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THE SCIENTIFIC AMERICAN SUPPLEMENT
No. 166,
For the Week ending March 8, 1879.

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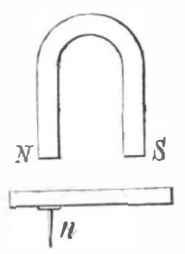
GARY'S MOTOR.

He who credits the statements concerning Gary's motor, contained in an article in the March number of *Harper's Magazine*, can readily believe in the wonders of that division of China where the rivers run up the mountains, the moon outshines the sun, and the cats have the power of elephants. He can, moreover, add to this belief a feeling of utter contempt for scientific men. Faraday, Rumford, Joule, and Helmholtz have lived in vain. Their work can be demolished by the simplest use of tenpenny nails and a few magnets combined with the use of a piece of sheet iron.

It would be difficult to find such utter ignorance of the first principles of science as is contained in this article on Gary's motor; it encourages men to spend time and money in fruitless effort, and at the same time to despise all training. The allegation is made that scientific men are slower than the general public to acknowledge a new step in advance; and the discovery of the neutral line, the principle of Mr. Gary's motor, together with the near possibilities of the grand discovery, are affirmed in an *ex cathedra* manner by one whose own statements show that he has no knowledge of the subject of which he speaks.

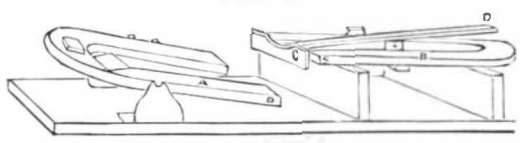
Mr. Gary's discovery of the neutral line is not a discovery. There is no neutral line in the sense that the polarity changes when Mr. Gary moves his piece of sheet iron with its attached shingle nail across the pole or near the pole of a magnet. The most delicate instruments fail to detect such a change of polarity. Mr. Gary is perfectly right in his description of the behavior of the nail: at a certain point it leaves the sheet iron and falls to the ground, simply because, by reason of its approach to the attracting pole, it tends to fly to it; but in leaving the piece of sheet iron, the force of gravitation acts more strongly than the force of attraction of the pole of the magnet, and the nail consequently falls to the ground. It is well known that the force of magnetic attraction decreases very rapidly with the distance. A small nail can fall across the pole of a very strong magnet within a quarter of an inch of the pole, and yet the force of gravitation asserts its stronger claim and the nail will not be diverted to the magnet. It will be noticed that Mr. Gary's models, which are figured in the article in *Harper*, are so arranged as to take advantage of the attracting force of gravitation. Hold a horseshoe magnet in a vertical position, and move a piece of sheet iron with an attached nail to and from the poles of the magnet. It will be found that there is no neutral line where the nail drops off. Vary the experiment by substituting an iron wire for the piece of sheet iron, and with an attached nail explore the space in front and beside the poles, and it will be found that the nail shows no evidence of a neutral line. Slip a small coil of wire along the wire or sheet iron, and connect its terminals with a delicate galvanometer; if there is any change of polarity, the galvanometer needle should be diverted first in one direction, then in another, as you move the sheet iron or the wire away from complete contact with the poles; no such change of deviation will be perceived.

Fig. 1.



In Fig. 2 the magnets are set in motion by vibrating, with the aid of a lever, a piece of sheet iron, so that it may "move

FIG. 2.



on the neutral line," as the writer in *Harper* expresses it. This acts as a cut-off, and one of the two opposing horseshoe magnets drops from its former position, where it was held by mutual attraction. Let us see what is the cause of this action. Place a horseshoe magnet on the table, and bring a compass needle directly in front of one of the poles of the horseshoe magnet. The compass needle will be strongly attracted to the neighboring pole. Now bring a thin piece of iron in front of the poles of the horseshoe magnet and between them and the compass needle; the latter will immediately dip, and will have its attraction for the pole of the horseshoe magnet diminished, not because the sheet iron acts as a cut-off for magnetism, but because the poles formed by induction in the thin sheet iron are nearer the end of the compass needle, and accordingly exert their influence. Here we see again the effect of proximity. Magnetic action acts through very short distances, and the nearest magnetic mass exerts more influence than a remoter one, which may nevertheless be the stronger magnetic body. Mr. Gary experiments with a box compass. The indications obtained in this way are apt to be very misleading, and the use of such a method was abandoned by scientific men more than forty years ago. The friends of the new magnetic motor have only to consult the experiments of Jamin, of Dub, and a host of others to discover that what are claimed to be new facts have long been known and discussed under the head of distribution and redistribution of magnetism caused by armatures to magnets and the presence of iron in the neighborhood of magnets. Abundance of time and patience to look up the subject will be needed, for the literature of the subject is immense.

Let us now consider the possibilities of the application of these well known facts; for it may be said, "Explain the neutral line as you may, there is still an important application of the force of magnetism in the invention of Mr. Gary." It is said that this little motor requires a careful adjustment of the fine pivots upon which the movable magnet turns, and particles of dust are sufficient to bring it to rest. The excursions of the so-called cut-off are limited to the one twentieth or one thirtieth of an inch, and a fine adjustment is also needed here. This is the motor which is to produce the electric light and to drive locomotives across the continent. The line of argument of the inventor's friends is very striking, and deserves notice. In the article in *Harper*, which we have taken as our text, the writer says: "To gain a large amount of power the inventor would place groups of compound stationary magnets above and below the beam at each side, and the soft iron induced magnets, in this case four in number, connected by rods passing down between the poles of the stationary magnets. A 'pitman' connecting the beam with a flywheel to change the reciprocating into a rotary motion would be the means of transmitting the power. With magnets of great size an enormous power, he claims, could be obtained in this way."

This is the old, old fallacy; and is always stated in this way: "A small magnetic motor will run and produce a comparatively great result, a large one will necessarily give a corresponding increase of power." This is not true; there is a limit beyond which one cannot pass. One can see this even in magnetizing pieces of steel of various sizes and in the construction of dynamo-electric machines. In regard to the use of Mr. Gary's motor in producing the electric light we have no hesitation in pronouncing upon its utter incompetency for such a purpose. It is in the discussion of the possibilities of the new motor that the writer in *Harper* is most eloquent, and we do not know which to wonder at most, the exuberance of his imagination, his moral courage in the contempt of the authority of science, or the naïveté of his utter ignorance. He says, speaking of the electric light which is produced by this motor: "An enormous volume can be secured with an expenditure of force so diminutive that a caged squirrel might furnish it. With the employment of one of the smallest of the magnetic motors, power may be supplied and electricity generated at no expense beyond the cost of the machine." This statement requires no comment. The writer further says: "Professors from Harvard and from the Massachusetts Institute of Technology called, examined, and were impressed." It is true that only one professor from Harvard called, examined, and was *not* impressed; for the motor had just been taken to pieces and was not in a condition to run; moreover the professor does not believe that it will run except for a short space of time. The only way that it could run would be by weakening it or using up the potential energy of the permanent magnets, and allowing the earth's magnetism to replace it. If such a toy could be made it would have great scientific interest; it would not contain the idea of perpetual motion, for it would be the employment of the magnetism of the earth, just as we employ the force of the winds. We should be delighted if Mr. Gary has done this; and a scientific reputation would be within his grasp. There is no evidence, however, that he has really made such a toy. We have called it a toy; for as a motor it could not do any appreciable amount of work except in a romance of Jules Verne.

SENATE PATENT BILL NO. 300.—SHALL IT PASS THE HOUSE OF REPRESENTATIVES?

The term of the present Congress is rapidly drawing to a close, and little time is left for the friends of industrial progress and the rights of inventors to express their disapprobation of the obnoxious clauses of the new Patent Bill (Senate Bill 300).

We are informed, by parties whose knowledge and integrity cannot be questioned, that the concerted plan of the promoters of the bill is to allow no further discussion of it, but to await a favorable moment for their scheme, and rush it through during the last days of the session in the hurry and excitement preceding adjournment—a period noted for hasty and ill-considered legislation.

We are confident that, were time enough allowed for all the members to become thoroughly informed in regard to the mischievous tendency of several of its provisions, the bill would be overwhelmingly defeated; but there would seem to be no time for that now. It is too late for extended arguments against the impolicy of crippling and discouraging the class of men who (as all parties acknowledge) have been and are one of the great motive forces of national progress: too late for elaborate protests against the threatened invasion of the constitutional rights of inventors, and the disorganization of our industries by the legalizing of infringements.

But it is not too late, we trust, for an effective expression of popular disfavor—by telegraph. Disregarding the slow formalities of memorials and like communications by mail, all who regard the inventor as more worthy of encouragement and protection than the infringer, should promptly avail themselves of the means which invention has provided for such emergencies, and telegraph their disapproval of Senate Bill 300. No member not already known to be opposed to the bill should be left a moment in doubt as to the feeling of his constituents. The changes which the bill would make in the spirit and the ruling of the patent system, should it become a law, are fatal; and no surer means could be devised for preventing its passage than an electric expression of popular will against it.