## CHAPTER VIII.

### EARLY POPULAR AND OTHER JOURNALS, AND THE PERCY ANECDOTES.

We shall commence with papers from the "London Magazine," the "Imperial Magazine," and the "Pamphleteer."

The absurdity of a Perpetual Motion is demonstrated as follows in the "London Magazine," vol. 17, 1749:—

As a perpetual motion, according to the opinion of some gentlemen, seems to be comprehended within the sphere of human attainments, I humbly present these lines to the publick, to caution such against vain and fruitless enquiries.

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In researches after this unattainable solution, not thinking it requisite, in the first place, to study the natural propensity of matter, which, causing its tendency to a state of inactivity, must consequently subject it to rest, as soon as deprived of its given velocity by repeated retardations, which all bodies moving in our atmosphere, or in any other medium, are perpetually subjected to; for even the least particle, upon collision or percussion, let its direction be what it will—viz., direct, oblique, or perpendicular—bears a part in the obstruction, which is more or less in proportion to such resisting particles or powers, different degrees of magnitude, density, elasticity, non-elasticity, &c. Therefore, when the sum of the velocity, which the resisting powers have received, amounts to the momentum given their actuating body, such having thus communicated its motion to circumambient particles or powers, must again return to its natural state of rest. Perhaps this demonstration may appear more evident

by a logistical method of argument, for which reason it may be requisite to reduce the whole into a syllogism.

As, according to the laws of nature, every moving body loses its motion, and returns to a state of rest, upon meeting, in a rectilinear direction, with a resisting power equal to the momentum wherewith it moves:

And as the factum, or aggregate, of a sufficient multiplicity of minutest resisting powers (or that of the successive and perpetually resisting force of the particles of air, which all bodies moving in our atmosphere are subjected unto) amounts to any momentum how great soever:

*Ergo*, all moving bodies will at length lose their motion and return to their natural state of inactivity—viz., when the sum of the retardations they meet with becomes equal to the momentum of the motions first communicated.

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"The Perpetual Motion Hunter" is the title of an article in the "Imperial Magazine," vol. 6, 1824:—

It gives me much pleasure (says the writer) to observe that you notice scientific subjects: you are very right in so doing, as it will not only give variety, but add considerably to the value of your very useful miscellany. It is my humble opinion that such a procedure is infinitely better than filling it with the splenetic effusions of angry minds, the ebullitions of disappointed envy, or, what is worse, dealing out large portions of scandal, and making use of personalities to wound virtuous sensibility; as is the constant practice in some similar publications.

I am now, Sir, an elderly man, and am sorry to inform you that I have lost much valuable time, and, of course, money, too, from having been infected, in the early part of my life, with the vanity of hunting after that *ignis fatuus*, called the "perpetual motion." Common report informed me that it would immortalize the name of the inventor; that by it the longitude would be discovered; and that, on this account, the British Parliament had offered a premium of ten thousand pounds for the discovery! This was something like assailing a man at all points at once: the acquirement of such prodigious fame flatters his vanity; and the "ten thousand

pounds" could be looked upon in no other light than as the reward of distinguished genius!

Under these impressions I began my career, and pursued it with an ardour which, in any other case, could not have failed to ensure me success. I read, with the greatest avidity, all the accounts of such machines I could anywhere meet with. For a short time I was amused with the ball of iron and the magnet, mentioned in Bishop Wilkins' "Mathematical Magic." I afterwards studied the properties of Orffyreus's wheel, which, as Gravesande informs us, continued in rapid motion for two months; at the end of which period it was stopped, he says, to prevent the wear of the materials. This astonishing wheel was, you know, destroyed by the inventor soon after the time of the above-mentioned experiment. I endeavoured, with all my might, to recover the long-lost secret, and success partly crowned my efforts; for, after a great deal of wearisome labour, I constructed a machine which I then believed would amply compensate the loss which the crazy philosopher had occasioned, when, in a fit of frenzy, he dashed it to pieces. The delight which Newton felt on discovering the law of universal gravitation did not exceed mine when I found that my machine would answer the intended purpose. 'Tis true, it would not put itself in motion—but what then? It was sufficient for the purpose, if it would move perpetually when put in motion; and at that time, like many others, I did not quite understand how many requisites were necessary in order that a machine might become a "perpetual motion."

You can scarcely imagine how my heart palpitated when I sent off a description of this, my first invention, to the Board of Longitude: it was a machine which I had no doubt would determine the longitude, both at sea and land, with the greatest ease and accuracy. During the first week, my nightly slumbers were frequently broken by the violent perturbations of my mind; and my day-dreams almost continually represented to me the postman knocking at my door with the wished-for letter that was to crown all my hopes. So certain was I of success, that I actually began to look about for an estate which the ten thousand pounds were to purchase; for, in my mind's eye, I had it already in my grasp. The humble occupation I had till then followed, I now looked upon with disgust; and I saw myself at once elevated to opulence and

fame. I waited with patience—yes, Mr. Editor, with all the patience I could muster—but no letter arrived. However,

> "Day presses on the heels of day,
> And moons increase to their decay."

After a few weeks, my mind recovered its wonted serenity; and in about three months more, my machine was as free from any violent perturbations as my mind, for, at the end of that period, it had completely lost all power, either of perpetuating or continuing its motion. This circumstance occasioned me some uneasiness; and I was not much amused with the taunting remark of one of my friends, who, on viewing it, exclaimed, "Well! it is a perpetual motion *still!*" At the end of nine months, I received a letter from the Secretary of the Board of Longitude, informing me of what I already knew—viz., that my machine would not answer.

It is now carefully stowed in my brother Jonathan's garret, at Brigg, in Lincolnshire, where it may be seen by all who are curious in such matters.

I now turned my mind into a different channel. I thought it possible that the object of my search might be accomplished by means of some of the fluids. I considered, with care, the almost continued oscillation of the mercury in the tube of the barometer; but I could deduce from this motion no practical result. I afterwards endeavoured to turn the tides to some account; but I failed here also. At length, after turning my mind in a variety of ways, as I was one day reading an account of the rise of water in capillary tubes, it at once occurred to me that, as the water rises in such a tube to more than an inch above the surface of the water in the vessel in which the tube is immersed, if I placed the tube in an inclined position, the water would run over its top; and as it would fall into the same vessel, the motion thus produced would be perpetual. At this moment my mind was again agitated: I exclaimed, like Pythagoras, "I have found it! I have found it!" I now supposed myself to be as great a man as any Pythagoras that ever lived. I did not, however, run out, like him, naked into the street; but I remember the discovery was made in the winter season, when I was warmly and comfortably clothed: had it been in the summer, I cannot tell what might have happened.

I soon procured a capillary tube, and proceeded very care-

fully to make the experiment; but the water did not flow! Well, said I, this is curious; but a syphon will run: that the water does not run from the top of the tube, is owing to the pressure of the atmosphere upon it. I now ordered a capillary syphon; and was again disappointed, for the sluggish water, as if envious of my fame, still refused to move.*

Having recovered a little from the stupor into which I had been thrown by the failure of another of my schemes, it occurred to me that if I employed a syphon to carry water over the bank of a river that communicated with the sea, the syphon would run if the outer leg on the outside of the bank was longer than the inner leg; and because the water would find its way into the ocean, and be brought back by the process of evaporation, which is constantly going on, the motion would be perpetual. I could not, however, employ this method to discover the longitude, either at sea or land, and of course I was not entitled, from this invention, to the ten thousand pounds.

Another of my machines consisted of two wheels, A and B: the wheel A had a number of buckets at equal distances round its outer rim: these buckets were so placed that they would each contain a ball of iron. Seven such balls were always on one side of the wheel A, urging it downwards; and one was in the inside of the wheel B. When the wheel A had arrived in a certain position, the lowest ball fell out of its bucket, and rolled down an inclined plane, placed for that purpose, into the interior of B; and then it rolled down another inclined plane into the top bucket of the wheel A; and so on. This machine had a very specious appearance, and was mistaken for a perpetual motion by thousands of well-informed persons. I need scarcely add that the persons I mention were ignorant of the laws of motion and the theory of mechanics. A similar machine was lately exhibited for a perpetual motion, and a great deal of money made by shewing it to the good people of New York, in North America. My last invention of this kind consisted of an iron wheel and four magnets, similar to the one exhibited some time back in

* I have since found that nearly the same account is given by Dr. Jurin, in the Appendix to Cotes' Lectures on Hydrostatics. I can assure you, however, that the experiments were actually made by me in the manner above related.

Edinburgh, and other places. As the wheel did not move uniformly, and as the power of the magnets soon began to diminish, I suspected it would ultimately fail, and abandoned it altogether. It is necessary to inform you that my modesty —or, rather, my honesty—would never permit me to exhibit any of my inventions for money, as I had always very strong grounds of suspicion that they would not answer, and my suspicions were always verified in a short time. It was only after a great number of disappointments that I began seriously to think on the subject. I at first wondered how it happened that my schemes should always prove abortive; but I soon discovered that I was entirely ignorant of the theory of mechanics. Not long after, I had also the mortification to perceive that, I had totally mistaken the specific nature of the machine which had been so long the object of my search; so that it would have been next to a miracle if I had found it. I now began, in earnest, to acquire a knowledge of the principles of natural philosophy, and I very soon found that I had begun at the wrong end of my business.

My misfortunes had created in me serious musings. Yes, said I, in all ages mankind have had some favorite object to pursue,—a something bordering on the limits of impossibility. Astrology, or the foretelling of future events, was once the grand charm that led men astray. People are fond of prying into futurity: all men are naturally delighted with what is wonderful; and what pains do they take to deceive themselves! Astrology ruled with despotic sway during the reign of ignorance; but, as knowledge advanced, the chimera retreated; and the few votaries it has now left are ranked either amongst the most ignorant or the most knavish of all the human race.

Alchemy was another favorite pursuit. To be able to transmute the baser metals into gold was certainly an object of the greatest consequence, and now the discovery would be particularly desirable. There is no doubt that it would be liberally patronized by the Ministers of State and the members of the British Senate; because, if properly managed, it would enable them to pay off the national debt, and ease the good people of England of the intolerable burden of taxation. In case of such an event taking place, what joy would be diffused throughout the whole of this great empire! The people would be wealthy, and the Ministers again able to

create places and to give pensions *ad infinitum*. But I must return to my subject. The search after the perpetual motion is of the same nature as those of astrology and alchemy: it has long amused the ignorant and deceived the credulous; but men of science, properly qualified to judge of its merits, look upon it as a nonentity, and laugh at its proselytes as deluded creatures, who are pursuing a phantom of their own creation.

I have not much hope of being able to convince those persons who are in search of this shadow of a shade, that their labours will be fruitless. I will proceed, however, to describe the machine they are endeavouring to construct. The perpetual motion is a machine which possesses within itself the principle of self-motion; and, because every body in nature, when in motion, would continue in that state, it follows that every motion, once begun, would be perpetual, if it were not acted upon by some opposing force, such as friction, the resistance of the air, &c. In order, then, to produce a perpetual motion, we have only to remove all the obstacles which oppose that motion, and it is obvious that, if we could do this, any motion whatever would be a perpetual motion. But how, let me ask, are we to get rid of these obstacles? Can the friction between two touching bodies be entirely annihilated?—or has any substance yet been found that is void of friction? Can we totally remove all the resistance of the air, which is a force continually varying? And does not the air at all times retain its impeding force? They cannot be removed, then, so long as the present laws of nature continue to exist; and who will attempt to destroy them? Besides, it is a well-known principle in mechanics, "that no power can be gained by any combination of machinery, except there be at the same time an equal gain in an opposite direction;" and must there not be some absolute loss arising from opposing forces, as friction, &c.? How, then, can a perpetual motion be found by any combination of machinery? Another necessary circumstance is, that the motion of any such machine be uniform; for, if it accelerates, it will in time become swift enough to tear itself to pieces; if it retards, it will at length stop. Now, among all the numerous forces acting on machines,—forces, too, which are continually varying, according to known causes, and to the

influence of which every machine is constantly liable,—who is there so hardy as even to imagine that a machine can be constructed, the motion of which shall be constant, and uniformly the same? There is one perpetual motion, and but one,—that is, I know of but one,—and that was constructed by Infinite Wisdom. The Divine Creator of the universe has balanced this earth with such exquisite art, that its diurnal revolutions are performed so precisely in the same time, that it has not varied the hundredth part of a second since the time of Hipparchus, which is now more than two thousand years.

All that we can hope is, that the beams of science will diffuse truth more generally through the world; for, otherwise, dreamers of every kind will continue to dream to the end of time.

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The following article appeared in an American scientific journal. The first part of it only is here taken from a reprint in the "Technological Repository," entitled—

*On the futility of the attempts to construct Perpetual Motions. By Dr. Thomas P. Jones, Editor of the "Journal of the Franklin Institute."*

It will not be expected, by those conversant with the inquiry, that anything really new can be offered on a subject which has been so frequently and so ably treated as the inquiry into the possibility of constructing a machine which has within itself a principle of continued motion. There is something extremely fascinating in the pursuit of this object, as is evinced not only by the attempts of a host of tyros in mechanics, but by the persevering efforts of some men of genius and science, who, although they have professed faith in the admitted laws of motion, have yet proved by their works that their faith was not perfect. Whilst there is nothing, in the known laws which govern the material world, upon which to found the idea of being able to construct a perpetual motion, the time might not be misspent which should be devoted to an investigation of the causes which operate upon the mind in exciting and keeping alive the expectation that such a machine will some day be discovered;

but if we possessed the ability fully to prosecute this investigation, it would belong more to a work devoted to moral, than to mechanical, philosophy.

Some of our readers may be ready to exclaim, "But we have understood that all philosophers denied the possibility of any such thing." We believe that all who really merit the name of mechanical philosophers do unite in such a denial; but, if this be the fact, the corps is but a small one; for our own observations, together with numerous facts upon record which might be called as evidence, go to prove most clearly that there are but few persons who admit this truth as they admit an axiom: there appears, in general, to exist some mental reservation; some apprehension that, if they declare the thing impossible, it may nevertheless happen that some lucky wight may "hit upon it," and thus ruin their reputation as accurate philosophers!

The subject of mechanics is one which, of necessity, occupies a large portion of the attention of mankind. All the moving powers which we can command are called to our aid; but into the actual employment and adaptation there enters much more of practice than of principle. A great portion of our mechanics are men of observation, intelligence, and experience; and many of them have paid praiseworthy attention to science. But their very pursuits and occupations, although greatly aided by the scientific knowledge they have acquired, forbid their carrying such investigations to a great extent. And we ought not, therefore, to be much astonished if some of them are occasionally engaged in this fruitless pursuit. To their credit, however, this is now a rare occurrence, as the observations founded upon correct practice must necessarily lead to the same general results as does a correct theory. The constant employment or notice of the various machines which are daily seen in operation, induces almost every man to conclude that he knows something of mechanics. In many of these machines, the cause of their motion is very obscure; whilst the motion itself is not only evident, but so uniform and continuous, as may well lead the ordinary mind astray, and cause the conclusion that the step from some of them to an actual perpetual motion is but a short one.

There are but few terms in our language which are less definite than the term "science;" it embraces almost every

department of human knowledge, whether natural, moral, or physical; and it happens, unfortunately, that when philosophers and men of science are mentioned, the world are not very discriminative; and the opinion of the adept in natural history, or in chemistry, will carry an undue weight in subjects to which he has not attended, and of which, although he is a man, he is nearly or completely ignorant. It is in this way certainly, and in this only, that the votaries of science, and the believers in a mechanical perpetual motion, have been identified. On which side were the scientific men of Philadelphia arranged, when Redheffer's machine was exhibited at Chesnut Hill? Those who recollect the period will find no difficulty in answering the question. We believe that nineteen-twentieths of those that were so esteemed, were avowed believers. We know one gentleman who professed, and was believed, to be a man of great mechanical knowledge, who delayed in completing a patent, lest Redheffer's machine should be found to be genuine. We are of opinion that there is scarcely any other subject so familiarly spoken of, and so little understood, as the principles of mechanics; and no one, therefore, in which quackery is more certain of success.

Let not our readers expect that, because we have thus freely spoken our sentiments, we are about to demonstrate that a mechanical perpetual motion is an impossibility: we should indeed be willing to take any particular machine, which might be pointed out to us as such, and undertake to show the fallacy of its claim; but to give a general negative demonstration is a task which we cannot undertake. It belongs to those who advocate its possibility, to establish a principle upon which it may be made to act; the general practice, however, has been to exhibit a complication of levers, weights, or other powers, which serve to obscure the action of the individual parts, and to claim, for the whole, effects to which these individual parts, taken alone, have no power to contribute.

It has been, we think, truly observed, that to produce a perpetual motion we must find a body which is at the same time both heavier and lighter than itself, and in which the action and re-action may consequently be unequal. This is manifestly a physical absurdity; and although many attempts have been made to cheat bodies out of the properties with

which nature has endued them, yet no one has had the hardihood to deprive them of their essence in a legitimate way.

To investigate the laws which obtain in the motion of bodies, would require a treatise of no small length: this, therefore, we cannot attempt; but, nevertheless, think it necessary to offer a few remarks upon some of them, and particularly upon the property denominated inertia, and upon momentum.

The very words which we employ to designate a particular thing are frequently permitted to lead us into error, in consequence of our not restricting our terms according to the nature of the things to which they are applied: thus, we frequently use the expression, "the power of inertia," which may lead to the conclusion that from this property of matter some power may be derived; although the very term "inertia" is intended to express the simple fact that matter is altogether inactive or powerless. Inertia is a mere nullity; and, therefore, instead of conveying the idea of power, it is intended to express the entire absence, rather than the existence, of that property. If this be true, inertia can give us no aid in producing a perpetual motion; for, supposing, for the sake of argument, that gravitation, friction, and a resisting medium, could be placed out of the question; as every single impulse which is given to matter tends to carry it on in a straight line, whatever deflected it must necessarily abstract from, and eventually stop, its motion. All our machines must have either a vibratory or a curvilinear motion, or they would, from their very structure, soon elude our grasp; any impulse which we give to them cannot, therefore, be continued, in consequence of the inertia of the matter of which they are composed. But we must also, and at every moment, encounter friction and a resisting medium; and, in consequence of these, our machine must eventually lose whatever impulse we may have given to it; for, although matter is indifferent both to rest and motion, it is not so to impulse, or, which is the same thing, to resistance; and whether we abstract from its motion by grains or by ounces, it must eventually cease. Upon this it is unnecessary to dwell, because the fact must be admitted on all hands to be as stated. But if inertia, or the absence of power, cannot give power to a machine, may we not obtain something from

momentum? Momentum is the quantity of motion, and is compounded of the quantity of the matter moved, and the velocity with which it moves. The case we have been considering under the head of inertia is a case of momentum; as we have supposed a certain impulse given to matter, which matter has, in consequence, acquired motion, and which motion, from inertia, would be continued were there no counteracting causes. If we give a double velocity to our machine, or mass of matter—as to a wheel, for example—we give a double momentum, or, what is the same thing, a double space of time, *cæteris paribus*, to exhaust this motion. We have not, therefore, advanced a single step towards perpetuity. It consequently is not in this way that aid has been sought from momentum, but one which, although it is equally fallacious, is better calculated to deceive. We have already observed that the momentum of a body is increased by increasing its velocity, or the space through which it passes in a given time, although its quantity of matter remains the same. Suppose we have a horizontal lever, or bar, with equal weights at each end of it, A and B, supported by a fulcrum between them, and that the fulcrum is but half the distance from A at which it stands from B; when allowed to move, B will therefore preponderate, and will move with a velocity which will be double that of A—that is, it will descend two inches whilst A ascends but one: its momentum power, or quantity of motion, will therefore be double. If, now, we could cause the fulcrum to change its place—that is, to bring it as near to B as it was to A, and back again alternately, each of the weights would preponderate in its turn, and a perpetual vibration would ensue. How an effect of this kind has been attempted, will be seen upon an examination of some of the plans to be presented in the sequel.

In many instances, machines have been made so complex as to render an analysis of them somewhat difficult, even to well-informed observers. This complexity, however, instead of promoting the desired end, only renders a larger portion of foreign aid necessary to produce and continue the motion.

Numerous impositions have been practised by individuals who have pretended that they had made self-moving machines. When deceptions of this sort have been practised,

the charlatans have, of course, endeavoured to perpetuate the concealment of their mode of procedure.*

[This article, which is of a very verbose character, proceeds to denounce Redheffer's machine as a deceptive one, and gives an account of "the wheel of Orffyreus," similar to that already given in the present collection. We now give in an abridged form the remaining portion of this paper, entitled—]

*Observations on the attempt to construct Machines of the kind usually intended by the term of Perpetual Motion; with notices of some of the particular Machines which have at different times been proposed for the attainment of this object. By the Editor.*†

Almost the only machine of the kind which has obtained any celebrity is the wheel of Orffyreus, of which an account was published by the celebrated philosopher, 's Gravesande, in 1774.

[Diagrams from Wilkins, Gravesande, and Nicholson, being described, the Editor proceeds:—]

The simplest rule that we can give, by which to perceive the fallacy of every plan depending upon the ascent and descent of weights, is, that whatever may be the weight which descends in a given time, it must raise an equal portion of matter to the same perpendicular height, in the same time, or the machine must evidently stop. Now, the power required to raise any weight to a given height is the same, provided the time be the same, whether that weight be raised vertically or obliquely. If the weights, the balls, or the mercury are to descend, they must first ascend to the necessary height; an equilibrium must therefore soon take place, should motion be produced by any extraneous force. Putting friction and a resisting medium out of the question, these machines supply no source of motion even to themselves.‡

* Gill's Technological and Microscopic Repository, vol. 6, 1830, p. 56, which appears to be the last volume published.

† Thomas P. Jones, M.D.

‡ Journal of the Franklin Institute, Philadelphia (1828), vol. 6, p. 318.

The two following articles are from the "Percy Anecdotes:"

PERPETUAL MOTION SEEKER.—Mr. Stukeley was a gentleman of fortune, bred to the law, but relinquished the profession, and retired into the country, filled with the project of discovering the perpetual motion. During a period of thirty years, he never went abroad but once, which was when he was obliged to take the oath of allegiance to King George the First; this was also the only time he changed his shirt and clothes, or shaved himself, during the whole time of his retirement.

Mr. Stukeley was at once the dirtiest and cleanliest of men, washing his hands twenty times a day, but his hands only. His family consisted of two female servants, one of whom lived in the house and the other out of it. He never had his bed made. After he relinquished the project of perpetual motion, he devoted himself to observing the works and economy of ants, and stocked the town so plentifully with that insect, that the fruits in the gardens were devoured by them. * * * * * *

The gentleman who accompanied him to the town-hall when he went to take the oath of allegiance, talked with him on every subject he could recollect, without discovering in him the least tincture of madness. He rallied himself on the perpetual motion, laughed at the folly of confining himself in-doors, and said he believed he should, some time or other, come abroad again, like other men. He was always esteemed a person of good understanding, before his shutting himself up. At the time of his death, he was building a house the walls of which were seven feet thick.—[Vol. 10. Article "Eccentricity," p. 3.]

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SPENCE'S PERPETUAL MOTION.—Among those who have attempted the grand problem which has puzzled philosophers in all ages—the discovery of perpetual motion—few persons have displayed more ingenuity than John Spence, an untutored mechanic of Linlithgow. When only three or four years of age, Spence was excessively fond of mechanical inventions, and never could get the idea of them banished from his mind. When eleven years old, he invented and constructed a model of a loom, the whole working apparatus of

which was set in motion by a winch, or handle, at one side. It was contrived on the same principle as the looms subsequently constructed in Glasgow to be wrought by the steam-engine, but had less machinery. He gave the model to a gentleman of Stirling, and never heard what became of it. When twelve years old, he was put to the trade of a shoemaker; after only eight days' instruction, he was able to make shoes on his own account; not that he was master of the trade, but he was then left to the resources of his own ingenuity, and acquired the art without farther actual superintendence. But the natural bent of his genius leaned towards mechanics, and he never liked the employment. Wheels and levers occupied his mind from his earliest recollection, and he was happy only when he was inventing, or constructing what he had invented. He soon left his native town, and went to Glasgow, not with the view of following out the trade of a shoemaker, but in the hope of getting into an employment which would place him near some of the magnificent machines used by the manufacturers of that city. Uninstructed as an artist, however, and utterly ignorant of spinning and weaving, it was difficult for him to find a situation about a manufactory which he was fitted to fill. At last he thought himself qualified for the humble situation of the keeper of an engine; and, accordingly, engaged himself in that capacity. For two years his daily occupation was to feed the furnace and to oil the engine; and he felt happy in the employment, for it afforded him an opportunity of looking upon wheels in motion. Tired, at last, of the sameness of the scene, he returned to Linlithgow, and endeavoured to follow his original trade. But the mechanical powers still haunted his imagination, and he continued to invent and construct, till he sometimes brought upon himself the admonitions of his friends and the scoffs of his enemies, for devoting so much time to his visionary inventions, as they called them, instead of attending to his trade. The invention of the long-sought-for perpetual motion appeared to him a splendid enterprise, attractive by the difficulty which attended it, and it excited his ambition by the very obstacles which it presented. He directed his ingenuity to that object, and at length he produced a piece of mechanism of extraordinary ingenuity.

In the year 1814, he had become so disgusted with the

trade of a shoemaker, that he could continue it no longer. Often would he throw the shoe from his hand in indignation, when his mind was diving deep into the principles of mechanics, and accuse fortune for dooming him to such despicable drudgery. As often would he draw down the sage advices of his spouse, who regarded him as the dupe of a heated imagination. He now conceived the idea of becoming a weaver. He had then in view to erect looms to be worked by a water-wheel; and thus promised himself both profit and pleasure from his change of profession. Accordingly, his first object was to learn the trade of a weaver. This was soon accomplished. He constructed with his own hands the whole apparatus of a loom, except the treddles and reed; got a professional weaver to put in the first web; and, without any other instruction, made as good cloth as those regularly bred to the business. This scheme, however, was never prosecuted farther.

His last effort was to complete his discovery of a perpetual motion. The invention was known in Linlithgow a considerable time before it was known to the public; but it was despised there, in the usual way, for a prophet is not without honour, save in his own country. The voice of fame, however, at length taught the good folks that a genius was among them, and they then crowded to see it, with as much eagerness as they formerly displayed indifference about it. A considerable number of strangers also visited it, and all expressed their admiration of the ingenuity, and, at the same time, the simplicity of the contrivance.

It is difficult to convey an idea of the invention by description. A wooden beam, poised by the centre, has a piece of steel attached to one end of it, which is alternately drawn up by a piece of magnet placed above it, and down by another placed below it; and as the end of the beam approaches the magnet, either above or below, the machine interjects a non-conducting substance, which suspends the attraction of the magnet approached, and allows the other to exert its powers. Thus the end of the beam continually ascends and descends betwixt the two magnets, without ever coming into contact with either, the attractive power of each being suspended precisely at the moment of nearest approach. As the magnetic attraction is a permanently operating power, there appears to be no limit to continuance of the motion, but the

endurance of the materials of the machine. So much may be said of his model, which is rather a practical development of the principle than an application of it to any purpose.

Spence afterwards simplified the apparatus, and exhibited a horizontal wheel, set full of needles, attracted constantly round by the magnetic power; and which, he said, would move as long as the axle of the wheel would last; or the magnetic virtue remain.

Spence made several other ingenious machines, including a self-moving car, which was exhibited in Edinburgh, and on which he used frequently to make excursions along the road. This ingenious artist has very little of the enthusiastic visionary in his composition, but possesses a full reliance on his own powers. His education has been that of the operative mechanics of Scotland in general—reading, writing, and arithmetic; but he has an intuitive perception of every principle connected with mechanics, which he never studied in books; because he found, on attempting to do so, that he derived no instruction from reading, on account of not understanding the terms. He has studied mechanics, however, extensively in another way—viz., by visiting many and various machines, by observing them in motion, and by thinking on the principles developed in their construction. He cannot, however, he says, well understand a scientific description, or easily communicate his own ideas by description to others. When he has invented any particular piece of mechanism, he constructs a model of it, and thus at once satisfies his own mind on the practicability of the principles, and conveys his ideas to other minds—rather, however, for his own gratification than for any assistance he expects to obtain from it. [Article "Ingenuity."—See also Chapter IX., page 145.]

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Under the title of "A few words inducing towards the discovery of Perpetual Motion, perhaps the actual discovery thereof," the following appears in the "Pamphleteer:"—

London, March, 1822.

What is meant by the term "Perpetual Motion?" Is it supposed that there is an undiscovered substance in the world, that will of itself perpetually move, with as little apparent

cause as that which actuates the needle in becoming motionless in one particular position? Or, is it to be found in the combined re-action of mechanical powers?

The first idea is stamped with a degree of probability, by the mystery of the needle; yet I imagine the latter is relied on with the greater confidence of mankind, and is the pith of the following few words:—

It is well known that the weight of a pendulum will almost regain the level from which it descended, losing a little space at every vibration, until it becomes motionless; if of itself it could exceed or even regain the level, doubtless it would become a perpetual motion.

To find a power that will aid the motion of the pendulum, and in conjunction renew its strength, is what is wanted to create perpetual motion.

What I shall endeavour to explain will at least induce towards the discovery of this power.

The principal parts of the machinery about to be shown are in number three:—

A vibrating pendulum,

A revolving pendulum, and

A tubular lever.

A vibrating pendulum in motion describes a segment of a circle, and returns on the same segment, and at every vibration its described segment decreases.

A revolving pendulum is composed of two or more pendulums, united at their lighter extremities, there revolving on an axis, the heavier extremities being placed at equal distances in the outer circle: this, I believe, is what is termed a fly-wheel when affixed to hand-mills, &c.

The tubular lever is the chief instigator of the whole, and must contain a weight apportioned to the weights of the two pendulums.

Fix the lever on a cross axis: thus, on an axis within a circle, the circle on an axis at opposite angles, thereby is given to each extremity of the lever a revolving power of motion; attach one extremity of the lever to the outer circle of a revolving pendulum, the other extremity confine within the bar of the vibrating pendulum; thus combined, the effect to be produced when put in motion will be this—

The two pendulums will guide the motion of the lever, which then partakes of the power of a pendulum, giving fresh

impulse at every vibration of the pendulum, and every half revolution of the revolving pendulum; for, as each extremity of the lever rises, the weight within falls to the opposite extremity, and gives fresh impulse to the whole: thus (if my idea is correct) will be produced motion perpetual—that is to say, perpetual so long as the materials of which it is made will hold together.

I have given this short description merely by way of example, as I believe there are several ways of combining these three powers, so as to produce perpetual motion, if my idea on the subject is correct.

The lever may contain mercury or a solid orb of heavy substance; and if the tube be exhausted of air the weight will pass more freely, and certainly increase the power of the lever.*

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The two following claims occur among the many instances of alleged discovery:—

That great phænomenon, a perpetual motion, is now found out by Sir Charles le Blon, and Henry Huish, Esq., captain in the Royal navy. The mechanical part of it was performed and improved by Mr. William Paget, watchmaker, late of Burford, in the county of Oxford.—(The "London Magazine," 1756.)

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Amongst the perpetual claimants of this (so far as we know) undiscovered discovery, another has arisen, who asserts that he has invented one which has not ceased for several years, and which, unencumbered by weights and springs, and such "foolery," will maintain itself as well for a century as a day: its power and velocity, he asserts, are equal to anything.—(The "Imperial Magazine," 1823.)

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Mr. Gill, as chairman of the Mechanical Section of the Society of Arts, having, in Thomson's "Annals of Philosophy,"

* The Pamphleteer, vol. 21, 1822.

No. 41, Tract 8.—Considerations of the Police Report of 1816, &c. With a few words inducing towards the discovery of Perpetual Motion—perhaps the actual discovery thereof. Page 207.

1820, exposed an imposture, as already given, now, in his own Journal, has "Another pretended Perpetual Motion exposed:"—

The public are highly indebted to the spirited conduct of three respectable and scientific individuals, in suppressing a gross imposition upon the too easy credulity of the British public. The exhibition was in Fleet-street, and the admission money demanded was two shillings for each person. It has been described to us (for we had not faith enough in the practicability of the thing to wish to see it) as consisting of two upright axes; their upper and lower pivots turning in holes made through pieces of brass sufficiently thick to enclose any communicating powers from machinery placed either above or below the pivots, to intimate that no motion was conveyed to the axes through them. Upon one of the axes, two toothed wheels were fixed obliquely, which worked into a long pinion upon the other axis; and upon the upper surface of one of the toothed wheels three inclined planes were fixed, having a small waggon or carriage upon each, with weights affixed to them; and it was pretended, by the exhibitor, that these carriages, by their downward tendencies, were the real cause of the motion. This, however, was all pretence, and intended to divert the attention of the observers from the real source of motion.

We have already stated that the pivots of the upright axes passed through thick pieces of brass. And it was evident that one or other of these pieces included two toothed wheels, the one upon the pivot which passed through it, and the other upon another axis, which derived its motion from a concealed spring movement, placed either above, or, more probably, below the pivot, in the support of the machine; which spring was wound up from time to time, as its power became exhausted. One of the gentlemen offered to give the exhibitor a thousand pounds, provided he would suffer him to enclose the machine in a locked chest, and that it should be found to continue in motion one week afterwards. This he declined to accept; but, upon their assuring him of their conviction of their being possessed of the true cause of its motion, twice did he refund the money he had taken from them! They did not, however, stop here; for, after detecting the imposition themselves, they thought it their duty to

prevent the public from being farther imposed upon; and therefore they prepared a placard, and paid a person for carrying it up and down Fleet-street, to caution the public against being duped by any pretended perpetual motion. This had the effect of dislodging the proprietor from his first place of exhibition, and it was thought to have suppressed the delusion: but not so; he soon recovered from his panic, and in his new placard announced that the *real* perpetual motion was only to be seen there: he also gave out that it was his intention soon to take out a patent for it; and several gentlemen actually called upon the editor to inform him thereof. The exhibitor did not stop even there, but laid a complaint before the Lord Mayor, of the annoying conduct of the gentlemen who had detected the imposition; but his Lordship, much to his credit and to the dismay of the quack, informed him that they had acted very properly; that their conduct was highly praiseworthy; and that, had they not done it, he should have found it necessary to have taken the same measure.

We hope that we may now congratulate the public upon being freed from this imposture, which had, however, found many believers in the possibility of the thing; and we would seriously advise all persons, in future, to inquire into the causes which actuate these pretended self-movers, and not give themselves up to the expectation that such an invention will ever be discovered.

The Society of Arts has been so very often annoyed by the claims of persons bringing pretended self-moving machines, or perpetual motions, before it, that it is about to offer a premium for the best demonstration of the utter impracticability of such a thing being ever accomplished.

The imposture of another of these charlatans, who exhibited in the Burlington Arcade, was last year detected, and soon stopped, by the editor.*

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A correspondent writes Mr. Gill "On a pretended Perpetual Motion," which would appear to be the same he himself described in 1820:—

Bury St. Edmunds, Suffolk, Dec. 10, 1825

SIR,—Some few years since a person exhibited in Bury a

* The Technical Repository. By Thomas Gill. Vol. 1, 1822, p. 235.

perpetual motion, or pretended perpetual motion, of which the maintaining power was magnetism. The invention consisted of two horse-shoe magnets, fixed in a horizontal plane, with their poles opposite to each other, and a few inches apart. Between them was placed a small needle similar to that of a compass; but, instead of the cap and point suspension, it was fixed at right angles to a light perpendicular axis, and it was pretended that the powers of attraction and repulsion of the two magnets kept the needle in a perpetual and very rapid rotatory motion. Between the two poles of each magnet was fixed a small block of a black substance, which, the exhibitor asserted, was a mixture of metals possessing the power of intercepting the magnetic influence; but beyond this, he was, or pretended to be, entirely ignorant of the principle of the invention, which he stated was not the fruit of his own ingenuity, but of some person whose name I forget, and who bequeathed it to him on his deathbed. Accidentally meeting with some numbers of the "Mechanics' Magazine," a few days since, I found a description of a perpetual motion which, I have no doubt, is the very same; but there is no attempt at explaining the principle upon which it is constructed. As you have already exposed one or two impositions of this kind, perhaps you will not deem the one I have attempted to describe below your notice. If it were a perpetual motion, as many imagine, it seems deserving of consideration for its great ingenuity; and if not, a detection of the fraud may serve, in some measure, to prevent similar impositions. * *

Your obedient servant,

A. E.

OBSERVATIONS BY THE EDITOR.—We must own that we cannot possibly conceive what benefit can be derived from the continual publication of pretended perpetual motions! They merely serve to gratify that perverted appetite for the marvellous, which, unfortunately for true science, is always too much prevalent.*

[He concludes by mentioning the rapid movements produced by electro-magnetism.]

* The Technical Repository. By Thomas Gill. Vol. 9, 1826, p. 56.

In the "Quarterly Review" appeared an able article on "The Century of Inventions of the Marquis of Worcester, from the Original MS.; with Historical and Explanatory Notes, and a Biographical Memoir. By C. F. Partington, &c. London, 1825."

The following selections are made from the review of this work, as being pertinent to the object of the present work. As regards the "Century," the critic remarks:—

It has frequently been asserted—but on grounds too weak to warrant any such supposition—that these "Inventions" of the Marquess were mere assumptions set down at random; and that he never had by experiment performed any one of them, nor intended that they should, either by himself or others, be performed. Hume, who does not even know the title of his book, boldly pronounces it (the "Century") "a ridiculous compound of lies, chimeras, and impossibilities;" and Walpole, in his "Royal and Noble Authors," designates the Marquess as a "fantastic projector and mechanic." With his too frequent disregard of truth, he asserts what is in direct contradiction to historical fact; he was a prejudiced writer, and, like some others more celebrated for their literary attainments than for scientific knowledge, affected to despise and undervalue what he did not understand.

There are some circumstances, however, it must be confessed, which lead one to conclude that his projects were wholly disregarded at the time. The Royal Society had then been some years in existence. Sir Isaac Newton, Boyle, Wilkins, Hook, and other learned and ingenious men, were living, and eagerly pursuing philosophical researches; yet no notice appears to have been taken by any of them of the Marquess's pretensions. Could it be that the mysterious and empirical terms in which his inventions are stated caused them to be disregarded? True it is, he was poor; and it is clear, from the Act passed in his favour, that his object was, and indeed it is so expressed, "to enable his heirs, for 99 years, to receive the sole benefit, profit, and advantage resulting from his 'water-commanding engine,'"—but his poverty was greatly, if not altogether, occasioned by his father's loyalty to two sovereigns.

[The reviewer then, alluding to the Marquis's imprisonment in Ireland in Charles the First's time, and in the Tower when Charles the Second ascended the throne, ably upholds his character for both genius and piety. After a dissertation of some length on the steam engine, he proceeds to say:—

The wonderful wheel described in No. 56—which is, as the Marquess says, "a most incredible thing if not seen"—is an attempt at what has been tried by thousands, and which will yet be tried by thousands more. The failure of such a number will not deter others from wasting their time and substance to no purpose in the discovery of a perpetual motion—a property the power of which is vested solely in the Great Author of the universe, and exists only, as far as we know, in the arrangement of the planetary system. No charge of quackery, however, can fairly be laid against the Marquess on this score, as the wisest men of his time, and both before and after him, have split upon the same rock. Now at last, however, the squaring of the circle, the finding of the longitude, and the discovery of perpetual motion are the stumbling-blocks mostly of feeble minds, set in action by that dangerous thing, "a little learning."

There are a few, but not many, of the "scantlings" which may justify Lord Orford's ill-natured remark; for instance, No. 25, which runs thus:—"How to make a weight that cannot take up an hundred pounds, and yet shall take up two hundred pounds, and at the self-same distance from the centre; and so on, proportionably, to millions of pounds." This is, at least, in its present state, unintelligible. It is "paradoxical," and so completely contrary to every established principle or rule in science, that we may fairly set it down among the marvellous, contributing to bring the whole "Century" into disrepute. Mr. Partington's little volume will, however, prevent this.*

* The Quarterly Review, vol. 32, 1825, 8vo., pp. 397-410.