which drawings and models were made ; but thc difficulty of rendering them steam and air tight, and the loss of power by friction, induced him to turn his thoughts to the adap­tation of the reciprocating motion to the production of a continued regular rotary one. This he accomplished by a series of improvements, the exclusive property of which he secured by successive patents in the years 1781, 1782, 1784, and 1785, including, among other inventions the ro­tary motion of the sun and planet wheels,@@1 the expansive principle, the double engine, the parallel motion, and the smokeless furnace. The application of the centrifugal re­gulating force of *the governer* gave the finishing stroke to the machine.

The invention of the separate condenser, and the con­trivances necessary to give it full effect, would alone have established the fame of Mr Watt ; but when to these are added the various inventions called forth to perfect his ro­tative engines, we are impressed by a union of philosophi­cal research, of physical skill, and of mechanical ingenuity, which has, we believe, no parallel in modern times. The perfection thus given to the rotative engine soon led to its general application for imparting motion to almost every species of mill-work and machinery, and gave an impulse, unexampled in the history of inventions, to the extension of our manufactures, wealth, and population.

Nor were Mr Watt’s inventive powers confined to the steam-engine. The necessity of preserving accurate copies of his various drawings and of his letters, containing long and important calculations, and the desire of avoiding that labour himself, which he did not think it right to intrust to others, led him, in the year 1780, to contrive a copying apparatus, the exclusive property in which he secured by letters patent, and commenced the manufactory of them, in partnership with Mr Boulton and his friend Mr Keir, un­der the firm of James Watt and Company; a contrivance of great simplicity, and of which he reaped an ample bene­fit in the time, labour, and expense it saved to himself, to say nothing of its advantages to the public.

In the winter of 1784-5, he put up an apparatus for heating, by means of steam, the room in which he drew and wrote. The possibility of doing this had been suggested by Colonel Cooke in the Philosophical Transactions for 1745; but we know not whether this was known to Mr Watt when he made this first practical attempt, from which he deduced proportions of surface, &c., which afterwards serv­ed to guide his firm in the introduction of the process in larger buildings.

Chemical studies engaged much of his attention during his busiest time : and at the very period when he was most engaged in perfecting his rotative engines, and in manag­ing a business become considerable, and, from its novelty, requiring close attention, he entered deeply into the inves­tigations then in progress relative to the constitution and properties of the different gases. Early in 1783, he was led, by the experiments of his friend and neighbour Dr Priestley, to the important conclusion, that water is a com­pound of dephlogisticated and inflammable airs (as they were then called) deprived of their latent or elementary heat, and he was the first to make known this thcory. This was done in a letter to Dr Priestley, dated the 28th April 1783, in which he states the doctor’s experiments to have come in aid of some prior notions of his own, and supports his conclusions by original experiments. That letter Dr

Priestley received in London ; and, after showing it to se­veral members of the Royal Society, he delivered it to Sir Joseph Banks, with a request that it might be read at some of the public meetings of the society ; but before that could be complied with, Mr Watt, having heard of some new experiments made by Dr Priestley, begged that the read­ing might be delayed. Those new experiments soon after­wards proved to have been delusive ; and Mr Watt sent a revised edition of his letter to Μ. de Luc on the 26th No­vember of the same year, which was not read to the society until the 29th April 1784, and appears in the Philosophical Transactions for that year, under the title of “ Thoughts on the constituent Parts of Water and of Dephlogisticated Air, with an Account of some Experiments upon that sub­ject.” In the interim, on thc 15th January 1784, a paper by Mr Cavendish had been read, containing his “ Experi­ments on the Combustion of the Dephlogisticated and In­flammable Airs,” and drawing the same inference as Mr Watt, with this difference only, that he did not admit ele­mentary heat into his explanation. He refers in it to his knowledge of Mr Watt’s paper, and states his own experi­ments to have been made in 1781, and mentioned to Dr Priestley : but he does not say at what period he formed his conclusions ; he only mentions that a friend of his had in the summer of 1783 given Μ. Lavoisier some account of his experiments, as well as of the conclusion drawn from them. It is quite certain that Mr Watt had never heard of them ; and Dr Blagden has stated, that he men­tioned at Paris the opinions of both the English philoso­phers, which were not admitted without hesitation, nor until the French chemists had satisfied themselves by ex­periments of their own.@@'

Mr Watt also has the merit of being the first person to introduce into this country, and to carry into effect, on a practical scale, in any country, the bleaching of linens and cottons by oxymuriatic acid, the invention of his friend M. Berthollet. That gentleman had communicated his inven­tion to Mr Watt at Paris in the winter of 1786-7, whither he had proceeded with Mr Boulton, at the instance of the French government, to suggest improvements in the mode of raising water at Marly ; and his mind was instantly alive to the extensive application of which it admitted. He ad­vised M. Berthollet to secure the property by an English patent ; but that he declined, and left his friend to make such use of it as he thought proper. He, in consequence, communicated it to his father-in-law Mr Macgrigor, and gave directions for the construction of the proper vessels and machinery ; and soon afterwards he himself superin­tended the first trials at his bleachfield near Glasgow, which proved eminently successful.

Some years after this, Mr Watt was led, by the illness of the daughter, and some apprehensions entertained for the son, who were the issue of his second marriage, to consider the subject of the medical application of the factitious airs, and to contrive various apparatuses for that purpose, which were described by himself, in his friend Dr Beddoes’s pub­lications on Pneumatic Medicine.

We have not space to particularise other improvements introduced by Mr Watt, or at his suggestion, into various arts ; for there were few arts with the details of which he was not intimately acquainted, and to the practical profes­sors of which he was not able and willing to impart infor­mation. We shall only mention, that before he left Glas-

@@@1 Mr Watt had originally intended to derive the rotary motion from the working-beam by means of a connecting rod and crank ; but the workman employed to make the model communicated it to a neighbouring manufacturer, who took out a patent for it. This stimulated Mr Watt to the invention of other means of effecting the same object, of which five are described in bis patent of 1781. He afterwards used the crank, which was indeed his own, when he saw occasion, in defiance of the patentee, who never troubled him.

@@@- There is a confusion of dates in the accounts of this affair. Mr Watt’s letter to Μ. de Luc in the Philosophical Transactions appears dated 26th November 1784, which is evidently an error of the press. Mr Cavendish, in his letter, read 15th January 1784, speaks of Mr Watt s paper “ as lately read before the society,” whereas the paper itself purports to have been read on the 29th April 1784. This we can­not explain.