volt per cell, this gives the maximum strength of the cell (the volt divided by the resistance) as ¼ ampère or 250 milliampères. This is when the poles of the cell are joined by a thick copper wire. And I may add, in passing, that this strength of 250 milliampères can not be exceeded, no matter how many cells are joined in tandem, that is, in series. In the case of the telephone battery-cell, the case is very different. The electromotive of the individual cell is 1½ volts and the internal resistance is less than one ohm; this will give a strength of over one Ampère per cell, or say 1,500 milliampères—the external resistance—that is when the external resistance is very low. Battery cells are joined in series when there is external resistance

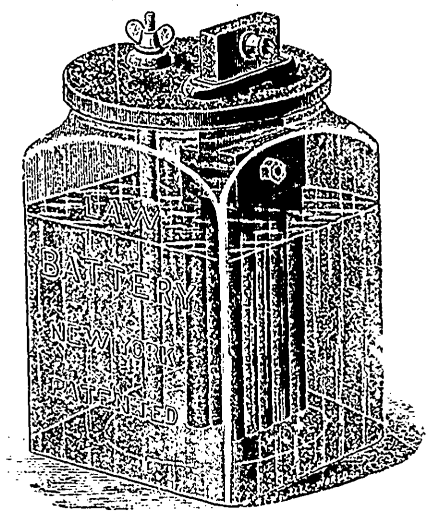

Fig. 1. The "Law Prism" open Circuit Battery Cell.

to be overcome; the higher the resistance the larger the number of cells necessary; but when the external resistance is very low, as, for instance, the thick wire of the primary circuit of a faradic coil, one cell with low internal resistance is as efficient as 10 or 100 cells. Hence the Ampère strength of the telephone battery-cell is about six times that of the telegraph battery. In telegraph signalling the efficiency of a battery is directly proportional to the electromotive force, and in electrolysis the efficiency is also directly proportional to the electromotive force, but it is also inversely proportional to the internal resistance. Thus, in telegraphy, 20 telephone cells would be as efficient as 30 telegraph cells, and in electrolysis a battery of 20 telephone cells would be as efficient as four batteries of 30 cells each (joined abreast or parallel) of the telegraph battery. The telephone battery cell in general use is a modification of the Leclanché cell, described in the February number of Medical Science. The one that I prefer is called the "Law prism." It is sealed to prevent evaporation, and the internal resistance is very low, about 3/5 of an ohm.

Unfortunately there is a serious drawback to the use of the Leclanché battery cells, namely, they become polarized in a very few minutes when the poles are closed through low resistance; hence it is necessary to keep a number of cells in reserve to replace those that are polarized. Thus, in uterine electrolysis, while 25 or 30 cells will give a sufficiently strong current for four or five minutes, 50 or 60 cells would be required to maintain that strength eight or ten minutes. When a *current selector* is used the cells are added to the circuit, one by one as they are required, and by means of a supplemental *current selector* the polarized cells may be eliminated. When, however, a rheostat is used the entire number of cells is placed in direct circuit at the outset, and the strength of the current is regulated by said rheostat. These cells are placed on shelves either in a closet or in the cellar, and wires leading therefrom are conducted to the operating room. When a commutator is used, a 60-cell battery would require a cable containing 61 wires leading to the operating room, but when a rheostat is used but two wires are required, namely, one from the positive and one from the negative pole of the battery.

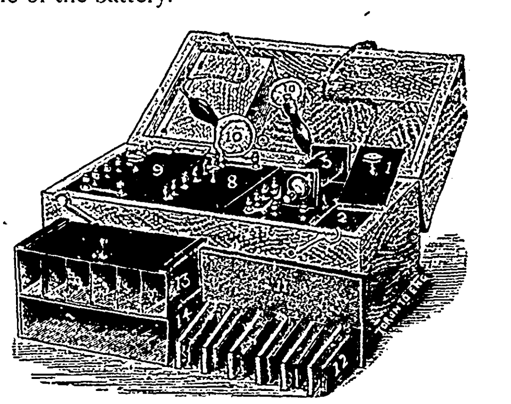

Fig. 2. The Author's Improved McIntosh Battery. The elements at rest.

Among the portable voltaic batteries I use either the chloride of silver or the chloride of ammonium