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Contents:

(Illustrations are indicated by an Asterisk.)

FAULTY CONSTRUCTION OF STEAM BOILERS.

It is palpable to the close professional observer of the manner in which steam boilers are generally constructed, that there is not only great need of reform in the actual workmanship, but that a large proportion of the accidents arising from the use of steam can be traced directly to faulty construction. It is a truism that "the strength of any structure is exactly that of the weakest part;" but who can say where the weakest part of a steam boiler *is*, as they are ordinarily made? Take a simple cylinder boiler, for instance: the sheets are run through the rolls and bent to the proper radius; when the riveting gang get to work, they close up the rivets with great rapidity, but when the holes come out of line with each other, the drift pin is resorted to, and the sheets are literally stretched until the rivets can be inserted; when the drift pin is knocked out, the sheet goes back to its place, and there is already, without a pound of steam pressure, strain enough to cut the rivets off. Repeat this performance through twenty or thirty feet, the length of an ordinary cylinder boiler, and who can say where the weakest point of the structure is? Suppose such a boiler to be made of silk, for instance, or any flexible material, what shape would it be in? It would be full of puckers, folds, seams, and gathers, and represent most accurately the various trials to which that most abused of all modern engineering apparatuses—the boiler—is exposed.

The case is aggravated, not benefited, when we construct a square boiler, for this shape seems, by general consent, to have been adopted for marine service. When the angles or flanges of the sheets are not broken by the flange turners, they are cracked out by the drift pin of the riveting gang, and it ought to be made a capital offense to have such a tool on the premises of any boiler-works. New boilers burst under the most mysterious circumstances; old boilers are patched and then burst; and we are told gravely that "putting new cloth into old garments" is the solution of the trouble. On each occasion the Coroner examines a host of "experts," who proceed to declare that "the iron was burnt," "the water low," "the stays insufficient," "the water changed into explosive gases," &c.; but it never occurs to these worthies that the actual strength of the boilers was in many cases unknown, and that the boilers may have been at the bursting point for days, weeks, or months, until at length it gave way.

It may be argued against this view of the matter that, if hydrostatic pressure is applied, it makes no difference where the strain comes, for the boiler is, as we have admitted, just as strong as the weakest point. It must be borne in mind, however, that it is natural or only reasonable to infer, in theory at all events, that every square inch of the boiler sustains an equal strain; with faulty construction this is impossible, for there may be, as we have shown, almost a rending force without a pound of steam in the boiler. It is ridiculous to suppose that safety is secured by *neat-looking* rivet heads, handsomely calked seams, and extra heavy iron; the best materials and the finest workmanship in other respects are of no use so long as rivet-holes shut past each other so much that some rivets we once took from a boiler were offset nearly half their diameters. Holes will come out of truth with the utmost care, especially in such hap-hazard work as punching is generally made; and when they do so, the only safe way is to rivet all the true holes first, rim all the faulty ones to one size and then put rivets in that fit, just as a machinist turns bolts to fit true holes in a bed-plate or cylinder. This method is no doubt costly, and will never be adopted, but it has the merit of common sense if no other. There is a great deal of carelessness in caulking seams also; for when the chipper chamfers the edge of the plate, the lower side of his chisel bears on the sheet and leaves a furrow, not very deep, it is true, but sufficient to cut through the skin of the iron, which is the strongest part. Neither are the braces properly set, for some draw all one way while others don't draw or hold at all, and are perfectly loose; thus a portion do all the work, and the rest are idle, they impart no strength and are an element of weakness, for the engineer relies upon them when they are doing no good. We are confident that a great deal of attention can profitably be given to the mere workmanship of steam boilers; they are not tanks or receptacles for boiling water, but great magazines wherein a tremendous power is stored, the safe custody of which is of paramount importance to all in the vicinity.

WASTE.

There must be, of necessity, a per-centage of loss in all the material transactions of every day life, whether these be carried on in the workshop, the counting-room, the kitchen or the laboratory; but this inevitable waste can be so far reduced by good management that it amounts to but little in the course of the year. Recent observation has convinced us that the loss in large workshops must be considerable, for in a great majority of cases we have seen materials lying about under foot—bolts, nuts, washers, kicking around in the mud out in the yard, new work exposed to injury from the elements, tools misplaced, essential articles, or tools necessary to the perfection of certain parts of the work at great distances from each other, and an infinite number of abuses which, although small of themselves, when summed up, make a grand total lost at the end of the year. As the thirty-second part of an inch too little on one piece of a steam engine, a sixty-fourth on another, and as much on still another will result in great derangement of the functions of the machine, so infinitessimal waste, continually occurring, is the representative of hundreds of dollars for which there has been no return. No matter what the nature of the trade or manufacture, it is very certain that a material reduction of the expenses of every department can be made by careful attention to the minor matters, and these remarks are made with the hope that all interested will give them attention.

A NEW METHOD OF LOCOMOTION.

On the fifth of October, 1861, we published an illustration of the enlarged pipe, for the transmission of letters and parcels, which was then being laid down for experiment, in London. This tube is of cast-iron, flat at the bottom, and arched above, in the form of a railroad tunnel. It is 2 feet 6 inches wide and 2 feet 9 inches high, and is furnished with a pair of low rails, on which a light wrought-iron car runs through it. The car is propelled by the pressure of the atmosphere; the air being exhausted from before it by a powerful fan at the further end of the tube. A pressure of from 4 to 6 ounces to the inch is obtained, and this gives a speed of about thirty miles an hour. This tube was laid down from one of the railway stations to the Post-office—a distance of about a third of a mile—for the transmission of the mail bags, and has been constantly employed in this service for more than a year.

By the last number of the London *Engineer*, we see that the success of this exeriment has been so complete as to cause a vigorous effort to be made to apply it to the conveyance of passengers. The *Engineer* says that applications have been made to Parliament by two companies ready to invest their money, for authority to lay down pipes for the conveyance of passengers between different parts of the city, and that engineers are ready to risk their reputations on the success of the undertaking. The *Engineer* also remarks as follows:—

"If a mail truck can be, as it is, whisked at the rate of thirty miles an hour, through a 4½-feet pneumatic tube, it needs no great amount of proof to show that it could be made to run equally well through a tube twice the diameter, or four times the sectional area. Now the mail trucks of the Pneumatic Despatch Company have been working regularly and satisfactorily through their tubes for many months, and although this system of communication is unseen by the multitude it is as much an established fact as railways themselves. Many persons, too, have made the journey in these trucks through the tubes, and it is clear enough that the result would be the same were the trucks filled with mail bags or with human beings. There has been no interruption of the postal traffic in the pneumatic tubes, no collisions, explosions or accidents occasioned by running off the line. The air is being constantly changed, and, as those who have gone through the tubes at the highest speeds well know, the interior is pure and sweet. Yet there is an undefined dread of the pneumatic system, arising simply from the ignorance of those who know nothing of its working. A country correspondent of ours, some time ago, wrote that it was 'of course wholly out of the question to expect passengers to commit themselves to carriages in a pneumatic tube.' On the contrary, passengers will go, even from the motive of idle curiosity, wherever they are assured of safety and comfort, and it is demonstrable that both may be secured in a higher degree in a pneumatic tube than upon any railway in existence."

We published an estimate, some time since, that passengers might be conveyed by this method at a speed of 4 miles per minute, or 240 miles an hour; and the *Engineer* gave an estimate of 6 miles per minute. Most persons naturally shrink at first thought from the idea of being blown through a tube, and, therefore, the scheme is generally regarded as impracticable; but it seems to be moving forward with steady steps towards its accomplishment.

WATER AND STEAM COCKS.

The origin of the invention of these simple appliances is very obscure. As far back as the time of Humphrey Potter, the lazy boy who made the valves of the steam engine self-acting, we find mention of them; and, for aught we know to the contrary, there may be some covered up in the Pyramids of Egypt at this day. The essential principle of the appliance is the same as it always was; and there are few material alterations in the outward form and general construction. The practical work to be accomplished by a cock is to form an absolutely air-tight partition which can be converted into a free passage between certain pipes or parts of an engine. The mechanical difficulties which prevent the accomplishment of this object (for comparatively few cocks are really tight and in good working order) are want of proportion, lightness of important parts, the absence of proper fixtures to retain the plugs or keys of large cocks in their places, and defective workmanship in making the plug tight on its seat. There is comparatively little difficulty in making the plugs of lesser cocks (or "faucets," as they are termed when of a small size) tight; as the great thickness of metal, compared with the diameter of the plug, prevents springing of the casting when it is bored. As the diameter of the shell increases, the difficulty of making the cock tight is augmented, and we believe there are few or none made with keys over five inches in diameter of opening. The costly nature of the work, and the difficulties before mentioned, render larger sizes impracticable, and the globe valve is very generally used in