

The mind of Watt seems to have perceived the importance of his invention almost before his first rude model was completed. His purse, however, was light, but his faith was strong. He therefore borrowed sufficient funds to make further experiments, and a good working model to show the advantages of his improvement. But beyond this he could not proceed, not even to secure a patent, without further assistance in the way of capital, and the difficulty was to find it. His native country was then poor to a proverb, except in religious freedom, education, and philosophy, and these could not build a steam engine. After many discouragements, a friend to the invention was found in an English gentleman—Dr. Roebuck—who agreed to furnish one thousand pounds (five thousand dollars in gold) to introduce the invention in consideration of owning two-thirds of the patent.

This instrument was obtained in January 1769, but not enrolled until the 29th of April following—just one century ago. It contained a very clear description of his condensing engine, also of a high pressure steam engine, and how it could be applied to various purposes. At this stage, however, its introduction was arrested by financial difficulties in Dr. Roebuck's business, and for the following five years, James Watt could not find a person in all Great Britain who had the capital, courage, and enterprise to become his partner, and furnish the funds to build engines. At last, through the friendship and zeal of Dr. Small—once the tutor of Thomas Jefferson—an engine with a cylinder 18 inches in diameter, was put up in Birmingham; and Mr. Matthew Boulton, a wealthy manufacturer, was so pleased with it, that he purchased the interest of Dr. Roebuck, and at once the manufacture of the engines was commenced with energy. A special act of Parliament extending the patent for twenty-five years was obtained. Watt took up his abode in Birmingham, to superintend the business. Soon the fame of the invention spread far and wide, orders for the new engines poured in rapidly, old mines that had been abandoned were reopened, many new mines were commenced, and a new era in practical mechanics was introduced. Generous and fair was the conduct of Boulton and Watt toward those who desired their engines for mines. They took the old engines of Newcomen as a standard, and simply required the payment, as a royalty, of one-third the value of the fuel saved by the new engines. James Watt was now afforded the leisure and means to devote all his attention to improve his engine. Very soon, he made it double acting—a complete steam engine—and added improvement to improvement so rapidly and successfully that under his care he rendered the low-pressure condensing engine nearly as perfect as it is at the present day. The struggle was long and arduous, but deserved success ultimately crowned the efforts of the great inventor. He had the satisfaction of applying it himself to almost every purpose, for which it is now employed, and we in the New World feel gratified that he planned and built in 1805 the engine of the *Clermont*, our first successful steamboat.

Other heads and hands developed the locomotive, but he seemed to have beheld it in mental vision moving down the avenue of time, for he described in his patent, how steam could be applied to drive carriages on roads. Language is incapable of conveying adequate ideas descriptive of the benefits which have been conferred upon man by the steam engine. Day and night, on land and sea, on steamship and locomotive; in factory, foundry, mill, and workshop, the grandeur of the invention is proclaimed throughout the whole civilized world.

In the United States steam power is employed equal to the labor of 130,000,000 of men, and in Great Britain, equal to 400,000,000. It gives speed to the iron steed surpassing that of the fleetest Arab, and it moves the press which daily prints the records of our morals and the transactions of our lives. Perhaps the city of Glasgow, where Watt invented his engine, affords the best illustration to be found anywhere respecting what steam power has done for some communities. In 1755, its population was only 22,000, to-day it is 500,000. Then no man could be found in it, possessing sufficient wealth and enterprise to invest one thousand pounds in Watt's engine, now it is the engineering metropolis of the world, furnishing nearly all the great iron steamships for the merchant navies of every nation in Europe.

In the old college where the invention had its birth the inventors first model is still reverently preserved in the museum, standing beside a noble bust of its inventor. But as a fitting climax to its history, illustrating the conquering and progressive power of steam, a new structure of grandeur and more imposing dimensions, to take its place, is about to be erected in another part of the city, and the venerable old building, the cradle of modern steam engineering, will soon be occupied as a great railway depot, a rendezvous of the highest type of the steam engine.

As James Watt advanced in years, wealth and honors flowed in upon him. He was elected a member of the Institute of France, and men of the highest attainments in science and art sought and cherished his friendship. He must have been a lovable man personally. All the records of him afford abundant evidence of his wonderful gifts, his gentle and unassuming manner, and his generous and truthful nature, and that he was admired and warmly beloved by everyone who knew him intimately. We have chiefly dwelt upon his life and character as connected with the invention of the steam engine, but that was not his only invention. The power indicator, the steam hammer, and several other machines in common use, were also the fruits of his genius; and in the science of chemistry, he was the discoverer of the composition of water. Take him for all in all, he stands out on the page of history, a unique and wonderful man. Old age stole gently upon him, and although his constitution was delicate, he attained the advanced age of fourscore and three years.

In the early autumn he felt the approach of the messenger summoning him away to "The better land." In calmly contemplating the solemn event "he expressed his gratitude to the Giver of all Good, who had prospered the work of his hands and blessed him with length of days, riches, and honor;" and the great inventor calmly fell asleep, to wake no more on earth, on the 19th day of August 1819. All that remained of his earthly tabernacle was carried to the parish church of Handsworth, and there interred beside his departed associate Matthew Boulton. His funeral was attended by a large concourse of distinguished persons and his faithful workmen who exhibited sincere sorrow at his departure from among them forever.

The news of his death produced a profound sensation throughout the kingdom, and men of all ranks and degree held meetings and passed resolutions of respect to his memory. Monuments have been erected to him in various towns and cities, and a colossal statue by the celebrated Chantrey has been placed in Westminster Abbey bearing the following unequalled lapidary inscription, by the late Lord Brougham.

*Not To Perpetuate A Name  
Which Must Endure While The Peaceful Arts Flourish,  
But To Show  
That Mankind Have Learnt To Honor Those  
Who Best Deserve Their Gratitude,  
The King,  
His Ministers, And Many Of The Nobles  
And Commons Of The Realm,  
Raised This Monument To  
JAMES WATT,  
Who, Directing The Force Of An Original Genius  
Early Exercised In Philosophic Research,  
To The Improvement Of The Steam Engine,  
Enlarged The Resources Of His Country,  
Increased The Power Of Man,  
And Rose To An Eminent Place  
Among The Most Illustrious Followers Of Science,  
And The Real Benefactors Of The World.  
BORN AT GREENOCK, MDCCXXXVI.  
DIED AT HEATHFIELD, IN STAFFORDSHIRE, MDCCCXIX.*

#### HABITS OF MECHANICS.

That "habit is second nature" is not only true, but it is evident to the observant that this second or acquired nature is frequently stronger and more influential than the first or original nature. This is equally correct whether predicated of bad and injurious habits, or of good and beneficial ones. No one who has arrived at maturity but knows from his own experience the strength of habits—habits acquired, perhaps, imperceptibly and remaining unnoticed by himself until matured, and then but for an effort of memory their possessor would find it difficult to determine that they were mere accretions and not innate qualities. The importance of forming, or rather acquiring correct habits, is thus very forcibly made apparent. It forms the text for many a homily by teachers of morality; we prefer to use the fact in a different but perhaps not less important, although restricted, sense.

Let us apply it briefly to the mechanic, not as a man, an individual, a member of the community only, but mainly as a workman. It is evident that if slovenly and careless habits are once acquired it must require an effort to get rid of them; and this effort is much greater than that necessary to acquire others. Every observing mind must acknowledge this proposition, evidences of the truth of which may be found in his own experience as well as in his own observation. It is harder to overcome the pressure of habits already acquired and formed than to form others. From this it follows that the contraction of bad or improper habits is to be avoided. One of the duties of masters or employers to their apprentices and workmen should be the inculcation of correct habits in the shop, not by arbitrary rules, alone, or verbal direction, but by example. Here many fail. A master, employer, or foreman, in escorting a visitor through his establishment or department, frequently disarranges the work or the tools of the workman, and expects him to rectify these errors. So in examining a job in progress, he will delay the work and disgust the workman by his inattention to the details of "Heaven's first law," according to Pope. In such a case no rules or directions can overcome the influence of such carelessness.

Order should be the general rule of workshops and workmen; not merely order in the subdivision of the work and the arrangement of the men in gangs, but extended to the minutiae of care of tools. Each workman should know the proper place of every tool he handles, when not in actual use, and should promptly return it to its place when done with. This presupposes a place for every tool; the providing of which should be the business of the "boss" or proprietor, or whoever has immediate control. It should be a habit of the mechanic to put a tool, he has used, in order for the next user, not to leave its repair for him who next needs it, whose time may be too valuable to waste in preparing the tool for his work. Of course, this rule is subject to modifications according to the nature of the work performed in the establishment, the number of workmen, etc.; but the rule should be imperative that the tool, when wanted, should be in working order. Some may think such a requirement entails useless labor, but from our own experience we are certain that time is really saved by a rigid enforcement of the rule.

"Sloppy" workmen, and disordered shops are an abomination; too many of them exist; none are necessary. Workmen who leave a tool where they last used it, or throw it carelessly under a bench are unfit for their business. However skillful and experienced, their skill and experience will not outweigh the annoyance and cost in time by their careless habits.

A habit of promptness is hardly less necessary to make a successful workman than a habit of order. The tardiness of one man, delaying his appearance in his place at the proper moment, may hinder a dozen others and disarrange the order of a whole department. We have known of a case where a neglect of the practice of punctuality involved a cost to the proprietors of more than two hundred dollars, and secured the dismissal of the offender.

Not less is it necessary to cultivate a habit of using each tool for its special and intended purpose, and no other. The use of a screw wrench as a hammer is to be reprehended. By the way, nothing is more common than the use of any implement that happens to be in the hand at the time, as a hammer. The file, chisel, wrench, even the screwdriver, we have seen employed for striking a blow for which the hammer alone was fitted. And even the hammer is made to take the place of the wrench. Who has not seen the hasty and impatient workman attempt to tighten a nut by hammering at its corners instead of procuring a wrench? The result would be, generally, a battered nut, and possibly a sprung if not a cracked bolt.

These foolish, unnecessary, and injurious habits need not be formed, but being formed they should be abandoned as soon as possible, and sensible, reasonable, useful habits substituted. There is neither reason nor palliation for such carelessness. Our mechanics generally are men of education; they think for themselves, and are capable of estimating the force of the suggestions herewith presented.

#### EMPLOYERS AND EMPLOYED.

Much of the success which attends the management of any business, where help in a subordinate capacity is required, depends upon tact, by which subordinates are made to perform their duties willingly. Many establishments are filled with time-servers, who do their work grudgingly and shirk the moment the eye of their superintendent is off them. Other establishments exhibit, on the contrary, the more beautiful spectacle of cheerful workers, with faces good humoredly beaming, and whose blows fall harder and more constantly from very lightheartedness. They feel on good terms with their employers, their superintendents, and their fellow workmen, and thus feeling they must be more efficient than a corps of sulky sour-tempered men whose heart is not in their work, and whose superiors are regarded as their natural enemies.

These facts being admitted it is evident, that the superintendent, who, without coming short in other respects, keeps his men in good humor, is better than one who can only keep up a show of subordination by a harshness of manner which begets a reciprocal feeling in the heart of his inferiors. Such subordination is subordination under protest, a subordination which leads to secret combinations and mutterings, and is only one step from revolt.

It has been justly remarked that the most perfect subordination is that in which the rights of subordinates are recognized; in which every man has his rights, and knows that any violation of them can be promptly and surely redressed.

A good deal might be said on the rights of subordinates, but we shall only touch upon the subject at this time. In the first place every subordinate ought to have the right to defend himself from charges made against him by fellow workmen. How often is it the case that from petty malice a workman is made the subject of invidious charges, which injure his reputation for skill or his character for honesty. A workman in this trying position should feel that he has an impartial judge in his superior who will protect him from unjust accusation.

A subordinate has the natural right to expect kindness so long as his conduct merits it. Our sensibilities have often been shocked by the language we have heard employed by superintendents of large establishments towards inferiors. Swearing at workmen is a far too common vice. Were we to employ a man as a superintendent of a workshop, we should tell him at the outset that swearing at workmen could not be allowed. Any employé feels a sense of degradation from such treatment which injures his self respect and tends to make him vicious and unreliable.

The right of an employé to be treated justly and the right to be treated kindly can never be violated without loss to both employer and employé. The former loses in the amount and quality of the service performed, the latter loses a cheerful happy temper and the ennobling desire to perform his work in the best manner possible, both as a matter of principle and out of good will to his employer. Good will is worth money. It is an excellent thing to invest in. Its profits cannot be estimated as so much per cent of capital, for its first cost is nothing.

Having pointed out two rights, to which all employés are entitled, we shall point out one which many suppose belongs to them, but to which, on the contrary, they have not the slightest claim. This is the fancied right to expect or demand explanations from their superiors, why they are required to perform their work in the manner directed. Any principal of an establishment, when condemning the work of an employé, or directing him how to perform it, will voluntarily explain the matter, if he deems such explanation necessary, as instruction to guide in future work or conduct. It is his interest to do this because he gets better service by doing it. If he withholds it, however, that is his business, and his subordinate would be justly subjected to reprimand should he ask in regard to what concerns him not. If he needs instruction that is another matter; but men in active business have too much on their hands to argue with help upon the propriety of any course they may have decided upon. An arguing foreman is every bit as unfit for his place as the swearing, browbeating one. He should be a man of decision, and as decision