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HOW MECHANICS ARE MADE.

It has often been a matter for no little speculation among metaphysicians, why our country should be so far in advance of other nations in the art of invention. Although our system of education, and free institutions for obtaining knowledge of all kinds, have an important influence over the character and intellectual capacity of our countrymen, it is not to these that we must ascribe the important and notorious advantage we possess in originating new and useful contrivances for saving time and labor, and consequently amassing wealth. The great majority of inventors in this country are mechanics of one kind or another; although ingenuity is by no means confined to craftsmen, but seems inherent to all classes of our citizens, whether lay or professional. All the colleges and schools in the world cannot make an inventor out of a dunce; and in seeking for the cause of our indisputable eminence in this respect, we must turn to the manner in which our workshops are carried on, and the enterprise and mechanical talent evinced by those concerned in them.

In order to draw a parallel between our own system, and those of other countries, it will be necessary to present the condition of, and restrictions imposed upon apprentices, or those young men, by whatever name they are called, from whom all arts and trades are recruited. Abroad, nearly every workshop is hedged about with the most absurd regulations, as to inspection and free access; some proprietors going so far as to impose bonds upon their workmen to keep silence respecting the nature of their occupations. Young men, in many instances, pay a premium for a place in a workshop, and if they do not actually sign indentures, are bound by other considerations, equally compulsory, to remain in the service of their masters. They are taught only the time-hallowed processes of ages; and go on blindly in the track of routine, with, it is unnecessary to add, not the most beneficial results. The manufacture itself, whatever it may be, is divided into several branches; over each of which there is a seperate foreman, who carefully preserves his supposed secret from the others. Under these circumstances the neophyte succeeds with difficulty in becoming master of his business; and, when out of his time, sets out upon his three years travel in order to complete his knowledge. When at length he returns to his native town, he must have money and interest to be made a citizen; and be admitted as member of a trade, or guild, before he can follow his calling, except as a journeyman. Without offering any comments upon this system—practised throughout Europe, as we are informed by those who have thus served—let us proceed to consider the course pursued in this country toward young men desiring to learn trades, and the shops themselves.

Among us, the apprentice signs no bonds, nor does he give any assurance, beyond a verbal pledge, that he will remain until the close of his term. Rarely, to the credit of our young men be it said, is this confidence forfeited; and the system has been found much better than one which formerly prevailed to some extent—of taking youths from workhouses, and binding them to trades from which they ran away on the first opportunity. The workshops are all open; every process is freely witnessed by all the apprentices, and each in turn has a chance at it; they circulate among the workmen, and discuss with them the advantage of this or that tool, or way of doing work. Now is it not clear that such a course as this is greatly to the employers benefit—to the advancement of the interests of the community—and creditable to the young men themselves? It makes mechanics. It produces a generation of inventors, who are eager and anxious to win fame, and make fortunes for themselves and families by developing the experience of their working hours. It is not possible to keep such men down; it is not reasonable to suppose that they can be otherwise than ingenious, when rewards in the shape of increased wages, and prizes in the form of stupendous fortunes await only the swift inspiration, and its practical development into iron and brass, to make the inventor a benefactor of his race. Of old, nations enslaved their fellows, and made the prisoners captured by the chance of war, their serfs. To-day the inventor sits in his room, and with his instruments devises a more willing and able helot, that accomplishes tenfold greater tasks than all the armies of Xerxes could achieve. Mechanics are made by the intelligent cooperation of hand and brain; by the efficient exercise of the gifts imparted to them by nature, and the advantages extended to them for observation, by study and toil; occasionally by birth or hereditary descent; but not one person in all the world was ever a mechanic in the true sense of the word by chance, or from the force of circumstances.

HOW TO BREAK YOUR NEIGHBOR'S LEG.

If you want to injure some one, eat a banana, and throw the skin on the sidewalk. If there is a crowd passing; so much the better; you cannot fail to trip up somebody. Do the same with an apple-paring, or an orange-peel. If a poor man, who works ten hours a day to support a family of six children, step on it, he will most likely sprain his ankle, if he do no more; and be confined to the house for a month, thereby losing his wages for that time. Peach skins are also efficient weapons against the public safety. If you throw the refuse of your fruit into the gutter, that would be an infraction of your privileges as an American citizen: a deprivation not to be borne calmly. It evinces a much greater degree of independence to see a man eat fruit, and throw the stones or skins just where some unfortunate person, perhaps a member of his own family, will tread upon the treacherous thing, and be maimed for life.

Such recklessness is but little short of criminality; and although the press has from time to time inveighed against the practice, it is yet committed far too often. We are now in the season of fruit of all kinds, and let every man take these words as addressed to himself. He will not then be the unintentional cause of suffering to some innocent person.

HEATING AND BENDING ARMOR-PLATES.

In a recent report to the Admiralty of the British Armor-plate Committee, Lord J. Hay Chairman, it is stated that various processes for bending armor-plates have been examined, and that the plates do not suffer deterioration in quality from any reasonable degree of bending, provided the process is properly performed. The most essential requirement for the bending operation is that the plate be sufficiently heated, to impart to it that degree of softness necessary to admit of its shape being freely altered. A cherry-red heat is hardly sufficient for the purpose; but it should be carried very little beyond this temperature. An essential condition to safety also, is the heating of the plate gradually and uniformly throughout. The furnace must be so arranged as to prevent fierce fire-currents impinging on the edges of the plates. It is believed by the Armor-plate Committee, that the re-heating rather improves the quality of the plates, when the process is carefully conducted; as it is equivalent to annealing the metal. It is deemed injurious to bend thick plates when cold, or even slightly heated; as there are few kinds of iron sufficiently ductile to bend cold, even in small bars. A hydraulic screw, wedge, or any dead pressure, is recommended for bending, instead of blows by powerful hammers.

JERKED BEEF AND MEAT BISCUIT.

A cargo of preserved beef has lately been forwarded to Scotland from Monte Video, as an experiment, by a company established for the purpose of introducing this article into new markets. If this production suited the tastes of the "canny Scots," other shipments were to follow. It is thus described, "The beef consists of the finest grass-fed ox beef, from which the bone is separated before drying, thus reducing the weight to about one-half, i. e., every pound of dry represents two of fresh beef. This food is in general use in Brazil at the tables of both rich and poor." It is nearly similar to the dried beef so much used in the United States. In all likelihood, it will not meet with much favor in Scotland; not being prepared to suit the long established tastes of the people of that country for "spiced beef," which is prepared by rubbing the meats with dry salt, ground pepper and cloves, regularly for five or six days before it is hung up to dry. The mixture used consists of an ounce of pepper, and half an ounce of cloves, to each pound of the best salt. If American dried beef were prepared in this manner, it would be much improved, and considerable quantities might be exported to Europe at remunerative prices. Such spiced beef would undoubtedly be beneficial as part of the rations of our soldiers, if substituted for some of the pork now supplied. We are informed that the spices in such meats tend to prevent scorbutic diseases. But superior to all these beef preparations, as a convenient article for long marches, is Gail Borden's meat-biscuit. This consists of an extract of the best beef, baked with flour, into biscuit. A few ounces of it will afford nourishment to a soldier for a whole day. The late General Sumner, while colonel of dragoons, in Texas, used it; four ounces made into soup, being sufficient for his daily food in field operations. At this rate, two pounds carried in the haversack of a soldier would sustain him for eight days. What a great advantage it would therefore be to supply this as part of a soldier's rations during long marches, in place of salt junk and hard tack.

In the lectures dellvered in London by scientific personages, on articles in the Great Exhibition of 1851, Dr. J. Lindley, F. R. S., Professor of Botany in University College, said this article was more important than all other preserved food substances in the exhibition. And Dr. Playfair to whom it was referred for analysis said, "it contained 32 per cent. of flesh forming principles, and was in all respects excellent."

CONNECTIONS OF SLIDE VALVES.

The essential virtue in the mechanical adjustment of a slide valve is that it shall open and close the ports at the proper time, and that it shall be steam-tight. Other considerations present themselves, such as the proportions, friction, &c., but we confine our discussion of this topic to the connection between the stem and the valve itself. A slide valv may be properly fitted to its bearing; but by reason of a badly designed or applied connection with the stem, it may be rendered inefficient. How many of our readers experienced in these matters are there who have not noticed that the slide valve is (oftener than otherwise) worn winding, or all on one side, when there was no apparent reason for such disaster? The cause can generally be attributed to the stem and its connection. Let us examine the ordinary plans in use for working a valve. If we do so, we shall find that the form generally employed is a simple nut, in which the stem is screwed, fitted into a pocket on the valve. This kind of connection is in use on some very large engines, and it is not at all to be commended. The stem working through the stuffing-box, has a very material vibration, and does not by any means work in a straight line. The packing affords no protection whatever against the evil, and the stem may deviate measurably from travel in a true line, to the manifest injury and loss of economy in the engine.

The supposition is that the nut being easily fitted, will give a little, up and down, and let the valve work fairly on its face. Such is not the case, however; and the stiffer the valve stem is, the greater the evil. It constitutes a lever which works on the stuffing-box as a fulcrum, and pries the valve up so

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much that it wears harder in one place than another. The pressure of the steam is not sufficient to overcome the strain exerted on the valve stem by the several connections. Even when guides are provided, the same evil is not wholly obviated: as they are not always set in a direct line with the valve face. Another popular form of connecting a valve to its stem is found in the square yoke fitting completely about the upper part of the valve, and in some cases provided with a tail which runs through the back end of the chest. The double stuffing-box is a good feature, as it insures a true linear movement of the valve stem; or at least one more correct than is ordinarily obtained. But without this provision, the valve is even more liable to tilt than with the single nut; for the reason that the surfaces in contact are greater. Slide valves are also driven by a nut laying in the center of the top through which the stem passes. This is perhaps the best form of applying the stem for general use; as it insures a direct pull from the center of the object moved, and does not create an undue twisting or straining of the valve itself. Too often the face and seat of a valve seem to indicate a true surface by their polished appearance; but upon examination by proper instruments it will be found that they are not so. The slide valve, as a means of controlling the energies of the rest of the machinery, should be carefully and frequently examined to see if it is in perfect order, as much loss results by its imperfect action. A leaky valve destroys not only its own face, but that of the cylinder also; and the latter is renewed only at an expenditure of much time and labor.

THE INTERNATIONAL EXHIBITION AT HAMBURGH.

This exhibition, of which we gave notice in the Scientific American some months ago, was duly inaugurated, on July 14th, at Hamburgh, Germany, amid much rejoicing. The American department of the exhibition was not very well filled; nevertheless, one of the exhibitors, Mr. George Campbell, of Vermont, took three prizes, for the finest wool-sheep; thus distancing the celebrated Saxony fleeces, which have been so widely known. As was natural, the Germans were quite disappointed at the award of the first and second prizes to this gentleman; and expressed open dissatisfaction. Colonel Needham, the Commissioner from Vermont, in order to heal the wounded sensibilities of the natives, proposed that a comparison of the weight of the fleeces from his sheep and those of the others entered should be had; and he made up a sum of one hundred dollars as a bonus to the owner of those animals who should excel. The challenge was not accepted, however; and the previous award of the jury was confirmed.

The machinery exhibited was very small in quantity, but received favorable notice; and much disappointment was expressed that so little interest had been taken in the object and success of the Exhibition by our people. At a trial of locomotive engines for common roads, the best results were only 5 miles an hour, on a macadamized road. Professor Kelsey, of Pennsylvania, was awarded a bronze medal for an improved harrow. A number of distinguished persons from America were present.

THE ENGINEERING SYSTEM OF THE ENGLISH NAVY.

A contemplation of the laws laid down by the English Admiralty for the control of engineers in the British Navy, would hardly induce foreigners to enlist in that service (provided they were allowed to enter), nor does it excite admiration for the courtesy or sense of justice of those who sanction the laws, which are complained of as unjust and harsh to a very great degree. Our own engineers have great reason to be contented with their position and prospects, when they compare both with that of their English brethren in the profession. Of late, that portion of the English press devoted to mechanical subjects—the *Artizan*, *Mechanic's Magazine*, and others, have devoted much space to the discussion of some points, a brief digest of which we give below. If the comments and strictures of the journals are not exaggerated, and we have no reason to think they are, the most monstrous injustice and intolerance is practiced toward a class of men than whom none in any navy are more indispensable. The doctor indeed, or surgeon (in most cases by courtesy) might throw his pills and powders overboard, and no one be a loser by it. If he would but turn his attention to dosing the enemy—giving his boluses to the boarders as they came swarming over the side—he might inflict serious and irreparable damage upon them. Will it be believed, then, that this immense destructive power is turned upon the defenseless crew; and that the follower in the footsteps of Esculapius actually receives more compensation, and greater distinction, than the engineer? In a vessel of war, the latter official should in all cases rank after the first officer in the ship: commander, admiral, or whatever his title; for reasons that are fully apparent. Without further comment, we transcribe a paragraph or two on this subject from the *Artizan*. The remarks are called out by a printed circular issued by the engineers and addressed to the House of Commons, setting forth their grievances:—

"We will now briefly refer to the several clauses of the printed statement. The first states that the pay is 'insufficient to maintain the position, which their rank,' &c., and here perhaps a little consideration of naval rank may not be out of place. Of course, every individual in the navy, as in the mercantile marine, holds a certain rank or position, supposed to follow from the nature and importance of his duties—but the great distinction of the naval service is in its division into military and civil branches. The first includes Admirals, Captains, Lieutenants, Masters, &c.; the latter embraces Engineers, Surgeons, and Paymasters. The former are called Executives, the latter Civilians. The former aspire to command, and the latter, to a very great extent, monopolize all the honors and rewards the naval service has to offer. The latter—at all events the engineers—enter the service as a profession, in which at least a respectable livelihood ought to be obtained. The former are the class to which Lord Palmerston referred when he asserted in the House of Commons that 'the honor of holding a commission in the Navy was to be considered as a fair set off to an acknowledged smallness of pay.' The civilian class, however, cannot accept that supposed honor as an equivalent for the hard cash which their labor and skill fairly entitles them to receive.

"Engineers, then, few of whom can be expected to possess private means, have a right to ask that their pay shall be such as to enable them to maintain their position; not in extravagance, certainly, but fairly and honorably to pay their way, without running into embarrassment in order to maintain an appearance while in commission; when too often a wife and family is left at home struggling through difficulty and debt, to make 'both ends meet.'

"Again, 'other officers of the *Civil* branch are better paid, for services neither more responsible nor more arduous.' We do not think the engineers can be charged with presumption, in making this comparative statement of the relative importance of the duties of the civil officers; for instance, however essential the duties of a surgeon may be, and however necessary the labors of a paymaster, we think it will be readily admitted that, in a war ship especially, an engineer is at least as indispensable as either of the preceding officers. Why, then, we may well ask, are they so much better paid? The medical officer (and we should indeed be sorry if we were understood to imply that he is *too* well paid) receives 10s. per day, the first day he joins the service, while the young engineer commences at 6s. The surgeon, on his promotion, which usually takes place in about seven or eight years from his entry into the navy, gets 15s. per day; while the engineer, who seldom gets his promotion to chief in less than twelve or thirteen years, receives but 10s. 6d. per day. Nor is this injustice removed by length of service, as will be seen from a glance at the highest rates of pay to which each of the classes of civil officers can, under any circumstances, attain. The pay of a Medical Inspector is £821, or about $4,100 per annum; that of a first-class Paymaster is £600, or $3,000 per annum; whilst the highest pay of an Inspector of Machinery is but £401, or $2 000 per annum.

"The third clause refers to the accommodation provided for Assistant Engineers. Now, let us imagine a young Engineer, of good education and ability, of fair social position, and accustomed to the comforts of a good home, entering the service. His first night on ship-board is almost sufficient to sicken him. A hammock to sleep in, the open deck to undress upon, no partition, even of canvass, to screen him from the sights and sounds of stokers, marines, and sailors, he may well feel disgusted with his new career; yet so difficult is it to provide a remedy for this state of things, that it appears cabin accommodation is only asked for the senior assistant in all ships.

"The necessity for making the junior Engineers gun-room officers, is very great; not because Engineers are willing to admit that an entry into the gun-room would be an elevation or an honor to themselves: but because, while they mess by themselves, other officers in the ship are enabled, and in most instances do treat them with neglect and indifference. Their rank is at all possible times ignored; and their being banished—as they are in the *Warrior*, *Black Prince*, and many other vessels—to the fore part of the ship, away from all contact with the other officers, is looked upon and urged as a proof that the rank which the Admiralty have given them is really only nominal; and was not intended to confer upon them such claims to considerate treatment, as it does in the case of the other junior officers.

"The request that the Engineer in charge of the machinery of a ship be allowed to mess in the ward-room, is, we consider, reasonable enough; seeing that he is virtually Chief Engineer of that ship, although his rank in the service may only be Engineer, or perhaps first-class Assistant.

"It is asked that 'all time served from date on entry count for full and half pay.' We cannot understand why the younger years of a man's life should be thrown away; and why, if any time at all which an engineer serves ought to be reckoned, the whole of it should not be taken into account. At present the engineer who enters the service at 21 years of age, and is lucky enough to arrive at the position of Chief Engineer at the age of 33 or 34, loses entirely at least eight years of his time. Medical officers, on the other hand, count their time from the moment they enter, and we think Engineers should also have that right extended to them. The request is also urged that when an Assistant becomes a commissioned officer, he should be allowed a scale of half-pay.

"Assistant Engineers are the only class of commissioned officers who are not allowed half-pay; which they consider is an invidious distinction: tending, with other things, to lower them in the estimation of other officers. They are allowed a scale of harbor pay; with the amount of which they do not so much complain, as of the compulsory attendance at one of the dockyards which it enforces upon them. Other officers, after a three or four years' absence, receive their half-pay, and are thus able to visit their friends in various parts of the country; recruiting their health, and enjoying some of those social amenities, to which, however, the Engineer is expected to bid adieu when he enters Her Majesty's Navy. And when it is seen that the half-pay which is granted to an Assistant Surgeon—with whom only the Engineer can fairly be compared—is greater even than that allowed to a Chief Engineer, the Assistant Engineer, with his harbor pay and dockyard attendance, has a right to complain.

"'Their names also to appear on the Navy List,' &c. Here again Engineers are the only commissioned officers whose names do not appear on the official lists—published quarterly—and when it is known what frequent changes take place among the junior officers of ships on foreign stations, it is not surprising that the friends of an Assistant Engineer very frequently lose sight of him altogether for years, unless they happen to be in personal communication with him.

It is self evident, especially when the fact is considered that the average time it takes to arrive at the position of Chief Engineer is thirteen years, that there must be many who can never arrive at that position at all.

"Paragraph 6 is one of great importance; but except the first point, it comes under the old and most important head of pay. More pay is what it means; pay to increase annually, instead of every five years, as at present. The first point, however, deserves some consideration; the Inspector of Machinery should, we think, be a distinct rank of itself; carrying with it distinct full and half-pay. At present,

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