

JAMES THOMSON

Note of Interview with Robert Stirling

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I have just seen the Rev Dr Stirling of Galston, he called here and I had a good deal of conversation with him regarding the air engine. At the commencement, in presence of William and Mansell, and afterwards in the presence of my father, I told him particularly not to tell me anything that he did not regard as entirely public in case I had some ideas on the subject myself. He mentioned that he is at present going on with some improvements in his air engines. Going away, he assured me that he had told me nothing that is not publicly known. I found that, as I had previously thought, he does not understand his own engine; not knowing at all the way in which the heat is expended in generating the work. He said he had been greatly perplexed for a long time about the changes of temperature of the air produced by changes of pressure and that at one time this had rather alarmed him in regard to the perfection of the engine as it appeared that the respirator would not even theoretically give back all the heat to the air; but that now he is inclined to think that a "sort of average is struck" or a compensation is made by which all the heat is really given back if the air passages be small enough the metal perfectly absorbent and non-conducting. I told him that some transference of heat from the furnace to the water by means of the changes of temperature of the air is essential to the action of the engine; that otherwise it would be theoretically perpetual motion. He replied that there are plenty of theoretically perpetual motions if we leave friction resistances etc out of consideration. I said that there are these, but not perpetual sources of power. After some consideration he replied that perhaps what I said was correct and that he had never thought particularly on the difference between a perpetual motion and a perpetual source of power. In pointing out to me what he supposed to be the action of the air in the respirator and so endeavouring to prove that the respirator does really return all the heat to the air, and so that the machine is theoretically a perpetual source of power, he had no idea that the air ought to tend to be cooled by expansion at one part of the stroke so as to take in heat from the fire, and that at another it ought to tend to become heated by compression so as to make it give out heat at the lower temperature; but he was strongly impressed with the supposition that the fire is useful merely to give a small supplement to the heat returned by the respirator so as to make up for incidental losses due to practical imperfections of the apparatus, such as conduction of heat, incomplete absorption, etc, not that the removal of some heat from the fire is essentially connected with the development of work.

The principal information I got from Dr Stirling was to the following effect. He uses so great a temp. as a dull red heat. His vessels (made of cast iron) have been liable to crack from unequal expansion but they do not burn away. The statement that one of his engines burned only  $\frac{1}{5}$  of the coal of a steam engine was rather an exaggeration. He explained to me rather more fully than I had before known it, the arrangement of the laminae or plates which he uses in the respirator. The main thing of consequence in regard to this is that, in his engines he considers it advisable to have the space between the plates so thin as  $\frac{1}{50}$  or  $\frac{1}{80}$  of an inch.