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IS PERPETUAL MOTION POSSIBLE?

The reply to this question depends entirely upon the limitations put upon the term "perpetual motion." If we understand these words to mean a machine that would start itself, furnish power for doing work, and continue in operation so long as required, or until worn out, without the assistance of any external agency, we may say with the utmost confidence, perpetual motion is impossible.

If, on the other hand, we define perpetual motion as a machine dependent for its action upon the variability of one or more of the forces of nature, we may say perpetual motion is possible. The thermal motor, in which expansion and contraction are produced by natural changes of temperature, is an example of a motor of this kind. In this machine, the changes in volume in a body are made to store energy to be used in continuous regular work. A perpetual clock has been made on this principle.

Sun motors of various forms have been devised, which might be used in connection with storage mechanism for furnishing power continuously. A sun motor of sufficient size with a suitable storage system, could furnish power the year round in almost any part of the world; success being a question of hours of sunshine and capacities of motor and storage system.

Of course, what is said with regard to the sun motor applies with equal force to water wheels, windmills, tide and wave motors. Without doubt, all of these prime movers will come more and more into use as time advances, and storage systems are perfected. Still they do not satisfy the seeker for the ideal perpetual motion. This should fill the conditions first mentioned; but, as we have already said, this is an impossibility.

The first and strongest reason for making this positive assertion in regard to the ideal perpetual motion is found in the fact that never in the history of man has he been able to make a single atom of matter, or create the smallest fraction of a unit of energy.

All the works of man, of whatever name or nature, have been constructed of materials already in existence, and all the work done by man and his enginery has been accomplished by using current natural forces, such as the gravitation of water, the power of the wind, and the heat energy of the sun, or the stored energy of coal and other fuels or of chemicals.

Having the command of some of nature's forces, inventors have sought to circumvent nature's laws, so as to make water "run up hill," to cause masses of matter to act alternately in accordance with and in opposition to the law of gravitation; in short, to deprive matter of gravity while ascending, and cause it to act with the full force of gravity while descending.

Among perpetual motion devices of this class, proposed and tried, is the one having weights arranged on a wheel in such a way as to fall outwardly and increase the leverage on one side of the wheel, while they fold in and diminish the leverage on the opposite side of the wheel. This machine, it is needless to say, has never moved on its own account, although it has become classic.

In this device, the superior number of weights on the side where the leverage is least exactly balances the weights at the ends of the extended arms. This is true of all the modifications of this type of machine.

A favorite device of the perpetual motion inventor is that of weights arranged around the periphery of a wheel and counterbalanced by springs on which gravity has no effect. Such weights being balanced are supposed to be capable of being moved upwardly in opposition to gravity without the expenditure of much power. After having been elevated, the weight, while maintaining its position relative to the wheel, descends, causing the rotation of the wheel. After it has done its work the weight must be restored to its original position before the operation can be repeated, and here comes the rub. Many very ingenious plans have been tried to accomplish this, but the result has always been a perfect balance.

In another device the attempt is made to utilize the Archimedean screw to elevate water to be used for driving itself. The inventors in this case fail to notice that although the water is running down an incline in the screw, this incline is always being elevated, so that the water must be actually carried up an inclined plane by a force as great as it would exert if allowed to descend through the same distance. In all these cases friction is left out of the question.

Capillarity has been tried as a means of elevating a liquid to be used as a motive agent, but in this case, as in all others, the defeating element is present—the surface tension of the liquid prevents detaching the liquid from the upper end of the capillary conductor.

It seems strange that in these days the proposition should be made to run an electric motor with a current from a dynamo and to operate the dynamo by the power derived from the electric motor, yet, absurd as this proposition is, it has often been broached in good faith. A mere superficial examination of this subject shows that the losses incurred in transforming the current into motive power, and *vice versa*, are such as to defeat any attempts of this kind.

The permanent magnet appears to have suggested itself to many as a possible solution of the problem, and experimenters have searched the world over to find an insulator of magnetism to act as a cut-off for releasing the armature after it has been drawn forward toward the magnet; but no such material has been found. Nature, in this case as in all others, refuses to yield energy without its full equivalent of energy in some other form, and the law of the conservation of energy is found to hold good.

We have mentioned but a few of the multitude of devices constructed with the hope, not to say expectation, of producing a self-moving machine by utilizing nature's constant and unvarying forces.

Although the efforts of inventors in this direction have been barren of results of the kind aimed at, yet their labor has not been fruitless; many experimenters who considered actual trial better than any amount of study or calculation have learned that "knowledge comes of experience," and while discovering the fallacy of the ideal perpetual motion, they have been led to consider more practical subjects; making inventions which have proved beneficial to the world and profitable to themselves.

If the inventor of machines intended to be self-moving will not accede to Newton's statement that "action and reaction are equal and opposite" (third law of motion), and that there is a perfect and wonderful balance in the forces of nature, let him thoroughly acquaint himself with the principles of physics, and he will erelong be able to say with certainty just how the balance will occur in any and every perpetual motion machine of the ideal kind, and admit that he has not the power of creating energy.

THE CAMERA AT HOMESTEAD.

During the recent troubles at the Carnegie iron works, a mob broke down a fence and entered upon the premises to resist the landing, on the company's grounds, of men employed and sent there by the company, and who were being conveyed to their destination by boats on the Monongahela River. Twelve men were killed outright and more than a hundred wounded. Who were participators in this murderous engagement? Who first violated the law, by breaking down the fence and entering upon the grounds of the Carnegie company? Who carried arms, and who used them, in the attack upon the boats which followed? These are questions which are now to come before the courts of Pennsylvania, in a number of cases which have been instituted against the participants in the bloody work which took place at the Carnegie works in the early morning of the 6th of July last.

It is said the company has evidence sufficient to convict against more than a thousand of the active participants, of whom more than two hundred were armed with guns. But what is the character of this evidence against so large a body of men engaged in a fierce, in a bloody riot, when everything was in a state of the greatest excitement? It takes but a line to state it, and at the same time afford unquestionable proof of its high character: "We had detectives with cameras in the mill at the time of the shooting," says Secretary Lovejoy, of the Carnegie company. It is always difficult to obtain competent witnesses of exciting frays, and those who know the most, either from interest or fear of the consequences, invariably have phenomenally bad memories. But the camera knows neither fear nor favor, never becomes excited, and it brings out a multiplicity of details. Probably by no other means could such effective corroborative evidence be obtained in cases of this kind.

In the Homestead case the rioters were scattered all over the grounds near the landing place, within the company's premises, armed with guns and other weapons. They were behind fences, in the trees, and occupying other positions of advantage as would have been done in an actual battle. As Judge Magee said at the first hearing, "There were sharpshooters with rifles in the field, picking off men." But to prove all this according to the old methods, with all the contradictory witnesses that would be offered, would be obviously impracticable. The instantaneous photograph removes the difficulty.

The "camera fiend," as the amateur photographer is sometimes styled, is now almost omnipresent, and one can never be sure when in any public place, in a crowd, or at a scene of excitement, but his person and actions, with all the surroundings, will become the subject of a picture which, whether he might like it or not, would have the stamp of undeniable truthfulness. The disclosures to be made on the trials, as to how well the camera did its work at Homestead, will be awaited with much interest.

THE amount of coloring matter in a pound of coal is enormous. It will yield enough magenta to color 500 yards of flannel, vermilion for 2,560 yards, aurine for 120 yards, and alizarine sufficient for 155 yards of Turkey red cloth.