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SAYING AND MEANING.

We have for some time felt that the attention of educators, at the present day, ought above almost all things to be directed to accurate instruction in language. It is hard to say whether, in a public teacher by type or tongue, the knowledge of things or the knowledge of words to express them is the more important. Wanting either, the failure is complete; but wanting the latter, it is worse than failure, as much as delusion is worse than ignorance. The paramount regard to physical science which has been urged with great plausibility and success upon the present generation, need not be disputed. It is enough to say that by a law of nature that paramount regard is becoming well-nigh exclusive. We are but too material in our tendencies at best, and it is the nature of material objects to assert in us abundantly their own importance. The result of supplied assistance in this direction has been promptly felt in a negligence of language and a confusion of tongues which already seems like Babel come again. In the popular discussion of principles, hardly any one's meaning can be more than conjectured from his language, and friends and foes in opinion are often almost indistinguishable.

Disagreeable misunderstandings often arise out of this state of things. The exact appreciation and application of terms is nearly everything in scientific discussion, and it is but just to say that among those who have any recognized status as men of science, the abuse of language is not frequent. An instance of the kind, however, encountered us the other day from an unlikely quarter, illustrating the infelicity of loose language as forcibly as could be wished.

A paper was read which asserted the eternity of matter, and was referred to in this journal as atheistical nonsense, unworthy of the deliberations of a scientific body. The author sent us a long and irrelevant vindication of the liberty of thought, for which we had no room or need, together with a disavowal of atheism and a re-avowal of the eternity of matter, which we stated, in justice to him, but pointed out their inconsistency. More aggrieved than ever, he called upon us, complaining that we had misrepresented him. By eternity of matter, he did not mean eternity, but only indestructibility: the axiom that matter or force cannot destroy itself. But this gentleman, whom we never had the slightest inclination to injure or to wound, could not be convinced that he had misrepresented himself by abuse of language, and that eternity necessarily meant anything more than future continuance. He appears to be still engaged in "fighting it out on that line," and by the extreme indulgence of the Polytechnic Institute employing its sessions to ventilate his misplaced resentment at the fancied ill will or illiberality of the SCIENTIFIC AMERICAN. Nevertheless, we cheerfully do him the justice he has not done himself, by explaining that his heterodoxy is all in verbiage. He does not hold the eternity of matter any more than we do. He only holds peculiar opinions, to which he is perfectly entitled, on the meaning of words.

Numerous correspondents, laboring more or less under the general confusion of tongues, have since favored us with long communications pro and con, some of them very good, but which we cannot make room for. Our paper is devoted to science, but not in any measure to scepticism or speculation, as its readers well know, and by an incidental allusion to a metaphysical error, we had no intention of opening a metaphysical controversy, and cannot be drawn into it. The respectable scientific gentleman who prefaces his metaphysics with philology to prove that speculation means substantially the same thing as science, and therefore has a just claim upon our space, wastes argument on us which should be directed against the dictionary. Whether the language or its assailants will ultimately prevail in the struggle now raging, is an interesting question.

ONE CAUSE OF STEAM BOILER ACCIDENTS.

While attention is very properly being directed to the material, construction, and management of boilers with a view to diminishing the danger of explosions, it may not be amiss to recur to what under the latter head is not always a subject of investigation with those who endeavor to ascertain the cause of a catastrophe—the qualifications of the engineer. It is a somewhat singular fact that while the workman at any other business is expected to serve an apprenticeship at his trade before being considered competent to perform the work required, in many cases assurance and an assumption of superior knowledge procures an ignoramus the position of an engineer. On our railroads generally, we believe, a novitiate sufficiently long to insure the requisite knowledge, is demanded, before the fireman can have a machine, and in some cases the service in the inferior capacity is unnecessarily protracted. On some roads service as a fireman is required a number of months, which is unalterable in all cases. On others the superintendent of the rolling stock exercises his discretion as to the length of the term. We think this latter course the best, because while, if the superintendent is competent and impartial, a good judge of a man's capabilities, and unmoved by personal preferences, the interests of the company and the safety of the public are assured, no injustice is done a bright mechanic, and he is not made to suffer for the incompetency of others. One fireman may easily become a competent engineer on his route in a few months while another may run a year and then be unfit to be trusted with a machine. There is a great difference in the aptness of mechanics and in their readiness to compass an object.

Naval engineers also are usually required to pass the ordeal of a sort of apprenticeship; but the runners of stationary engines are not unfrequently selected for their willingness to work for low wages. If they can pack an engine, start and stop it, and keep it looking bright, they are considered by some employers as entirely competent. "Anybody can run an engine" is a common expression. True enough; and it might be added "an engine can run itself." The engineer, however, should be a mechanic who thoroughly understands the machine he manages and has some general knowledge of the powerful agent he attempts to control and direct. Boys who have an ambition to run an engine and men too indolent and ignorant for shop work are frequent candidates for the engineer's position. If they will work cheap the bargain is too often concluded; and when an explosion occurs from the stupidity or want of knowledge of the so-called engineer, the employer gropes about among the debris of the wreck to find some imperfect workmanship or material as the cause of the disaster. Few think to inquire about the engineer's management and such inquiries are often entirely fruitless; for if he, himself, is not buried in the ruin he has caused, he is discreet enough not to betray himself.

An engineer who will start his fires with the water below any gage, and without knowing anything about its level, is not an engineer. One who will open his blow-off and forget it while piling in the coal is hardly a safe man to have around. One who does not know how much pressure the weight on his safety valve denotes, or does not know whether the valve is fast to its seat cannot fairly be considered a competent engineer. Neither can one who places a prop over the end of the safety valve lever to "keep the steam from leaking out." Yet we have known men employed to run engines who have done all these insane and criminal acts. It would seem that here is an opportunity to discover the cause of some of those "mysterious" explosions which so bother some investigators. Others beside boiler makers may be to blame if boilers explode and human lives are sacrificed.

NOTES OF A FLYING TRIP TO NORTHWESTERN PENNSYLVANIA.

In these days of rapid traveling it would be almost useless to inquire of the tourist, who desiring to leave one point and reach another employs the forces of steam to aid him and flies through the air with a velocity rivaling that of the birds, what he had seen on the route. Only by stoppages can he gain any adequate idea of a town, village, or even a way station. To be sure, there are the elements of a flitting panorama as he flies along over some elevated ridge, on this side seeing but the wall of densely wooded steeps, and on the other beholding, far below him, the level valley with clustered dwellings, a winding stream, a country road, a slow moving vehicle, and fields for cultivation. Or, he skims along the margin of a river whose waters some hundred miles away mingle with those of an ocean estuary near some mart of trade. Or, perhaps, he glides rapidly over a level plain dotted with cultivated farms and occasionally enlivened with the white houses and tall spires of a village. But all these are like the images in a kaliedoscope, as evanescent and as changing.

Still, if he spends an hour or two in a place he may so employ his time as to gain a very fair idea of the condition of business and the importance of a locality. On a westward trip a few days ago we tarried at Dunkirk. This is the western terminus of the great New York and Erie Railway, one of the finest roads in the country, whether viewed in its length, its solidity of construction, the noble bridges and viaducts on its line, the comfort of its cars, or its general good management. At Dunkirk is located one of its establishments for building and repairing locomotives and cars. At Susquehanna station is another, very much larger and more important. This we had no time to inspect. The works at Dunkirk are, however, very extensive and appear to be thoroughly well managed. Five new locomotives are now in process of construction at these works and a number of others are re-

ceiving repairs. Outside cylinders appear to be the favorite style. Whatever objections may have been urged against such cylinders by those who have used them on other roads on account of the increased oscillation of the engine, are valueless on the Erie road, which is of a wide gage. The driving wheels of the locomotives have hollow rims and hubs, which, we were informed, insures much greater evenness of structure and strength than a solid casting. The crank pins are of cast steel, finely fitted to the hole and forced home by hydraulic pressure without key or pin to secure them. The tires now used are of steel from Krupp's works, Prussia. They are in great favor with the engineers and the managers of the road.

There are some very fine tools in this concern, but we noticed they had only the common trip hammers for heavy forgings. Their work requires a direct-stroke hammer, as it is impossible to do square work of all sizes with equal facility on a trip. The castings, both of iron and composition, which are made at this establishment, appear to be excellent, and the finished locomotives are very fine and good workers, easy to control and powerful.

Erie, Pennsylvania, in the extreme northwestern corner of the state, has some fine manufacturing establishments. To say nothing of the railroad shops, which are of the first class, there is the large concern of the Erie City Iron Works which builds portable and other engines, saw mills, tools, etc. This establishment is building the Bradley engine, a machine having two cylinders of varying diameters but of the same stroke. The large cylinder is at the end of the frame opposite the crank, and the smaller one—one-half the diameter—is between it and the crank, both forming one casting, and both on the same line. Steam is admitted to the small cylinder and works at full pressure the entire stroke, or nearly so, and is then exhausted into the larger one, thus being used expansively. It appears to be an attempt to utilize all the power of the steam, or rather to get all the advantages of using steam expansively.

The Bay State Iron Works at Erie, build engines and tools turning out some excellent work. The boilers especially which are built here appear to be made of the best materials and well put together. H. Jarecki has in the same city a large establishment for brass and iron work which possesses one peculiarity not shared by any other with which we are acquainted. He uses the gas from an abandoned oil well to furnish fuel for his engines and lights for his shop. The gas is led from the well, something over 1,000 feet distant, through a three-inch iron pipe, and is used to generate steam and warm and light the building. On Sundays and nights, when the works are not in operation, the gas is lighted at an escape pipe and burns so brightly that in the darkest nights the streets in the vicinity of the factory are brilliantly lighted. Chilled wheels for cars are largely manufactured in Erie, which satisfy all who have used them. The city, being the terminus of several important roads, is fast rising into commercial importance. The establishment of a grain elevator at the harbor, and the starting of a line of steamers from the city to Buffalo on the east, and Cleveland on the west, and a communication by water through the Lakes, the Welland Canal, and the St. Lawrence, with Europe, will before long make it one of the most important depots in the country. It is the entrance of the oil region, and the products of the oil-producing portions of Pennsylvania, and its importance as an outlet to the coal mines of several counties, will soon bring this locality into prominent notice.

THE DAY FORTY-EIGHT HOURS LONG.

Last week we showed that the first beginning of the day is somewhere between America and Asia. The precise locality of that somewhere has not been determined. If the Pacific ocean were thickly populated with men, the place of the beginning of the day would be a matter of great consequence, and would probably be settled by statute. The day would start from a meridian line extending from pole to pole, and the longitude of this day line would be so accurately fixed that a man might stand astride it and realize the paradox of having one foot in Monday and the other in Tuesday. Many of the readers of this will live long enough to hear this subject discussed in national councils.

We propose now to show that Monday or any other week day is forty-eight hours long; we mean that during the whole of forty-eight hours, Monday is on the earth somewhere to be found. The Monday of this city is of course twenty-four hours long, but before and after our Monday there is Monday in some other quarter. When Monday begins in New York, there have been three hours of Monday in London, and for three hours after our Monday ends there will be Monday in San Francisco. Thus between these places Monday lasts eighteen hours. Now if the day line were at our antipodes, Monday would begin there twelve hours before ours, and end twelve hours after ours. Thus, for the space of forty-eight hours the earth is not rid of Monday. The fact may be illustrated in another way. Suppose we are at the day line. Monday begins, there and in twenty-four hours along comes Tuesday. But just west (half an inch if you please) Monday began only an instant before it ended east of the line. The Monday east of the line is twenty-four hours long, and west of the line is the same length and in all Monday lasts forty-eight hours.

BESSEMER PRODUCTS.—Valuable articles upon the subject which have appeared in one of the last numbers were prepared by Dr. Adolph Schmidt of Troy, N. Y.

GOLD OR SILVER LEAF, as a covering for spectacles, transmits the most delicate and agreeable light for extremely weak eyes. It is a good medium for looking at the sun.