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### XIII. Model of a small electrical machine

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oxygen. At the temperatures employed in the foregoing researches, however, it is not to be supposed that dissociation would proceed to completion ; this change, therefore, would not have taken place.

But further experimental investigations must precede the theoretical discussion of this question. It will be my first endeavour to carry out experiments within greater temperature-limits, and especially to estimate the specific heats of the vapours. I have already carried out a prolonged series of preliminary experiments with this object, making use of the apparatus already described with a few slight modifications ; the narration of these experiments will occupy a further communication.

### XIII. *Model of a small Electrical Machine.*

*By* GEORGE FULLER, C.E., Belfast\*.

THIS machine is a double-acting electrophorus worked by cranks, with the addition of an arrangement by which a small electric charge given to it is augmented and kept up, so that the dielectric does not require to be recharged.

A is a vulcanite plate supported in a vertical position by two insulated standards, *p, p*.

B, B' are two insulated metallic plates, one on each side of the plate A ; these can be moved together to and from contact with A by means of cranks worked by the handle C.

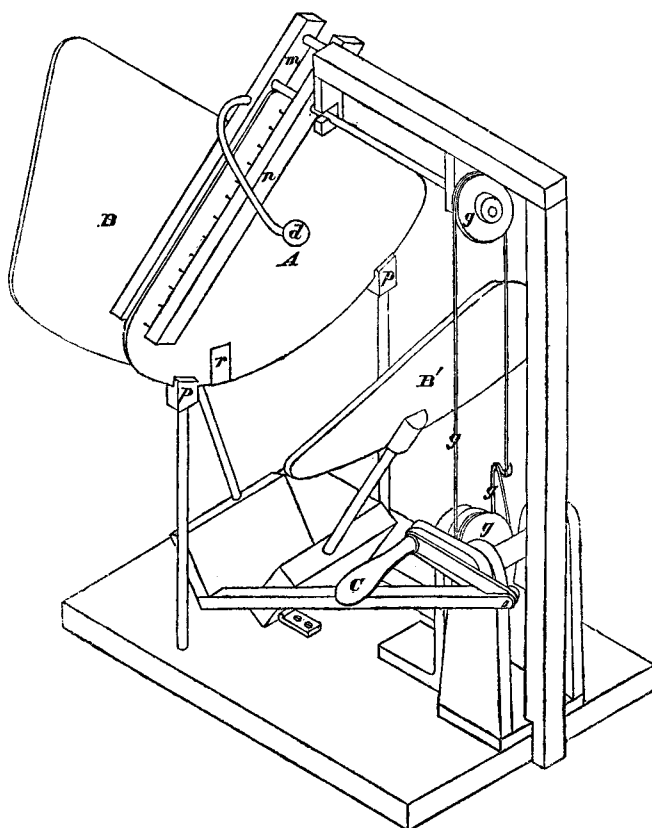
*m* and *n* are two conductors armed with needles and connected by means of two glass rods, so that they receive the same reciprocal motion from the mechanism by means of the wire, cord, and pulleys, *g, g, g*. The wire *g* is attached to the arm that moves the plate B' ; and the length of the cord and size of pulley are so adjusted that when this is in its extreme position from A, as shown, *m* and *n* are also at one extremity of their motion, as shown ; and when B and B' are in contact with A, *m* and *n* are horizontal. The conductor *n* is not insulated ; and it will be seen by the diagram that *m* and *n* during their motion pass on either side of the plate A.

To the conductor *m* is fixed a wire terminating in a brass ball, *d* ; this wire is of such length and form that when B and B' recede from A, and *m* and *n* move downwards from their horizontal position, the ball *d* passes close to B'. Care has to be taken that this juxtaposition does not occur until the vulcanite plate separates the points on *m* and *n*.

The action of the instrument is as follows :—A charge of,

\* Communicated by the Physical Society.

say, negative electricity having been given to the insulated arm *m* when in a vertical position, on motion being given to



the machine this electricity is distributed by means of the points over the face of the vulcanite next to *B* ; at the same time positive electricity is drawn from the earth, thrown upon the other face of that plate by the uninsulated points attached to *n*. When now *B* and *B'* are brought into contact with *A*, the negative electricity on its one face attracts the positive on the conductor *B* and repels the negative, whilst the positive on its opposite face attracts the negative on the conductor *B'* and repels the positive ; then, by means of the piece of tinfoil (*r*) that connects *B* and *B'* when they are in contact with *A*, the two electricities that are repelled neutralize each other ; and when the plates are moved away from the vulcanite, *B* is charged with positive and *B'* with negative electricity. Then, before

reaching its extreme position, the latter communicates its charge to the insulated arm  $m$  by the brass ball  $d$ , and its negative electricity is thus distributed over the surface of  $A$  next to  $B$  and thus augments its original charge. At the end of its path  $B'$  is momentarily connected to earth. It will be evident that on again bringing the plates into contact the charge in  $B$  is augmented; also that if a supply of negative electricity is required, the only modification of the above is to give to  $m$  a charge of positive instead of negative electricity.

The above instrument forms an easily constructed and worked electrical machine, and is beside interesting as rendering automatic the classical electrophorus of Volta.

#### XIV. *Views of the Nature of Heat.* By F. MOHR\*.

THE phenomena of heat have been till now almost exclusively explained in text-books by the assumption of a Heat-substance. The discoveries of Melloni have made this view inapplicable to the phenomena of Radiant Heat; they require the assumption of vibrations similar to those of the Undulatory Theory of Light. The Propagation, Transmission, and Polarization of Radiant Heat have been completely explained by these assumptions; and, with such facts to guide us, it is certainly no mere idle speculation to attempt to extend this view to the phenomena of common or stationary heat; rather it is in the highest degree seasonable to point out how this view, which depends upon the well-settled facts of Melloni, explains with overwhelming clearness most of the phenomena of stationary or conducted heat; and it is to be expected that, with this reform in our ideas, there will be a corresponding reform in our terminology.

Heat is thus no longer a particular kind of matter, but an oscillatory motion of the smallest parts of bodies. Radiant Heat is propagated in straight lines; and the molecules vibrate in all directions in a plane perpendicular to the direction of the ray. A polarized ray vibrates in one direction only in this plane; on the contrary [the particles of] an ordinary hot body vibrate in all possible directions of space, and therefore propagate their heat uniformly in all directions. The propagation of heat by contact is thus a communication of motion by impact; and cooling is a relative coming to rest. The number of heat-vibrations per hour must, as in the case of light, be very large, since all bodies become luminous at a certain temperature; but even at this temperature waves of light and

\* Translated by Professor Tait from Liebig's *Annalen*, vol. xxiv. 1837.