

in operation a new and convenient boiler-shop, which, we were assured, is among the largest in the country, being 200 feet long by 75 feet in width, completely furnished with steam engine, punches and all the tools usually employed in the prosecution of this branch of their business. The excellent water facilities which the site of these works affords, permit the largest vessels to come up alongside the dock and receive the machinery designed for them with great dispatch. At the time of our visit the Messrs. Esler had in course of completion the following engines and boilers: For the Union Ferry Co., two inclined engines of 38-inch diameter of cylinder, and 10-foot stroke, low pressure, fitted with the ordinary jet condensers; two boilers for the same, having 1,245 feet of heating surface in each. Engines for five propellers, now building by Van Deusen Bros., at the foot of Sixteenth street, New York, for Capt. Williams, of the Neptune Steamship Co.; these are twin engines, having cylinders of 44-inch diameter and 36-inch stroke; they are direct-acting and have jet condensers. The boilers are also building, and have a fire surface of 4,802 feet.

In addition to the above they are also building a small beam engine for Messrs. Sandford & Co., of 36-inch cylinder and 8-foot stroke, and have just completed two gunboats for the Government, which were approved and transferred to the Navy Yard a short time since. The force employed at present amounts, including men of all trades, to 380 workmen. The capacity of the works, however, will admit of a much larger number should occasion require it.

THE SCIENCE OF STEAM ENGINEERING

Not many months since a law was passed, requiring all persons in charge of steam boilers to have a certificate of competency from commissioners appointed to decide upon their fitness for their situations. In most instances, probably, this law has been complied with; in some others it has been wholly disregarded, in precisely how many, we have no means of ascertaining; accident, however, has revealed one case at least, where the person employed as an engineer had no legal proof of his capacity, and, as the issue proved, no mechanical fitness either; he blew himself up with half a dozen others.

We shall not make unfounded charges, or be entangled in any assertions which we cannot prove; and we say that, although this is the only case that we know of, as being directly contrary to the provisions of the law for such cases made and provided, we can refer to countless instances where men have received testimonials of efficiency for engineering qualities which they did not possess; the five dollars of their employer bought them a character at second hand. Now such a state of affairs may or may not be all right; it depends solely upon the light in which they are scrutinized. Engineering is a profession, it is not a trade, strictly speaking; it is not comprised in opening and shutting valves, in scientific flirts with an oil can, or in impertinence and vulgarity of demeanor when asked a civil question by an "outsider." It requires the closest attention, and both mental and physical labor, in order that the best possible results may be obtained; whoever does less than to devote all his energies to his profession, robs his employer and cheats the world of science of discoveries which he might have made had he used the faculties nature gave him. Admitting engineering to be a science and not a handicraft, we must then look for a high class of men to fill the situations, posts of honor and trust, which it opens out to the trade at large. No calling can be more productive of good results in respect to mental training than the one under discussion.

Familiarity with steam machinery, most especially with the boilers, is apt to beget a confidence in the ignorant, which is not born of a knowledge of the dangers and exigencies which are continually occurring during their working, and which is the offspring of conceit and the grossest folly; but contact with steam, a thorough elementary knowledge of its constituents, theory of action and production, only inclines the philosopher and the seeker-after-knowledge to be more patient and lowly in spirit when developing the mysteries of its sublime power, and applying the same to the arduous and monotonous task of doing the work of the world. A moment's reflection will

show this to be the true light in which to view this matter, for in what other branch of the arts and sciences can we find another person into whose sole charge is given so much responsibility and power? The magazine he guards may spread havoc and ruin about if he impede the action of the feed, or neglect the valves which control the surplus pressure. If he be upon the railroad or in the crowded city, the weal or woe of multitudes is committed to his keeping; if he be upon the sea, in the shock of battle, when iron-clad answers to iron-clad, and the sea frets itself hoarse in the vain effort to overwhelm them, the fate of nations even is in his power; the cause of truth, of justice, and human rights, or the reverse of all these, lies hidden in the lifting of a valve, the lubricating of a rod or shaft, or the loosening of a gland or screw at the proper time.

These are not mere rhetorical assertions, they are living truths, every practical man knows it, and will give his testimony to the same effect; nor is it our purpose to especially glorify engineering above all other professions, but simply to direct attention to their peculiar sphere and duties, and to make them more conscientious in the discharge of their heavy responsibilities. Into their hands is given the wealth and property of the employer; not of one, but of many; conceive then the delay and hindrance caused by neglect or mismanagement. Let one man in a district of ten square miles be five minutes late in starting his machinery in the morning; and reflect if there be one in such a predicament within the limit proscribed, what a loss will ensue to the country at large, through all its towns and cities. Or if this be too impractical in its bearings, suppose one careless man in the same area to squander his employer's oil, his tallow, waste and small stores of all kinds; that man just as much robs his fellow craftsmen of wages as if he put his hand directly into their pockets, for the next one who comes after him will probably receive less to make up for the former's waste; thus, little by little, a trade or calling degenerates, until from being a profession or a science, it falls into the hands of incompetents and inept, and ceases to be anything more than a mere occupation.

Only by slow and sometimes painful degrees can we arrive at logical deductions; and the study of steam engineering—one of the noblest sciences that ever attracted the attention of man—affords an example of the truth of this assertion. Among the mightiest physical forces of the globe, steam knows no master but a watchful one; it acknowledges no attentions but those which are undivided and unalienated by any other pursuit. Many employers, in their ignorance of the qualities required in an engineer, cause him to devote the intervals of firing to some other branch of their business, to saw wood, and, in one instance that we recall, to attend to the care of a horse; having, perhaps, some faint idea that this was the best way to give the man a proper conception of horse power; this is not levity, it is not by any means funny; but only painful, as showing the estimation a noble servant of man is held in by those whose money is able to purchase its aid.

The relations of steam engineering and commerce are fully ascertained; it is not fitful in its action, neither spasmodic nor uncertain, but give its machinery undivided care and attention, and day after day it will go on its round of duty without cessation. The pressure will be evolved, the pistons rise and fall monotonously, and the whole grand and vast system of steam in this country will perform its functions without other derangement than such as usually falls to the lot of man's devices. It is only through attention to the subject of this article that superiority in it is reached; the expert attains to better results than the neophyte, yet the former was once awkward and rude in the science, and has only obtained his superior skill by a conscientious discharge of the responsibilities given into his keeping. If, therefore, each and every one in any way connected with the care of steam machinery resolves to raise the standard of their profession, the results will be apparent in a few years, in increased pecuniary benefit to themselves, and also to the arts and world of science generally.

When it is 12 o'clock, M., at San Francisco, Cal., it is 25 minutes and 48 seconds past 3 P. M., in Boston.

Subterranean Railroad in London.

A subterranean railroad has just been opened in London. It runs from Victoria street, Holborn, to Paddington, and three and a half miles of the route are finished. The work consists of an elliptical tunnel, perforated at the top at very short intervals for purposes of light and ventilation, and in its construction the engineers have witnessed a huge battle between science and sewerage. The complicated system of sewers through which the tunnel passes has caused great trouble; the wet still streams in on either side, and the odor is anything but agreeable. Nevertheless, by dint of severe application and a great deal of ingenuity, the tunnel is gradually becoming water-tight and sweet-smelling, and on the experimental trip, three weeks since, six hundred passengers passed through without suffering material inconvenience. The *London Daily News* says:—

The tunnel is a magnificent specimen of brickwork throughout, with an arch over head of twenty eight feet span, and a height from the roadway to the crown of seventeen feet. As we have before said, throughout the greater portion of the line there is little more than a skin between the top of the tunnel and the street overhead, but in some places, in consequence of the well-known inequalities of the route, there are fifty-four feet of intervening stratum between the railway train and its rivals, the omnibuses. The line sweeps round nearly all the way in an easy curve, dipping at one place to a gradient of one in one hundred, but rising again as it approaches the city terminus. Practically speaking, a complete subterranean railway communication has been achieved between Holborn and Paddington, and a very short time indeed will be sufficient to make the whole line complete, and it must be confessed to be a very wonderful work.

A street engine for drawing ponderous loads is just introduced in London. Its first essay was successful, a wrought-iron girder weighing twenty tons having been drawn over the pavements with ease and without accident. Its wheels are very wide, and it turns aside for vehicles as readily as a cart. Great crowds assembled to witness the performance as it passed through the streets.

If such engineering feats are accomplished in Europe, they can be here, and it seems perfectly feasible to construct a railroad tunnel in this city, upon the same principle; the passage of the main streets, Broadway, Grand and the Bowery, would be much easier for pedestrians, and the transmission of all sorts of merchandise greatly facilitated. The tunnels, however, need not be confined to railroads, but might be constructed so that every main artery of travel in this city should have its cut-off or outlet; in this way the city could be used on both sides, and the improvement consequent upon the introduction of a system similar to the one spoken of would soon be apparent. The only objection to the plan would be the water and gas pipes; perhaps these could be evaded by going below them. Politicians might also object to reaching their destinations by such a questionable route as an underground railroad, but we think that even their prejudices would be overcome in time. In respect to the street engines, we have had several machines in operation which could be adapted to the same work as the English one has performed. Should a tunnel be projected, they will have an excellent opportunity to exhibit their powers.

FOOD IN PARIS.—A French journal gives statistics of food in Paris, as compared with London. According to these the Londoner's nourishment is more substantial and invigorating than that of the Parisian. The consumption of bread is about equal in the two cities, but in London a large quantity of flour is used in family kitchens, in addition to baker's bread. Of butcher's meat twenty per cent more is eaten in London than in Paris—the difference of population, of course, being taken into account in all these estimates. Twice as much fish is used in London as in Paris. The consumption of butter, milk, poultry, and fruit is larger, however, in Paris than in London.

WHEN Great Britain fought Napoleon, she made the Bank of England notes legal tender, and the premium on gold rose so high that twenty-one-shilling pieces rose to twenty-seven, but that did not prevent her from carrying on the war successfully.