THE "ELECTRIC" GIRL.

"Electricity is a mysterious agent, therefore everything mysterious is electric." Such is the logic of the masses, rightly observes Mr. Nelson W. Perry in an article in which he exposes the somewhat crude processes employed in an exhibition made recently, at Paris and London, of a girl called "magnetic" or "electric," and possessing, according to her manager, an inexplicable and unknown supernatural power, although it is a question of a simple application of the elementary principles of the laws of mechanics, chapter of equilibrium.

This logic of the masses has already given birth to electric belts, hair brushes, tooth brushes, tripoli and book covers. To this logic of the masses, the logic of the scientist responds, almost under the same form: "All cows have tails, but all animals possessing tails are not cows." The conclusion is that the "electric" girl is electric only in name. If the exercises that she performs provoke the astonishment of a certain portion of the community, it is because the spectators are not, at a distance, in a situation to observe the artifices employed in each of the exercises, or to find a natural explanation of them in the known laws of mechanics. We propose to point out here a certain number of such artifices and to describe a few of the experiments, utilizing for this purpose the data furnished by Mr. Perry, as well as those resulting from our own observations.

Fig. 1.

Fig. 2.

The first exercises of the kind under consideration date back to 1883. They were presented by Lulu Hurst, of Georgia, and were the subject of a description by Prof. Simon Newcomb published in *Science*, Feb. 6, 1885. The success of those exercises, then unexplained, was prodigious, and Lulu Hurst soon had many imitators.

Miss Abbott, of London, and Miss Abbett, of Paris, are, we believe, the most recent and the first in Europe. They give the same exhibition and have even greatly improved upon and varied the experiments of their initiatrice Lulu Hurst. All these exercises tend to the same end, *i. e.*, to make it believed that there is a supernatural and incomprehensible force, electric or magnetic, by putting in opposition, under equivalent or *apparently* equivalent conditions, athletes or very robust men and a frail or delicate little girl, who triumphs over them in every experiment.

One of the experiments consists in having a man or several men hold a cane or a billiard cue horizontally above the head, as shown in Fig. 1. On pushing with one hand, the girl forces back two or three men, who, in unstable equilibrium and under the oblique action of the thrust exerted, are obliged to fall back. This first experiment is so elementary and infantine that it is not necessary to dwell upon it. In order to show the relative sizes of the persons, the artist has supposed the little girl to be standing upon a platform in the first experiment, but in the experiments that we witnessed this platform was rendered useless by the fact that the girl who performed them was of sufficient height to reach the cue by extending her arms and standing on tiptoes. Next we have a second and more complex experiment, less easily explained at first sight.

Fig. 3.

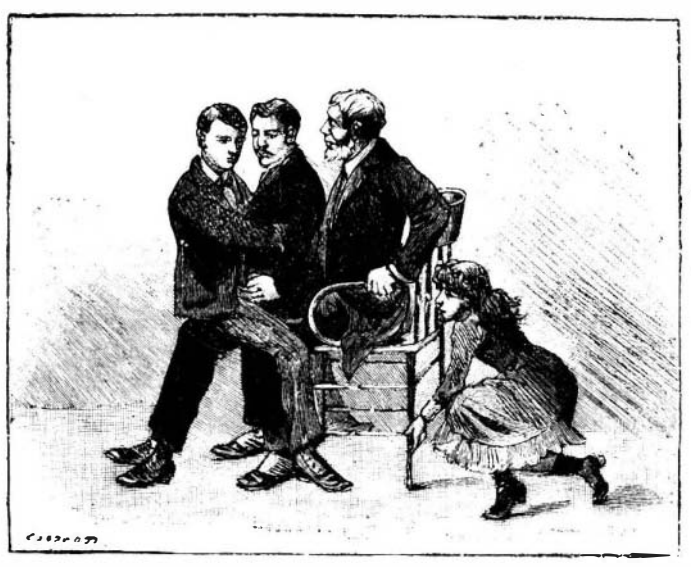

Fig. 4.

Two men (Fig. 2) take a stick about three feet in length, and are asked to hold it firmly in a vertical position. The girl places her open hand against the lower end of the stick, in the position shown, and the two men are invited to make the latter slide vertically in the girl's hand, which they are unable to do, despite their conscientious and oft-repeated attempts.

Mr. Perry explains this exercise as follows: The two men are requested to place themselves parallel with each other, and the girl, who stands opposite them, places the palm of her hand against the stick and turned toward her. She takes care to place her hand as far as possible from the hands of the two men, so as to give herself a certain leverage. She then begins to slide her hand along the stick, gently at first, and then with an increasing pressure, as if she wished to better the contact between the stick and her hand. She thus moves it from the perpendicular and asks the two men to hold it in a vertical position.

This they do under very disadvantageous conditions, seeing the difference in length of the arms of the lever. The stress exerted by the girl is very feeble, because, on the one hand, she has the lever arm to herself, and, on the other, the action upon her lever arm is a simple traction. When she feels that the pressure exerted is great enough, she directs the two men to exert a vertical stress strong enough to cause the stick to descend. They then imagine that they are exerting a *vertical* stress, while in reality their stresses are *horizontal* and tend to keep the stick in a vertical position in order to react against the pressure exerted at the lower part of the stick.

There is evidently a certain vertical component that tends to cause the stick to descend, but the lateral pressure produces a sufficient friction between the hand and the stick to support this vertical force without difficulty. Mr. Perry performed the experiment by placing himself upon a spring balance and assuming the role of the girl, with two very strong men as adversaries. All the efforts made to cause the stick to slide in the open hand failed, and the excess of weight due to the vertical force always remained less than twenty-five pounds, despite the very determined and sincere stresses of the two men, who, unbeknown to themselves, were exerting their strength in a *horizontal* direction.

In the experiment represented in Fig. 3, and which recalls to mind the first one (Fig. 1), the two men are requested to hold the stick firmly and immovable, but the slightest pressure upon the extremity suffices to move the arms and body of the subject. Such pressure in the first place is exerted but slightly, and the stresses are gradually increased. Then, all at once, when the force exerted horizontally is as great as possible, and the men are exerting their strength in the opposite direction in order to resist it, the girl abruptly ceases the pressure *without warning* and exerts it in the *opposite direction*. Unprepared for this change, the victims lose their equilibrium and find themselves at the mercy of the little girl, and so much the more so in proportion as they are stronger and their efforts are greater. The experiment succeeds still better with three than with two men, or than with one man.

In the experiment represented in Fig. 4, where it concerns the easy lifting of a very heavy person, the trick is no less simple. Out of a hundred persons submitted to the experiment, ninety-nine, knowing that the experimenter wishes to lift them and cause them to fall forward, grasp the seat or arms of the chair, and, in endeavoring to resist, make the whole weight of their body bear upon the feet. If they do not do so at the first instant, they do so when they are conscious of the attempts made by the girl to raise the seat, and they help therein unconsciously. The experimenter, therefore, needs only to exert a horizontal thrust, without doing any lifting, and such horizontal thrust is facilitated by taking the knees as points of support for her elbows. As soon as a slight movement is effected, the hardest part of the work is over, for it is only necessary for the girl to cease to exert her stresses in order to have the chair fall back or move laterally in one direction or the other. At all events, the equilibrium is destroyed, and, before it is established again, it requires but little dexterity to move the subject about in all directions without a great expenditure of energy. The difficulty is not increased on seating two men, or three men, upon each other's knees (as shown in Fig. 4), since, in the latter case, the third acts as a true counterpoise to the first, and the whole pretty well resembles an apparatus of unstable equilibrium, whose center of gravity is very high and, consequently, so much the more easily displaced.

All these exercises require some little skill and practice, but are attended with no difficulty, and, upon the whole, do not merit the enthusiastic articles that have given the "electric" or "magnetic" girl her European reputation.—*La Nature.*

Aluminum Soldering.

The following methods of soldering aluminum are recommended by the Neuhausen Company. For sheet aluminum an iron-tin solder may be used with a flux composed of resin, neutral chloride of zinc, and grease. The metal should not be cleaned or scraped unless it is absolutely necessary to do so, in which case alcohol or essence of turpentine should be used for the purpose. For 5 per cent aluminum bronze tin solder may be employed, but this is not possible with the 10 per cent alloy, in which case the company recommends a preliminary copper plating. If it is difficult to dip the ends to be plated directly into the solution, pieces of blotting paper soaked in a solution of $CuSO_4$ may be laid on them and a current passed. The flux mentioned above may be used.

Another solder which is recommended is one consisting of copper 56 parts, zinc 46 parts, and tin 2 parts, applied with borax. Some tests made at Neuhausen showed that with these solders plates of aluminum soldered together, edge to edge, required a tractive effort of from 16½ to 18 tons per square inch to pull them asunder; if the edges overlapped, 22¼ tons per square inch were required. Pieces of cast aluminum bronze, if placed in sand moulds, can be joined together autogenously by running in some of the molten metal. If this operation is properly carried out, the joint is indistinguishable from the rest of the casting. Thin cylinders of aluminum are made in this way by bending the sheets round end to end, and soldering with molten aluminum.