THE INVENTOR OF THE STEAM HAMMER.

When a man has invented a hammer moved by steam, so completely under control that it will crack an egg-shell in a wine-glass without breaking the glass, or deal a ponderous blow with the force of descending tons that will forge the great mainshaft of a steamer—his name must be permanently linked with that invention.

James Nasmyth had the good fortune to be born in a family in comfortable though moderate circumstances, and to have advantages of education both in schools and at home. And though he began his own active career at the bottom of the ladder, he was spared the struggle with poverty which, however much some have conquered in it, can scarcely be looked upon as a blessing. He came of a line quite noted for excellence in mechanics and the fine arts. His grandfather and great-grandfather were architects and builders. His father was an artist of repute, and inherited a mechanical aptitude. He invented the "bow-and-string bridge," which has been largely used on railways, and the principle of which is applied to the roofing of large structures. He also invented the method of riveting by compression instead of by hammering. In the workshop in his house his son learned the use of tools and materials, while the father's artistic taste and instruction gave him the ability to think in graphic representation.

James Nasmyth was born in Edinburgh, August 19, 1808, the next to the last in a family of eleven children. They were a happy and industrious family, helping themselves and each other. Part of the education of the boy was carried on at home by his eldest sister. Then, having outgrown her teaching, he was sent to school. He had no taste for the classics, and derived little benefit, he tells us, from his High School teaching, except, he adds, "one lesson which is of great use in after life: I mean as regards the performance of duty. I did my tasks punctually and cheerfully, though they were far from agreeable." Leaving the High School in 1820, he continued his studies in private classes. Arithmetic and geometry were his favorite branches. "The first three books of Euclid were to me a new intellectual life." His father at the same time was giving him every opportunity for practising the art of drawing, and he was learning the "graphic language" which served him so well all through his life. "I was constantly busy," he says; "mind, hands, and body were kept in a state of delightful and instructive activity. When not drawing I occupied myself in my father's workshop, at the lathe, the furnace, or the bench. I gradually became initiated into every variety of mechanical and chemical manipulation. I made my own tools and constructed my chemical apparatus as far as lay in my power."

His life was thus passing without special incident. At the age of seventeen he began to construct working models of steam engines and other apparatus required for the illustration of mechanical subjects. "The price charged for my models was £10; and with the pecuniary results I made over one-third to my father, as a sort of help to remunerate him for my 'keep,' and with the rest I purchased tickets of admission to certain classes in the university." How steadily the young man worked may be seen from this record: "I got up early in the mornings to work at my father's lathe, and I sat up late at night to do the brass castings in my bedroom." When he was nineteen years of age, at the request and expense of the Scottish Society of Arts, this budding engineer constructed a road steam-carriage, which worked successfully. In this, without being aware that it was George Stevenson's method, he used the waste steam to create a blast for the furnace.

The next stage in the life of this industrious young mechanic was spent in the engineering works of Henry Maudsley, in London, considered at the time the best of their kind in Great Britain. He owed his entrance here to the skill he showed in the construction of his models and in his mechanical drawings. Mr. Maudsley took him as his own assistant workman, and the young Scotchman, not yet of age, became intimately associated with him in carrying on his experimental work. Nasmyth's wages at first, in part owing to his own modest estimate of himself, were small. To live on them, therefore, and not to trench on the little capital he had gathered by the sale of his models, he did his own cooking in an apparatus which he himself invented, and which worked to his great satisfaction. His service with Mr. Maudsley covered a period of about two years, when that worthy man died, and in August 1831, our engineer returned to Edinburgh to begin business for himself.

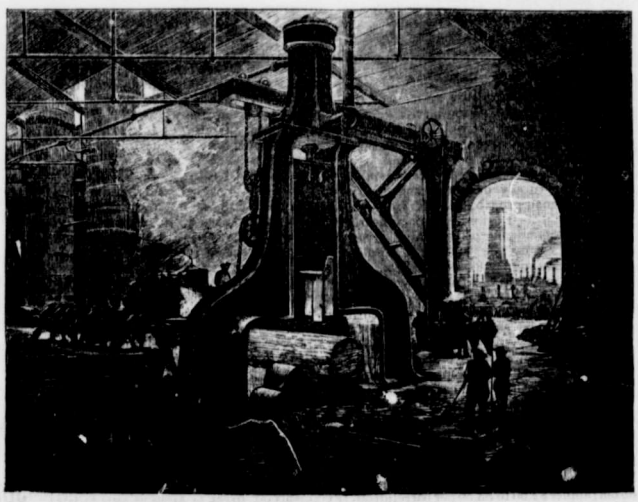
James Nasmyth

After some time spent in his native city, where he employed himself in part in the construction of machine-tools to facilitate further work, young Nasmyth, then twenty-six years of age, moved to Manchester and set to work at the manufacture of machinery of various kinds. His business grew. In order to keep pace with the influx of work he had to take on fresh hands. He put the best workmanship of which he was capable into all the machines he made. He was punctual in all his engagements. His business proved safe and profitable. It was a time of great activity in mechanical products. Railways were being constructed, and there was a largely increased demand for machine-making tools. So greatly, indeed, did Nasmyth's business increase that it outgrew the flat in Manchester where he had established it, and he was forced to provide himself with new quarters. These he found at Patricroft, on the Bridgewater Canal, and also on the line of the Liverpool and Manchester Railway. Here he erected the Bridgewater Foundry, in the conduct of which the remainder of his active life was spent. In August, 1836, the foundry was in complete and efficient action.

We have little space remaining for details. Our readers will find those in the volume. We there learn how he associated a business partner with himself; how he managed his workmen so as to avoid the difficulties of strikes; how he infused a spirit of zeal in those in his employ; and how he married happily and settled down in a home of his own. We turn to the invention of the steam hammer. The immediate occasion of its device was the call for a paddle-shaft of greater dimensions than had ever before been made, to be used in the steamer "Great Britain." There was no shop in the country that could undertake so large a forging. The engineer of the company inquired of Mr. Nasmyth whether it would be safe to use cast-iron. This inquiry set Mr. Nasmyth thinking. The existing hammers — of the kind known as "tilt-hammers" — were inadequate because of their want of compass, of range and fall, as well as of their want of power of blow. Let the autobiography tell the rest of the story:

"The obvious remedy was to contrive some method by which a ponderous block of iron should be lifted to a sufficient height above the object on which it was desired to strike a blow, and then to let the block fall down upon the forging, guiding it in its descent by such simple means as should give the required precision in the percussive action of the falling mass. . . . . In a little more than half an hour I had the whole contrivance, in all its executant details, before me in a page of my scheme book."

The steam hammer, as will be seen in the illustration, consists of a massive anvil, a heavy block of iron with which the blow is given, and an inverted steam cylinder, to whose piston-rod the hammer block is attached. The steam in the cylinder raises the hammer-block, and then by a valve under the control of an attendant, the steam being allowed to escape, the hammer descends upon the forging, and these blows may be given in any required number or intensity—as we said in our opening sentence, cracking an eggshell or forging a ponderous mainshaft for an ocean steamer. As Mr. Nasmyth says: "The attendant could, by means of the steam slide-valve lever in his hand, transmit his will to the action of the hammer, and thus think in blows." The hammer was afterwards constructed to use steam above the piston, thus adding to the force of the blow. A method of self-action was also devised, and is sometimes used. "The steam hammer," says its inventor, "has advanced the mechanical arts, especially with relation to machinery of the larger class, to an extent that is of incalculable importance."



THE STEAM HAMMER AT WORK.

In 1856 Mr. Nasmyth, having acquired a fortune ample for all his requirements, retired from business. But he has not yet retired from active pursuits. Even while engaged in the pressing cares of his large foundry, he had been interested in astronomical studies, and had constructed a number of reflecting telescopes in order to prosecute his investigations. The further study of astronomy has been a source of pleasure to him in the years that have intervened, and in a book on the moon he has added to astronomical science.

The steam hammer was not Mr. Nasmyth's only invention. We have not space here to give even a list of his many contrivances. They are all remarkable for the simplicity that characterizes them, and are illustrations of his definition of engineering —"the application of common sense to the use of materials."

The reader of the volume cannot fail to be charmed with the simplicity of the narrative, a reflex of the simple character of the man himself. There will be many to wish for the great mechanician a long continuance of his serene old age.—*Illustrated Christian Weekly.*

REST IN ACTION.

Absolute perpetual rest and absolute perpetual activity are equally incompatible with life. Each, duly balanced, is the complement of the other. Sleep is simply rest in its completest form—rest of brain, and rest of all the organs, save those necessary to existence. The tough heart rests between the beats, nor can it be much accelerated by stimulants without immediate or remote injury. The harder-working lungs rest between inspiration and expiration.

The brain must have rest, or fail. Such a case of unresting activity as that of Henry Kirke White—and there have been thousands like it—should show scholars that nature holds it an unpardonable sin to rob the brain of its rightful rest. Others, who toiled like White, instead of paying the penalty in early death, have exchanged genius for madness or imbecility.

But a large part of our needed rest may be secured in connection with a high degree of activity. The clerk threatened with "writer's cramp" may escape, not so well by lying for a month in a reclining-chair as by engaging in athletic games, chopping wood, or rambling in the forest.

Generally only a small part of the brain is unduly used, and that may be recuperated by calling into action some other part; that is, by change of mental application. Gladstone doubtless rests his brain from the cares of State as much by such studies as Homer as by the sturdy blows of his axe. The pastor's calls at the homes of his flock not only double the good of his preaching, but most effectually rests his brain by the change.

The mere money-getter tends to become a monomaniac. The miser, dying in filth and rags beside his hoarded gold, is the end of avarce. The power and the disposition to accumulate need to be balanced by the disposition and the power to use acquisitions properly and wisely.

If one has overworked both stomach and brain, let him beware how he yields to the temptation to stimulate them artificially to their wonted activity. On the contrary, let him give each a long rest, while he bestirs himself to a general invigoration of his physical system.

So whatever organ has been overused, rest that. And this can commonly best be done in connection with a full or a special activity of other parts.—*Youth's Companion.*

HAVE A PURPOSE in life, and having it, throw into your work such strength of mind and muscle as God has given you.—*Carlyle.*