equivalence and correlation of forces, such as Faraday, Mohr, Mayer, Grove—not even Joule and Helmholtz— that if neither matter nor power is lost, the phenomena of loss and waste in nature and in human life remain unexplained. The only mind to whom this problem presented itself was Sadi Carnot, and it presented itself to him in an extreme form; for he started with the idea that even heat itself in doing work was not lost or destroyed, but handed over from the hotter body (the boiler of the steam-engine) to the colder body (the condenser of the steam-engine). We now know that this view was not correct—that the whole heat is not handed over, but always only a portion of the heat. But, with this exaggerated view in his mind, he tried to explain the phenomena of loss and waste, and he conceived that the explanation lay in the lowering of the temperature. " It would be difficult to say why " — though he had assumed it as an axiom that—" in the development of motive power by heat, a cold body should be necessary, why in consuming the heat of a heated body we cannot produce motion."[1]   Heat at high temperature is of more value for doing work than the same amount of heat at

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[1] The words quoted are taken from one of the fragments published in the year 1878 by H. Carnot from the posthumous MSS. of his brother, Sadi Carnot. In this fragment he approaches the modern conception that heat is the result of motion: he sees that all other phenomena can be explained by this hypothesis; but he pauses after having stated the difficulty quoted above in the text, and reverts, after some further queries, to the same diffi- culty in the words, "Can one con- sume the heat entirely without letting any arrive at the body B [viz., from a body A]? If this were possible, one could create motive power without consumption of fuel, and simply by the destruction of the heat of bodies" ('Puissance motrice, &c.,' ed. 1878, pp. 92 and 94). It is interesting to see how nearly these reflections approach to those made more than twenty years later by Thomson.