

## A M E D I E V A L E D I S O N.

## THE INGENIOUS MARQUIS OF WORCESTER.

BY GEORGE FREDERIC STRATTON.

It has been said that Mr. Edison was the first inventor to develop an organized business of invention. The first available money which came into his hands was devoted to the building and equipment of workshops for purely experimental purposes, and since that time, his genius has been altogether engaged upon the practical development of his ideas. He has never engaged in business *per se*. But three hundred years ago a man was born in England who was nearly as persistent an inventor and investigator as Mr. Edison, and, apparently, almost as systematic. This was Edward Somerset, Marquis of Worcester.

It is a matter of no little wonderment that, in an age when mechanical pursuits were looked upon with great contempt by the class to which the marquis belonged, he should have shown such intense devotion to them. He was one of the wealthiest men in England. His ancestors had been soldiers and courtiers of great power and influence, and there was nothing in the early education or association of the marquis which was, in any degree, related to mechanical affairs; yet at the age of twenty-seven he had become so deeply interested in such matters, that he fitted up workshops at Raglan Castle, one of his homes, and engaged one Caspar Kalthoff, a clever artisan, as his chief workman. A few years later he moved these workshops to Vauxhall, near London, where he expended fifty thousand dollars in buildings and equipment, and a total of two hundred and fifty thousand dollars in experiments—sums which, considering the vast difference in money values between then and now, were really enormous. These experimental workshops he maintained through the whole of his life, broken, as it was, by the great rebellion against Charles the First, and the consequent civil war, in which the marquis was actively engaged. And so enthusiastic was he on scientific matters, so enlightened in his views, and so far ahead of his contemporaries in progressiveness, that he always expressed his determination to endow the extensive shops at Vauxhall, and, with them, found a college of artisans—a plan, however, which he was not able to carry out.

In 1663 he published a book entitled "A Century of Inventions." The full title is curious enough to be reprinted here:

"A Century of the names and Scantlings of such Inventions as at present I can call to mind to have tried and perfected which (my former notes being lost) I have, at the Instance of a Powerful Friend, endeavored now, in the year 1655 to set these down in such a Way as may sufficiently instruct me to put any of them in Practice."

The term "century" refers to the number of inventions described, and the book itself contains only what the author deemed the more important of his inventions, a great number having been omitted. The term "scantlings" means notes or very brief descriptions.

Among these one hundred inventions, many of them marvelously ingenious, are some which show that the marquis was fully two centuries ahead of his time. One of these, described in his own words, is "an engine, portable, in one's pocket, which may be carried and fastened on the inside of the greatest Ship, and at any appointed minute, though a week after, either of day or night, it shall irrevocably sink that ship."

Although the "Century of Inventions" is, for the most part, a catalogue only, and, except in a few cases, without description, the inventor left other papers which show many of his designs in detail, and from these we learn that this destructive "engine" was, practically, an explosive machine operated by clockwork. He supplements this invention by another. "A way from a mile off to dive and fasten a like Engine to any Ship so as it may punctually work the same effect, either for time or execution."

These seem to be the forerunners of the modern torpedo and submarine torpedo boat.

Another invention shows him to be the originator of safe-deposit doors and combination locks. His description reads:

"A way how a little triangle scrued key, not weighing a shilling, shall be capable and strong enough to bolt and unbolt round about a greate Door an hundred Bolts through fifty staples, two in each with a direct contrary motion and as many more from both sides and ends."

The combination lock is also described, as follows:

"An Escutcheon to be placed before any of these locks with these properties:

"1. The owner (though a woman) may, with her delicate hand, vary the ways of coming to open the

lock ten millions of times beyond the knowledge of the smith that made it, or of me who invented it. 2. If the stranger open it, it setteth an alarm a-going which the stranger cannot stop from running and, besides, though none be within hearing, yet it catcheth his hand as a Trap doth a Fox."

Here is the origin of one of the latest types of mud dredges:

"A Screw made like a water screw but the bottom made of Iron-plate, Spade-wise, which, at the side of a Boat emptieth the mud of a Pond or raiseth Gravel."

In one note he describes what he calls "an abundantly significant Seal," which is remarkably similar to a modern dating stamp, having adjustable seals in one frame, by which "the day of the Moneth, the day of the Week, the Moneth of the year, the Year of our Lord," and several other matters could be stamped, as desired.

He appears to have been the inventor of the hydraulic ram, for he describes a machine by which the force of a plunger in a pump may be used "to weigh up an anchor or to do any forcible exploit in the narrowest or lowest room in any Ship where few hands shall do the work of many."

In 1661 a patent was granted to him for an improved pistol, the specifications reading as follows: "To make certain guns or pistols which, in the tenth part of one minute, may with a flask contrived for that purpose, be recharged, the fourth part of one turn of the barrel, which remains still fixed, fastening it as forcibly and effectually as a dozen threads of any screw." In another manuscript this gun is described as one that "shall contain ten balls or pellets of lead, all the which shall go off one after another, having once given fire, so that with one harquibus one may kill ten thieves without recharging." Although no fuller description is extant, it seems very clear that this was a magazine gun, with breechloading arrangement.

In another passage he claims to have devised a universal alphabet: "How to compose an Universal Character, methodical and easie to be written, yet intelligible in any language; so that, if an Englishman write it in English, a Frenchman, Italian, Spaniard, Irish, Welsh, being scholars, shall as perfectly understand it in their own tongue as if they were perfect English."

These inventions, it must be remembered, were made in an age when a machine, as understood in these days, was unknown. Hand tools were of the crudest description, and a combination which formed the simplest machine was looked upon with incredulity and often denounced as pertaining to "Black Art."

The last invention described in the marquis's book is the "Fire Water Work," as he calls it in one place, and the "Water-Commanding Engine" in another. He built one of these engines at Raglan Castle and another at Vauxhall, both of which were used for raising water to cisterns on the roof, a drive of about forty feet; that at Vauxhall being kept in operation for over eight years. Although these engines were operated by steam, they did not resemble the simple piston engine of the present time, but they were the first machines ever devised for the practical utilization of the power of steam. Simple and crude as they were, they demonstrated, as never before had been demonstrated, the possibility of a power which would revolutionize the industrial and even social conditions of the world. The marquis himself undoubtedly foresaw these possibilities. He says: "I may boldly call it the Most Stupendous Work in the whole world . . . I deem this Invention to Crown my Labours, to reward my Expenses and make my Thoughts acquiesce in way of further Inventions." And in another place he says: "I call this a *Semi-Omnipotent Engine*, and do intend that a model, thereof, be buried with me." These engines excited great interest among the few scientific men of the day, but all others looked upon them with the greatest suspicion and ridicule. In fact, after the death of the marquis, his wife, who was as enthusiastic over their possibilities as he had been, was roundly denounced, by the priests, for her persistent attempts to obtain assistance for putting them into public use. A letter to her from one of these priests contains these words:

"It is a great temptation which you are now under, and very dangerous and hurtful, both to your temporal and eternall happiness; yett, I confess, that the Devil to make his suggestions the more prevalent, doth make use of some motives that seeme plausible." Those were not the days of the promoter and the

business organizer, and a century and a half elapsed before this invention of the marquis found its development in the hands of Watt, Newcomen, and Stephenson.

The marquis lived in the most troubled times of English history—the time of Charles the First, the civil war, and the doughty, imperious Cromwell. He was a staunch royalist, and spent no less than three hundred and fifty thousand pounds in equipping troops and fighting for his royal master.

After the king's execution and the accession of Cromwell to the Protectorate, Worcester's estates were confiscated, and he was exiled; going to France, where he lived for three years in great poverty. Returning to England, he was seized and imprisoned in the Tower of London, where he remained for another three years; and his intense devotion to scientific and mechanical experimentation is shown by the fact that, during that period of exile, imprisonment, and dire poverty, he still sent to his chief craftsman Kalthoff (who had been permitted by Cromwell to continue his work at Vauxhall) drawings and instructions for making models of such inventions as continually occupied his mind.

The marquis was scarcely a philosopher. There were men generations before him, and of his own time, as well as of succeeding times, whose names are famous for their deep speculations upon natural phenomena; but he was the first great practical inventor; and in view of the times and conditions under which he worked, in view of the fact that many of the great inventions of modern days, viz., the steam engine, the revolver, the hydraulic ram, the dredge, the combination lock, and other things, had some measure of practical suggestion, at least, from his great and versatile brain, it can scarcely be said of him that he was surpassed by any man in ingenuity, versatility, or devotion to mechanical invention, until the arrival of Edison.

An old biographer of his has said that "he took nothing on trust, but reduced everything to the test of absolute experiment. There never was any contrivance of which he thought or read, that he did not reduce to a model." Two hundred and fifty years after him the Wizard of Menlo Park made a similar remark regarding himself: "I never take anything for granted. I can't recall a single problem in my life, of any sort, that I ever started on which I didn't solve, or prove that it couldn't be solved." A kindred spirit surely, showing indisputably that the ambitions and methods of the greatest inventor of the middle ages were the same as those of the greatest inventor of modern times. But how widely different in their successes! One has acquired unbounded honor, wealth, and fame; the other died in poverty, his inventions viewed with incredulous ridicule.

The lives of inventors abound in dramatic stories of difficulty, failure, and bitterness, but nowhere is there found anything more pathetic than the last appeal for assistance, from the House of Lords, by this gallant old soldier and gentleman, broken in health and fortune and vainly seeking some little return from his inventions. He says: "The more, then, that you shall be pleased to make use of my inventions, the more inventive shall you find me—one invention begetting another. . . . Ingeniously confessing that the melancholy which hath lately seized upon me (the cause whereof none of you but may easily guess) hath, I dare say, retarded more advantages to the public service than modesty will permit me to utter."

A few weeks afterward he died, but whether or not a model of his beloved "Semi-Omnipotent Engine" was buried with him history does not state.

M. Gustave Lyon has discovered a method of remedying faults in the acoustic properties of large halls, and his idea is the result of a long series of researches. It will be of great benefit in many cases, and he has just made a practical application of it in the great hall of the Trocadero, one of the largest in Paris, which is notorious for its acoustic defects, as the echo is such that it is almost impossible to hear a speaker in some parts of the hall. The worst spot is at the president's box. Lyon uses a very ingenious method of locating the surfaces which give the echos, and then covers them by a double cloth covering spaced a few inches apart. A single cloth will not deaden the echo, but he discovered that a double cloth would do so. Just why is not as yet clear, but the fact remains that the Trocadero hall is wonderfully improved.