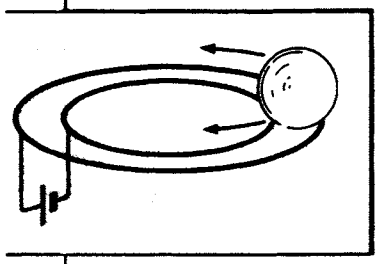
FEEDBACK

These effects are not confined to ball-bearings alone: linear-type motors may also be contrived. For instance, one idea consists of placing a metallic cylinder on two rails as shown in **Fig. 2**. Once the cylinder is pushed into action it shows a variation on the theme, whereby a metallic sphere propels itself around a circular railway.

The particularly interesting fact, however, is that the two ideas presented here are far from novel: they are culled from 'The Theory of the Nature of Light, Part 5' p.195 by John Harris, published in June 1875. With reference to the 'circular railway' of **Fig. 3** it is worth quoting the book, as follows:



> *"When the circular base. . . is made level, the ball placed upon the rails, and a voltaic current, copious in quantity and moderate in intensity, introduced at the screws the ball will begin immediately to vibrate, and increase its motions till it revolves on the rails. It revolves with equal facility in either direction. . . and it becomes much heated during its motion."* and further that *"the cause of the motion to be an intermittent thermic action taking place at the surface of contact, at a point a minute distance behind the centre of gravity of the rolling metal."*

Dr Marinov's assertion that the mechanical energy is 'produced from nothing' was obviously an April Fool's joke designed to confuse the majority of readers who probably believe, as I do, that 'you cannot get something for nothing'.

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In the Department of Electrical Engineering of the institute where I was working as a teacher from 1975 to 1985, one of my colleagues liked to intrigue students and teachers with the same ball-bearing motor as the one described by Stefan Marinov in the April issue of *EWW*.

As electrical engineers, we all tried to explain the machine with electromechanics. Some of us considered the ball-bearing motor as a special case of the homopolar machine, which can be considered as a very sophisticated variant of the well-known Barlov wheel. A homopolar machine is a direct-current electromagnetic machine without a commutator and can be used as generator and as motor. It operates with very big currents and very small voltages.

Looking at the rotating ball-bearing motor, we had the idea that the tremendous currents in the connecting wires produced a magnetic field with components perpendicular to the current in the rotor and thus producing Lorentz forces. However, when I stopped the motor with my hand to feel the torque and next tested its self starting capabilities by giving it a flick in the opposite direction, it started to rotate in that opposite direction, opposite to the torque produced by the Lorentz forces!

At that time, this observation killed our homopolar machine model and we left the ball-bearing machine unexplained. There was, however, another observation, that might be crucial for Stefan Marinov's statement that his motor delivers energy from nothing: when it was rotating in one direction the motor ran slower and produced a smaller torque than when it was running in the other direction! I fully appreciate Stefan Marinov's explanation of the ball-bearing motor as a thermal engine, but his claim that it delivers energy from nothing is nonsense.

He remarks: "One can see immediately that the ball-bearing motor has no back tension because there are no magnets, and the magnetic field of the current in the stator cannot induce electric tension in the metal of the rotor." Where currents of ten or even hundreds of ampères are flowing, you can never see immediately that there are no magnetic fields including electric tension in the rotor. (It would have been nice if Mr Marinov had mentioned the metal from which his rotor was made. Ours was steel.)

I am pretty sure that the outcome of the energy measurements will be different for different directions of rotation. If so, we can draw the conclusion that a ball-bearing motor is partly a thermal engine and partly an electromagnetic motor.

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To criticise Stefan Marinov's ball-bearing motor may be to push at an open door, but it would be poor science if I were just to pour scorn on it. Here, then are some explanations of the more glaring flaws in his reasoning.

First, the thermal contraction of the ball bearing is not a direct reversal of the expansion. In expanding, the ball does work by pushing against the inner or outer ring, whereas in contracting it simply loses heat to the air without doing work (apart from against small internal stresses, which in any case operate in the opposite sense from the expansion work, and so increase the discrepancy rather than reduce it). This causes the curve of expansion against temperature to have a hysteresis shape, corresponding to the increase in entropy common to all thermal engines. This in turn means that more electrical energy has to be put in than the mechanical work got out, so in no way can the motor be said to run on zero energy.

Secondly, the calorimeter experiment proves nothing except what we know already, namely that all of the electrical energy becomes heat eventually – even the part which temporarily becomes mechanical work. Now, if Marinov could repeat the experiment with the motor generating heat equal to the electrical energy *and* with the axle protruding from the calorimeter doing useful work in the outside world, *then* we would have something worth looking at.

Finally, the reason for the reduction in resistance at higher currents is trivial. At higher currents, the balls expand more, and so the area of contact between ball and ring is greater.

There may be some uses for a motor based on this design, but energy for nothing it is not!

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Faster than light?

The interesting and varied explanations for the Obolensky effect, submitted by your correspondents in *EWW*, March, 1989, show how valuable such letters are. Here was an experiment giving results of apparent superluminal speeds, and now we have a plethora of possible explanations requiring nothing of the kind! Yet the fact that those explanations *were* varied means that there was no unanimous opinion on several points.

(a) Where did the precursor signal originate? (At the relay? On the braided cable? Within the conductor? At the oscilloscope terminals? Previously induced within the oscilloscope? By stray coupling? etc.).

(b) When did that precursor signal begin? (The experiment had no independent timing device to indicate this vitally important instant).

(c) How did that precursor signal travel? (Through the air to the oscilloscope? On the outside of the cable? Through the braiding of one cable to the conductor of another?)

(d) When did that precursor signal reach the oscilloscope? (The experiment has no independent timing device to indicate this second, vitally important instant).

Although your correspondents made the above assumptions given in brackets, any epoch-making experiment should not require that an explicator is forced to make assumptions. No doubt many of your correspondents (or the authors) could suggest ways in which the above points could be obtained with certainty.

Do we have to use cables for discovering precursor signals? Why not send a signal pulse to the Moon?

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