with curiosities of mechanical invention ; and the learned virtuoso who would take the trouble of ransacking the mechanical productions of the sixteenth and seventeenth centuries, would be able to collect materials for an interesting, curious, and amusing volume. Perpetual motions were very common ; wings for enabling men to fly in the air, mechanical chariots for a similar purpose, conveyances to the moon, and engines for making continual and cheap music by mills or by fire, for rocking of cradles and turn­ing of spits, were favourite subjects of design ; and many of these curious contrivances, without serving any definite purpose, form elegant and curious pieces of apparatus. We are now passing from the era of the curiosities of mechanical contrivance, into that period in which the same principles that actuated the toys of Hero and the automata of Kircher were to be applied to set in motion mighty machines for the advancement of the welfare of the human race.

2. *The Era of Worcester.*

Edward Somerset, Earl of Glamorgan and Marquis of Worcester, invented and constructed the first steamen gine. His title to this honour has been the subject of dis pute, some historians attributing to him a greater share of merit than there was sufficient evidence to warrant, while others deprive him of even that honour to which he possesses an indefeasible claim. His life is one of the most romantic chapters of English history. Enterprising, generous, disinterested, and confiding, he was at once beloved and betrayed by his king, loaded with honours and reduced to poverty ; at one time exercising almost without control the functions of the sovereign, conferring dignities from the rank of marquis down to baronet, and at another thrown into prison, and begging from a creditor the paltry loan of five pounds. Possessing inventive genius of the highest order, he was considered a mad enthusiast because his speculations were advanced so far before the age in which he lived, and has been set down a quack and impostor by men incapable of comprehending the nature or appreciating the value of his creations. The slow march of knowledge and of time has at last revealed the worth, and established the character, of an illustrious and unfortunate man of genius, who only lived to complete his mighty design and carry it happily into effect, and having done his work, went to take his rest in death.

That the Marquis of Worcester was acquainted with the nature and force of steam, no one has ever disputed ; but it has been matter of serious doubt whether the machine which he has described had ever any real existence. Hitherto we have had nothing more than circumstantial presumptive evidence of the actual construction of the marquis’s steam-engine. It is only a few years since the industry of the indefatigable antiquary Robert Stuart has presented us with an historical document of undoubted authenticity, affording undeniable proof of the existence and efficiency of one of the engines of the Marquis of Worcester, of more than two horse power, employed for raising water on the Vauxhall side of the river Thames. As the Marquis’s title to the invention has not yet been established in any of the numerous treatises on the steam-engine that have hitherto appeared, and as the proof we are now able to adduce must for ever set at rest the querulous cavillings of those otherwise respectable writers who have attempt­ed to controvert the great truth that the steam-engine is a machine wholly of British invention, we shall give a short account of what the marquis undoubtedly accom­plished.

We are principally indebted for our acquaintance with the mechanical inventions of the Marquis of Worcester to a work in which he published a list of one hundred of his mechanical. inventions, under the title of “ 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, endeavoured now, in the year 1655, to set these down in such a way as may sufficiently instruct me to put any of them into practice.” Lond. 1663, 12ιno. Of this remark able work there are several other editions. The following are the passages which have immediate reference to the high-pressure steam-engine which he had invented and made. It may he proper to premise, for the purpose of preventing the supposition from being entertained that it was impossible to get devices of so complex a nature carried into effect at a period when the mechanical arts of construction had made so little progress, that he had employed constantly in his service, during a period of five and-thirty years, one of the most eminent artificers of the time, one Caspar Kal toff, and that he had provided him with suitable work shops, tools, and machinery, at an expense of more than ten thousand pounds. It thus appears that the marquis was no mere schemer, but that he submitted his devices to the test of experiment; and it is merely not passing the bounds of credibility to suppose, that, with fertile resources, an active and inventive mind, the best tools, an “ unparalleled ” artificer, and the expenditure of great sums of money, he had in five-and-thirty years constructed machines of such perfection as no other artist of his age had accomplished, and few of the hangers on of a royal court could understand or appreciate. No one who is acquainted with the modern high-pressure steam-engine can fail to recognise it in the following spe­cification, which, be it observed, was given by the marquis rather for the purpose of exciting curiosity than gratifying it—for stating the capabilities of his engine than explaining its principle, which he wished to keep secret for the purpose of obtaining a patent.

“ Invention 68.—An admirable *most forcible way to drive up water by fire ;* not drawing or sucking it up wards, for that must be, as the philosopher calleth it,

‘ intra spheram activitatis,’ which is but at such a dis­tance, *but this way hath no bounder, if the vessels be strong enough ; for 1 have taken a piece of a whole cannon,* whereof the end was burst, and filled it three quarters full, stopping and screwing up the broken end, as also the touch-hole, *and making a constant fire under it ; within twenty-four hours it burst and made a great crack :* ***so*** that, having found it way to make my vessels so that they are strengthened by the force within them, and the one to fill after the other, I have seen the water run like a *constant fountain forty feet high.* One vessel of water, rarefied by fire, driveth up forty of cold water ; and a man that attends the work is but to turn two cocks, that one vessel of water being consumed, another begins to force and refill with cold water, and so successively.”

The internal evidence of the truth of this description is too strong to be resisted. We cannot say what ideas it may have suggested to such a man ns Lord Orford, who was probably as ignorant of mechanical principles as he was devoid of candour and charity to a man of principles and religion different from his own ; but to anyone conversant with the mechanical contrivances and treatises even of that time, it was scarcely possible to read the sentence without forming a distinct conception of a similar apparatus to that here described by the marquis. We shall see that the description was so perfect as to enable a subsequent mechanician to reconstruct the machine **of** the marquis, with some additions, and produce an effective machine for draining mines. We see, too, how philosophical was the process by which ho