

MODEL OF AN ELECTRIC CELL, SIMULATING ION AND ELECTRON FLOW

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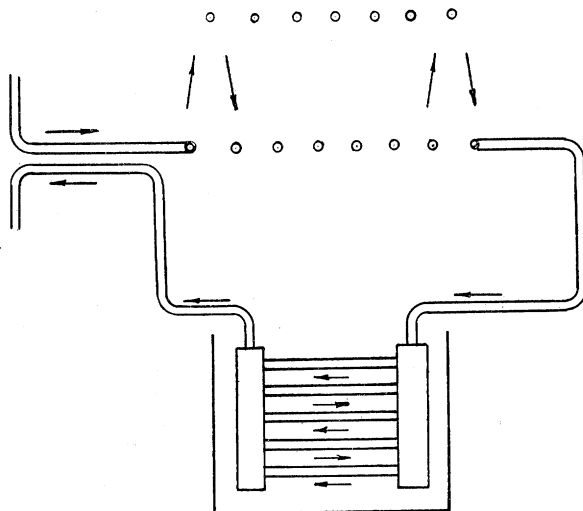
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During the spring of 1934 a model of ion and electron flow in an electric cell was constructed in the physics laboratory. It was tried as an experiment at first and exhibited at the bi-annual Electric Engineering show held at the university in April and worked so well that it was planned to set it up at the "Century of Progress" fair, Chicago, for the summer.

The model in outline is shown in Fig. 1. All the parts are of Pyrex glass tubing of about 1 cm internal diameter. Beginning with the arrow at the upper left-hand corner of the figure and following round one comes first to the glass solenoid. This is 8 inches in diameter and about 12 inches long and has 10 turns. From this solenoid the tube leads to the battery cell and

disappears in the positive electrode (a hollow copper box) and after traversing back and forth between this and the negative electrode (a similar box of zinc) it emerges and completes the circuit by passing up to near the starting point. To make the battery more realistic the improvised electrodes with their connecting tubes are placed in a large battery jar filled with water to the usual height. A few copper sulfate crystals placed in the jar adds color to the liquid in case one wishes to simulate a blue cell.



—Courtesy University of Illinois.

FIG. 1.—Model of an electric cell.

The operation of the model is quite simple, yet it requires considerable care in making the initial adjustments. It is only necessary to allow a stream of water from a suitable head (not shown in the figure) to flow down through the solenoid and on down through the cell (back and forth a number of times) and then on up to the starting point, as shown in Fig. 1 where it turns down and flows into the sink. The flow of electrons and ions is simulated by introducing air bubbles closely spaced at a point near the head. These are carried along by the flowing water, through the solenoid and down to the positive electrode of the battery. To this point the bubbles represent electrons (of course flowing against the conventional current). Their flow back and forth in the cell between the electrodes represents ions (plus ions and minus ions), while they again represent electrons as they leave the negative electrode (zinc) and complete the circuit.

To make the illusion more complete the incoming tube should be placed in front of the outgoing tube, thus making the flow appear to be continuous round the battery circuit.

The portion of the apparatus to the left at this point is screened from view.

In the Chicago set-up the same liquid was used over and over by the use of a small motor driven pump. The water should be slightly colored.