

22.
Perpetual
motion
impossible.

Helmholtz in Germany, and Thomson in England, heard about Sadi Carnot himself. Sadi Carnot, so much earlier and so unlike Mayer, had nevertheless one point in common with him. This point seems to have given a common anchorage to all those thinkers who, in the course of a generation, gradually lifted the theory of heat and energy out of twilight into clear thought. Sadi Carnot, Mayer, Joule, Helmholtz, Thomson, all express or imply the same idea — viz., the impossibility of a perpetual motion.¹ In one form or other this seems

¹ The conception of a “perpetual motion,” or, as it is termed abroad, of a “perpetuum mobile,” and that of its impossibility, have been changed and more clearly defined in the course of the hundred years which followed the decision of the Paris Academy of Sciences in 1775 not to receive in future any scheme of perpetual motion. Into the same class of axiomatic impossibilities were also thrown the “squaring of the circle” and the “trisection of the angle.” Helmholtz (appendix to his Lecture on ‘Die Wechselwirkung der Naturkräfte,’ 1853, dated 1883) remarks that the proof of the impossibility did not then exist, and that the resolution was therefore based merely on the experience of past failures. The doctrine of Energy, the arithmetical discoveries of Gauss, and the elegant researches of Hermite and Lindemann, have thrown much light on these celebrated problems. In the last chapter of this volume I shall revert to the two latter; as to the first, the “perpetual motion,” what follows may tend to clear the popular conceptions. Tait has correctly remarked that “perpetual motion is simply a statement of Newton’s

first law of Motion” (‘Recent Advances,’ 3rd ed., p. 74). He might have added that it took probably as much ingenuity on the part of Galileo to arrive at the principle of inertia—viz., that “all motion is perpetual until force interferes to alter and modify it”—as it took to formulate correctly the other principle that such a perpetual motion is of no use, because you cannot do any work with it, except by using it up or annihilating it. In the beginning of the nineteenth century the impossibility of a mechanical device for the so-called perpetual motion was universally admitted, though—as Rosenberger (‘Geschichte der Physik,’ vol. iii. p. 229, note) remarks—this was not also extended to physical processes, it being taught that the processes of nature represented a “perpetual cycle which uninterruptedly renewed itself.” In fact, the truth was beginning to dawn that if motive power or energy could not be obtained out of nothing neither could it be destroyed. Carnot in 1824, and Mayer in 1842, both take it as an axiom that power cannot be created; Mohr in 1837, and Joule in 1843 and 1845, are equally convinced that power cannot be