"They want to believe there's a secret being hidden by cruel scientists."

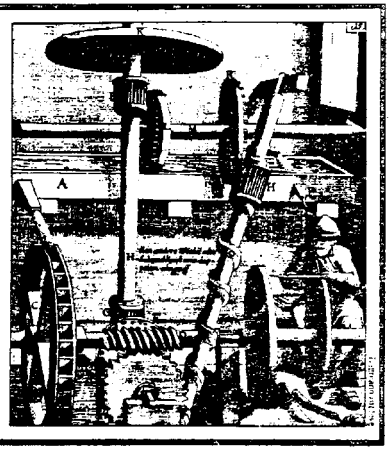
SCIENCE 83 MAY

Why not an endless stream?

Archimedes is credited with discovering a simple way to pump water: Rotate a coiled pipe. Water does indeed rise. So why not hook this Archimedes screw to a water wheel? The falling water turns the wheel, which turns the screw, which pumps the water back up to turn the wheel again. . . .

"When I first thought of this invention, I could scarce forbear, with Archimedes, to cry out Eureka; it seeming so infallible a way to for the effecting of a perpetual motion," wrote the Bishop of Chester in 1648. But when he tried it out, the English bishop learned a lesson about loss of energy due to friction. "I find it altogether insufficient," the bishop wrote, "and that for these two reasons: 1. The water that ascends will not make any considerable stream in the fall. 2. This stream will not be of force enough to turn about the screw."

A 17th-century German woodcut, right, shows this scheme turning a grindstone. The designer did make one allowance for friction—a small stream of water at P to keep the grindstone cool as it rotated. Which, of course, it would stop doing as soon as the other sources of friction dried up the wheel's water supply.

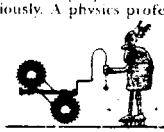


wardens trying to tell me what I can hunt and where I can hunt and when the season's on. It doesn't bother me what they say about my machine. The only thing they've done with their theories is conserve their own mental energy."

Johnson got the idea for his perpetual motion machine, a permanent magnet motor, while taking a college physics course in 1942. He's been refining it ever since while supporting himself with various engineering jobs, including one designing brakes at a company in Detroit and another developing lubricants at the Oak Ridge National Laboratory as part of the ill-fated attempt to build a nuclear-powered airplane. In 1979 he finally got his motor patented—which is curious, since government policy prohibits patents for perpetual motion machines unless the inventor has a working model. The patent doesn't specifically identify the motor as a perpetual motion machine, but it does state that the motor runs without an outside source of energy, which amounts to the same thing. So why was the patent issued? "I can't comment on the case," says a patent office spokesman. "All I can tell you is that mistakes do sometimes slip through."

One thing that can be said with confidence about Johnson is that he seems sincere. He is a kindly, slow-talking man with white hair, spectacles, and an extraordinarily wide face that gives him the semblance of an owl. Although he believes his invention will change the world—he often speaks of himself in the same breath with Faraday, Bell, and Edison—he insists that he doesn't want to profit from it. He claims to have turned down an offer of $10 million from a man in Ohio. "I don't have the right to make a quick buck from it and retire," he says in explaining why he has established a nonprofit foundation to develop his motor. "This is something that could turn the country around. One of them in every house would give us all the energy we need. I've already heard about an oil company that wants to buy it so they can get rid of it. I don't want that to happen, and I don't want the House of Morgan doling out this new energy source either. I want to be sure it's developed for the good of the country."

There are people who take him seriously. A physics professor at



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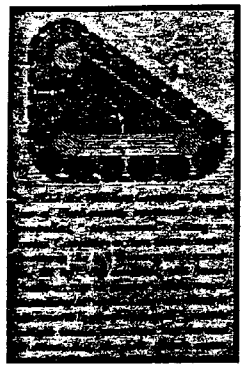
Virginia Polytechnic Institute, near Johnson's workshop in the Roanoke Valley, has worked with him on the design. A United Nations paper describes his motor as "an electricity generating unit requiring no fuel" and lists it as an important potential source of future energy. The *New York Times* reported his patent and said the invention "combines the attraction and repulsion existing between stator magnets and armature magnets to

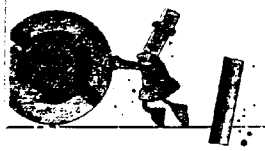


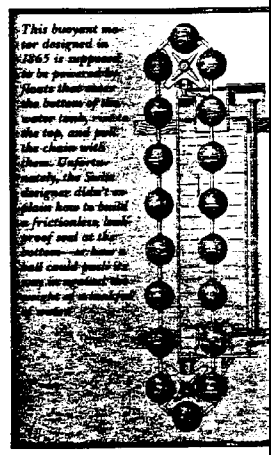
cause continuous movement." *Science & Mechanics* magazine ran a cover story titled, "Amazing New Motor Powered Only by Permanent Magnets," written by "a former research scientist" who visited Johnson and reported: "Within two days, this former skeptic had become a believer. Here's why. Howard Johnson refuses to view the 'laws' of science as somehow sacred, so doing the unthinkable and succeeding is second nature to him. If a particular law gets in the way, he sees no harm in going around it for a while to see if there's something on the other side."

What's odd about all this attention is that the motor itself doesn't exist. Johnson says that a prototype has been built, but the outside contractors left some bugs in it that he's now trying to get out. All he has is a few crude models in his basement and a patent with drawings for a device that looks not unlike the dozens of past permanent magnet motors that didn't work. Like Johnson, these former perpetual motionists started with the belief that a magnet has energy—after all, if you put a strong enough magnet at one end of a track and a steel ball at the other, the magnet will pull the ball down the track. The problem is that the ball stops once it gets there. So the quest has always been to find a way to make a ring of magnets that would somehow keep pulling the ball—or the arm of an electric motor—around in a circle continuously.

Johnson claims to have solved this problem. He also, in fact, claims to have discovered the source of a magnet's energy—a subatomic particle that has yet to be detected by physicists. His theory is not, to put it mildly, widely held. Paul Monus, a magnetics expert at Cleveland State University, has judged Johnson's plans to be "pure rubbish." Monus points out an inherent contradiction in any magnetic scheme to pull a ball around a circle: If the magnets are strong enough to pull a ball from the starting point, they're strong enough to prevent it from returning there to complete the circle. Johnson dismisses such criticism.

"These scientists haven't done





anything to solve the energy shortage. I have," Johnson said recently as he and his 12-year-old son displayed the models in the rec room of a friend's house near Blacksburg. First he showed his turntable, a piece of plywood mounted on a skateboard axle. A circle of magnets wrapped in aluminum foil sat on it. When Johnson or anyone else held a magnet above the center of the magnetic ring, the turntable would rotate continuously. The cause, obviously, was alternating attraction and repulsion from the magnet in the center.

But where did the energy come from? The magnet in the center, according to Johnson. The hand holding the magnet, according to skeptics. They argue that tiny vibrations in anyone's hand, moving the magnet ever so slightly up and down or side to side, changes the magnetic field enough to keep the

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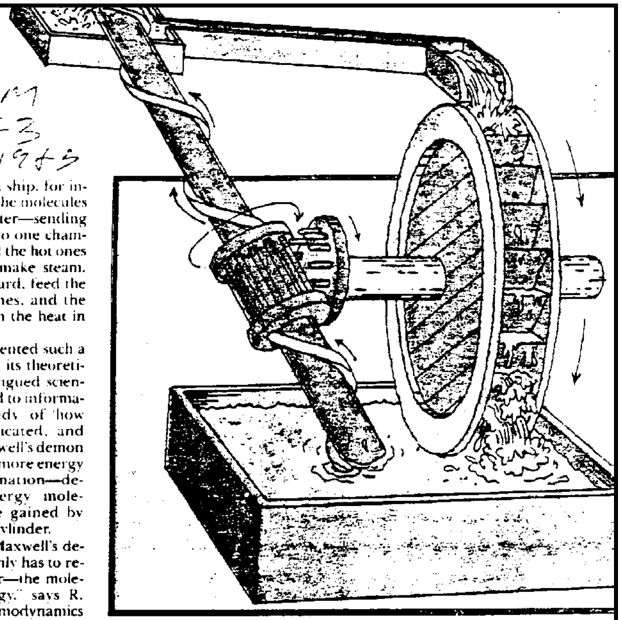


demon could power a ship, for instance, by separating the molecules in ordinary ocean water—sending the cold molecules into one chamber to produce ice and the hot ones into another one to make steam. Throw the ice overboard, feed the steam into the turbines, and the ship could run just on the heat in ocean water.

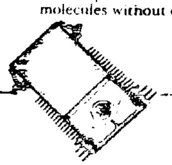
No one has ever invented such a demon, of course, but its theoretical possibility has intrigued scientists. They have turned to information theory, the study of how signals are communicated, and tried to show that Maxwell's demon would have to expend more energy in gathering information—detecting the high-energy molecules—than could be gained by trapping them in the cylinder.

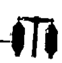
"You can think of Maxwell's demon as a goalie who only has to return balls of one color—the molecules with less energy," says R. Stephen Berry, a thermodynamics expert at the University of Chicago. "However he does that, whether he opens and shuts the gate or kicks the balls back himself, he has to do some work. Applying information theory shows that the work he does and the heat gained in the cylinder balance out according to the laws of thermodynamics. An obvious weakness in this argument is that there's a big difference between information theory, which involves a few hundred bits of information, and classical thermodynamics, which involves trillions and trillions of molecules. But the argument is generally accepted."

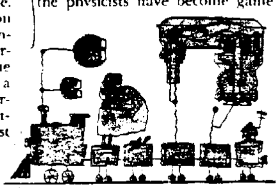
David Jones is one of those not completely convinced. He thinks that there still might be some theoretical possibility of separating molecules without doing work—by using, say, a membrane filter. He once ended an essay on the laws of thermodynamics with a joking exhortation to perpetual motionists: "Keep at it! The quest is not yet entirely hopeless!" After observing the reactions to his own fraudulent machine, though, he is more cautious with his words.

"The laws of thermodynamics are as certain as anything in science," he says. "I don't think it's been absolutely proven that perpetual motion machines are impossible. You can't prove a negative. But I do think Maxwell's demon was pretty much exorcised by information theory, and there's certainly no point in spending time looking for minute cracks in such a solid pedestal as the laws of thermodynamics. In one sense, perpetual motion crackpots in the past didn't labor in vain—they provided the psychic force that led to the principle of conservation of energy. It's just a pity they're still at it. They want to believe in magic. They want to believe there's a secret being hidden by cruel scientists."

Howard R. Johnson, a 62-year-old inventor in Blacksburg, Virginia, has no patience for all this talk about laws. "Physics used to be a science of observation and measurement," he complains. "Now all the physicists have become game



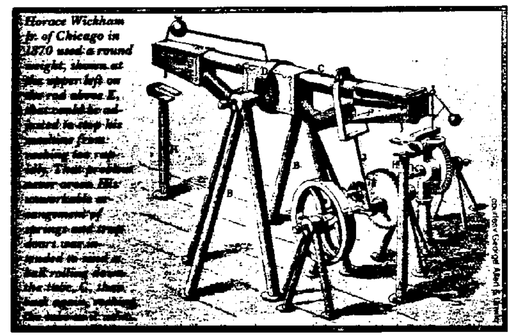




"These scientists haven't done anything to solve the energy shortage. I have."

ring turning. Monus got so tired of hearing about Johnson's device that he built one of his own at Cleveland State that also rotates when a person holds a magnet. Monus then showed that if this center magnet were instead attached in place, the turntable stopped.

"I know this one won't please the physicists until I attach it to something permanent," Johnson said. "I haven't had time to do that yet." He walked over to a potentially more persuasive model. This was a model railroad track, an oval about six feet around, with sets of magnets arched over each straightaway. He put a car loaded with magnets at the start of a straightaway. It was supposed to be drawn through the magnets, accelerated up a slight grade and around the curve, then coast until the second set of magnets attracted it. Then the car would accelerate and continue back to the beginning—and, according to Johnson's theory, keep going round and round the track.



Horace Wickham Jr. of Chicago in 1870 used a round weight, shown at the upper left on the rod above E, [illegible]

On its first three tries the car fell off the track immediately. The fourth time it went through the first set of magnets, then came to an inglorious halt before the end of the straightaway.

"It's not climbing the way it should," said Johnson. "This new bearing in the car needs to be adjusted."

"Well," he was asked, "how many laps could it do if it were working? What's the record?"

"Oh, there's no end to that," Johnson said. "But you see we've got problems with the track. Right here, for instance, it's got to be nailed."

"Of course. But what's the car's record?"

"Well, that's the thing. We usually have some kind of mechanical hindrance. This is just enough for me to know that it can work. If these bearings were working—"

"What's the record?"

"Well, the amount of runs has nothing to with the theory. I don't know of anything that limits it. You see—"

"Has it ever gone around the track twice?"

"You see, I usually have one part working and another part not, and—"

"Has it ever gone all the way around once?"

"Well, I don't keep track of these things. I think it has—"

His son stepped forward.

"It's gone up to here, Dad," said the boy, pointing to a spot a foot before the starting line. "It stopped when it got to here."

Johnson nodded. Several more questions produced the information that his magnetic scheme, the one that he expected to turn engines perpetually throughout the world, had thus far not sent a car one complete lap around a model railroad track.

This did not bother him.

"If the theory's as good as I think it is," he said, smiling as he walked up the stairs out of the basement, "nobody's ever going to stop it." S

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