food of cattle and horses, designed by Mr Newlands of Edinburgh, *a a* is a steam boiler, furnished with man hole, safety-valve, gauge-cocks, supply pipe, and regulating float ; *b,* water cistern, placed not less than six feet above the boiler ; *c c,* the steam pipe proceeding from the boiler, and extending along the front of the gauntree for supporting the casks or other vessels in which the food is held. These vessels are hung on pivots, between the uprights, (of which one is seen in the drawing,) in such a manner as to throw the centre of gravity a little below the points of support; and each vessel has a false bottom pierced with many holes, and fixed a few inches above the true bottom. When the contents of a vessel arc to be discharged, the superintendent lays hold of the handle, seen in the front, and, by a little force, turns the vessel round its axis, until its front lip rest on the front bar of the gauntree, which is placed so low as again to throw the centre of gravity of the vessel below the points of support ; the contents may then be emptied into a close barrow, or other suitable vessel, or into a trough extending along the front of the gauntree.

The manner of connecting the vessels with the steam

pipe remains to be noticed. From the main pipe *c,* branches are carried through the front bar of the framing opposite to the centre of every vessel, of which there may be many, although two only are represented. Fig. A exhibits a section of the main pipe, the branch pipe, and a part of the bottom of the vessel. The branch pipe *d* terminates in a conical socket, and into this the plug fixed on the vessel *c* is fitted. When the vessel is in a vertical position, the connexion between it and the boiler is complete, but when, in being emptied, the vessel is overturned, the plug is withdrawn from the socket, and the communition cut off. When the vessel is again restored to its vertical position, the parts again fit each other without trouble or care on the part of the attendant. The branch pipe is moreover furnished with a stopcock, the handle of which is wrought by a rod from either an eccentric or a crank fixed to one of the pivots of the vessel. When the vessel is overturned and the plug withdrawn, the eccentric shuts the stopcock, and prevents the steam from escaping, and reopens it when the vessel regains its vertical position.

THE STEAM-ENGINE.

It is a singular peculiarity in the history of the steam engine, that, ever since the period which exhibits the earliest traces of its embryo, it has continued slowly and gradually to advance with the flow of time towards its present state of high maturity, though not yet, perhaps, of ultimate perfection. Other arts and inventions, once well known and successfully used, after having attained a certain measure of perfection, have again been lost sight of amid the ruins of empires and the revolutions of nations, never more to be rescued from oblivion. While some of these, on the one hand, have sprung suddenly up into maturity, arrayed in the panoply of immediate power, being sent as it were directly by divine mission, to perform some important part in the destinies of the world, perfect from their birth, there exists another class of inventions and of sciences that have themselves undergone so many revolutions as, in the later part of their history, to present nothing more than the name in common with the maturer knowledge of the present day. But our knowledge of the properties and powers of steam, and its agency by a steam-engine, differs in every way from the progression of other arts and other knowledge. Known in the earlier ages of Egyptian science, it appears to have played its part in adding to the imposing effect of those stupendous monuments of absolute power which the storms of thousands of years have failed to obliterate. In the more refined ages of Greece, steam appears to have ministered alternately to the elegance of Attic luxury and the delusions of heathen idolatry ; and to have become extensively known until the destruction of the Alexandrian schools of science dispersed those seeds of mechanical science which the flames of its library have spared to Western Europe ; and there, imbedded in the ruins of learning during the dark ages of second barbarism, they lay preserved, but unfructifying, among the other remains of the learning of the middle ages ; and when at length the light of knowledge once more dawned on Europe, the science of the Greek philosophers was exhumed from the rubbish which had concealed it, and revealed to the dawning light by the mighty lever of the press. The work of Hero on

*Pneumatics and Steam Machinery* was one of the finest and earliest specimens of the art of printing. Since that time the science of steam, and the art of constructing the steam-engine, have made slow, regular, and progressive advancement, until this mighty work of many hands has at last attained a prominent importance in the interests of humanity, and become a mighty element in the future destinies of the world. In this remarkable course there has been no retrogradation. Centuries have added their contributions to the elucidation of its principles and the perfection of its mechanism ; but no great revolution has ever thrown back, nor any single effort reproduced the mighty machine.

It is this peculiarity which has induced us to present to our readers the history of the steam-engine as the most apt and useful introduction to the perfect comprehension of its principles and structuro. In many other subjects the history of the science or art is little more than an interesting and curious antiquarian research, fascinating to the virtuoso, and even instructive to the historian or philosopher, but by no means necessary, or even conducive, in any degree, to the acquisition or comprehension of the modern condition of our knowledge. What, for instance, have the astronomical systems of the Chal dees or the Greeks to do with the Copernican system of modern astronomy ? In what degree would a learner be assisted in comprehending the sublime doctrines of the celestial mechanics of Newton, by having made himself thoroughly acquainted with the cycles of Hipparchus and Ptolemy, the crystal spheres of Frascatorius, or the multitudinous epicycles of Purbach ? But with our know ledge of the phenomena and the powers of steam, the case has been widely different. The progress of the steam engine has been coordinate with the progress of the human mind in physical truth. The history of the past improve­ments of the steam-engine is therefore the history of the human mind ; and the same phases which have been seve rally presented, at widely separated epochs, by successive inventors, are the very phases of gradually growing knowledge by which a single individuaI mind does most naturally and most profitably proceed, step by step, to the