piston, and forces it to return to the top of the cylinder. When the piston is very near the upper termination of its stroke, another slider *a* raises the handle 2, and in so doing disengages the catch, which permits the upper Y-shaft to revolve upon its own axis and open the valves G and L, and the downward stroke recommences as has been related.

When the piston descends, the buckets R, T of the air-pump P and hot-water pump T also descend. The water which is contained in these pumps passes through the valves of their buckets, and is drawn up and dis charged by them through the lander or trough *t*, by the next descending stroke of the piston. Part of this water is raised up by the pump V, for the supply of the boiler, and the rest runs to waste.

The reader who wishes further details concerning the steam-engine of Mr Watt, will find them in the descriptive portion of this treatise.

The history of the steam-engine ends with the history of Mr Watt’s labours. There are, it is true, many parts of the steam-engine that have been altered, simplified, or adapted to peculiar uses and circumstances since his time ; but these are matters of minor importance, with out which, the engine would not have been materially cur tailed of its present efficiency. It is a remarkable fact that the steam-engine has scarcely received any very valuable improvement since his time. He, in fact, rendered it a ma­chine nearly perfect. The testimony of Mr Farey upon this subject is explicit, and must be conclusive on the subject with every one who has the means of ascertaining the very high estimation to which the knowledge and practical skill of that excellent writer on the steam-engine most justly entitle him. “ It is a circumstance,” says Mr Farey, (*steam-engine, p.* 473,) “ highly creditable to Mr Watt’s character, both as an original inventor and as a practical engineer, that his first double-revolving engine, which he made in 1787 at the Albion Mills, performed quite as well as any engine which has since been constructed to employ steam οn the same principles. Some important improvements have been made in the construction of modern engines by substituting cast-iron and stonework in the place of wood, and by putting the parts together in more substantial modes ; but all those essential forms and proportions which affect the performance of the machine, were so ascertained by the first inventor, that no improvement has been since made in them, and every departure from those forms and pro portions has impaired the performance in a greater or less degree.”

Thus have we taken a rapid survey of the history of the steam-engine. We have omitted the names of many individuals who have distinguished themselves by ingenuity directed to this subject. We have omitted the labours of Gebert, Alberti, Cardan, Decaus, Branca, Mor land, Papin, Amonton, Leopold, Meyer, Bosfrand, Ges sanne, and a hundred others who have, all in different degrees, expended ingenuity upon the application of steam to the production of mechanical power ; and these we have omitted not because we consider their labours either undeserving of notice or uninteresting to the general reader, but because they have not contributed towards the production of the modern steam-engine, and because an account of their works would rattier serve to illustrate the possible varieties of the machine and the fertility of the human mind in mechanical devices, than either to conduct the reader along the stream **of** historical suc­cession, or render him better acquainted with the nature and mechanical peculiarities of the steam-engine itself.

Part II.—Description of The Modern Steam Engine**.**

Of modem steam-engines there are two distinct species —the high-pressure and low-pressure engines. The former is simple, light, and of few parts, generally used for locomotive engines, steam-carriages, steam-vessels of a light and rapid construction, and such other purposes as require portability or cheapness. The latter is more com plex, but more effective; more expensive in original construction, but more durable and more economical in con sumption of fuel. The first is more commonly in use in America, the latter in this country. The high-pressure engine is sometimes also called the non-condensing steam engine, to distinguish it from the low-pressure engine, which is also called the condensing steam-engine ; but there is sometimes a combination effected of some of the parts and principles of both these species, in what is called a high-pressure condensing engine, by which, for certain purposes, the peculiar merits of both species are combined in the same machine.

Of these two sorts of steam-engine it is remarkable that the more elementary and simple—that which is the more easily conceived and understood—was not invented and brought into practical use until long after the other kind had been very extensively used and made known by its inventor, James Watt. It appears to us, that we are to consider Oliver Evans of Philadelphia as the inventor of the modern high-pressure engine. Before 1786 he had contrived and made experiments upon a high-pressure engine, which seems to have been in all essential respects similar to our own. lndeed, it appears that the Ameri cans have taken the form and arrangements of their engines from Evans, as implicitly as in this country we have adopted those of Watt. The history of Evans consists almost entirely of the romance of real life. Sanguine and energetic, he continually encountered difficulties only to overcome them, and to encounter renewed disaster and disappointment, till he at length died of a broken heart. To him we attribute the rapid advancement of America, at the commencement of the present century, in all that relates to the introduction of the steam-engine in its multifarious applications, and especially in steam navigation. He had awakened in that nation a lively sense of the advantages which they were likely to derive from the introduction of the power of steam, and placed in their hands an instrument well fitted for their use, and which they were not slow to adopt and apply.

The high-pressure or non-condensing engine consists of *two* principal members, *generator* or *boiler* and working *cylinder,* each with sundry appendages. The low pressure or condensing steam-engine consists of *three* principal members, *generator, cylinder,* and *refrigerator or condenser,* each with sundry appendages.

The generator and working cylinder, with their append ages, are neatly the same in both kinds of steam-engine, the presence of a condenser or refrigerator forming the principal and almost only distinction of the second species. By this second species the steam is returned into its first state of water, thereby effecting a saving of heat and of mechanical power ; whereas, in the first form of engine, the steam, after performing a certain portion of its labour, is discharged into the open air as useless; a process which can only be advisable in circumstances where the labour and apparatus for condensing would cost more money, and cause more inconvenience than would countervail the loss of fuel and heat and power.

As, therefore, the high-pressure non-condensing steam engine is simpler in its action and construction than the low-pressure condensing engine, it is convenient to con