diminution of speed in passing the centers could be detected, illustrating very satisfactorily the value, in this respect, of the speed employed, and of the action of the reciprocating parts of the engine in equalizing the rotative pressure on the crank through the stroke. The governor was, during the trials and through the exhibition, nearly motionless, while the load remained constant, and instantaneous in its action on changes of resistance, maintaining a steadiness of running which left nothing to be desired."

The judges—Prof. F.A.P. Barnard, Thos. J. Sloan, and Robert Weir—speak in their report as follows:

"The performance of this engine has exceeded that of the two fine engines which were on trial here last year. The results seem to be without precedent in such engines. The engine ran from 11 to 12 hours repeatedly without showing a sign of a warm bearing, displaying thorough perfection in all its parts. In all respects the engine is first-class, and from the fact of its presenting weight with speed, as a requisite for perfection in steam engines, it has opened a new era in this necessary branch—its economy having been clearly demonstrated in the careful trials, which ought to be published in full."

LYCEUM OF NATURAL HISTORY.

There was an unusually large attendance of members at the meeting of the Lyceum of Natural History, on Monday evening, the 6th inst., to listen to an address by Professor B. Waterhouse Hawkins, on the progress of the work of the restoration of the forms of extinct animals in the Central Park. Mr. Hawkins gave an account of the difficulties he encountered at the outset, in finding any skeletons of animals in New York, with which to make comparisons, and he was finally compelled to go to Boston and Philadelphia for this purpose. After much study and many delays, the casts of the *Hadrosaurus* were completed, and numerous smaller skeletons prepared. At this stage of the proceedings an entire change in the administration of the Park took place, and the newly appointed Commissioners decided to suspend the work upon the Palæozoic Museum, and they dismissed Mr. Hawkins from their service.

The announcement that an end had thus been summarily put to one of the most important educational projects ever started in this country, was received by the Lyceum with profound surprise. For a few minutes after the close of Mr. Hawkins' report, no one felt disposed to make any comment, but as the truth of the great damage became apparent, there was considerable disposition manifested to have the Society give expression to its sense of the value of Mr. Hawkins' services in the cause of education, and their regret that so important a work should be suspended at this critical period. Remarks were made by Dr. Newbery, Professor Joy, Mr. Andrew H. Green, Professor Seely, Dr. Walz, Mr. E. G. Squier, and others, and the following resolutions were unanimously adopted:

Resolved, That the Lyceum of Natural History, in the city of New York, has learned with deep regret of the temporary suspension of the work of restoration of the forms of extinct animals, as hitherto prosecuted in the Central Park, under the able superintendence of Professor Waterhouse Hawkins.

Resolved, That the Society considers the proposed palæozoic museum not only a valuable acquisition to the scientific treasures and resources of the city, but also as a most important adjunct and complement to our great system of public education.

WARMING AND VENTILATING RAILROAD CARS.

There has been enough of denunciation against the present general method of warming and ventilating railway cars. It produces no effect on the corporations who could, if they would, adopt appliances that would not burn people to death in cases of accident, nor regularly and persistently poison them with bad air.

There is no lack of ways and means; the problem is simple and easily solved; nay—a not very extensive search through the Patent Office records will show that it has been solved already; perhaps not in the most practical and perfect manner, but still solved so well, as, were it not for corporation cupidity, would greatly add to the comfort and safety of passengers.

The real problem is how to compel corporations to recognize the fact that the public has rights they are bound to respect. It is the disregard of these rights that fills our cars