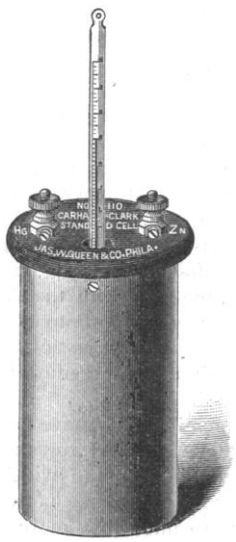
AN IMPROVED STANDARD CLARK CELL WITH LOW TEMPERATURE COEFFICIENT.[1]

LORD RAYLEIGH'S form of Clark cell, described in the Philosophical Transactions for 1885, is the best one hitherto made. The objections to it are, first, that it has a high and variable temperature coefficient; second, it is not constructed in such a way as to keep the mercury away from the zinc when shaken in transportation; and third, an important chemical defect is the local action taking place by which zinc replaces mercury in the mercury salt and the zinc becomes amalgamated, the amalgam often creeping up so as to reach the solder at the copper wire. These difficulties I have, I think, perfectly overcome. I have made cells which have been tested for several months with the low coefficient, at 15° C., of 0.000386 per degree C. At higher temperatures a peculiarity is that this coefficient decreases slightly, while that of Lord Rayleigh's increases very appreciably. The cell is so made that the mercury is confined to the bottom of the cell, or at least, if it does move at all it cannot reach the zinc. These cells have been found to stand transportation exceedingly well.

The same arrangement or device removes the zinc from the mercury salt and perfectly prevents local action. The sealing of the cell is also effected with a more perfect compound. Further,



IMPROVED STANDARD CLARK CELL.

in the preparation of the mercury salt I have succeeded in making mercurous sulphate so free from the mercuric form that it shows no yellowing when washed free from acid. It also remains white upon admixtion with zinc sulphate, and indefinitely, after the cell is set up, provided it be kept out of the light. The light darkens it.

One of these cells has been heated up to 53° C., and the following day it returned to its precise former value of electromotive force at the same temperature. The temperature coefficient given holds at the above high temperature. As indicating the uniformity attained, the last two cells made never differ in electromotive force by more than one part in ten thousand, and usually by only half this, at the same temperature.

[1] Abstract of a paper read before the American Association for the Advancement of Science, at Toronto, by Professor H. S. Carhart.

THE WENSTROM DYNAMO.

THE Wenstrom dynamo, of which Fig. 1 is a perspective view and Fig. 2 a cross section, is well known in Europe, especially in Sweden. It was invented by Jonas Wenstrom, an eminent Swedish engineer, and differs in some respects from other dynamos in the market. It is of simple and substantial construction, as may be seen by the illustrations, and utilizes the magnetic forces to a remarkable degree. It is of the iron-clad type, the armature and field coils being protected by a cast iron shell, parts of which perform the function of pole-pieces. There are four poles, opposite ones being of the same sign, all four being energized by one pair of field-coils, which surround the cores of the inner or horizontal pole-pieces, and are surrounded by the shell which serves as annular cores for the top and bottom field-pieces. Ventilation is provided

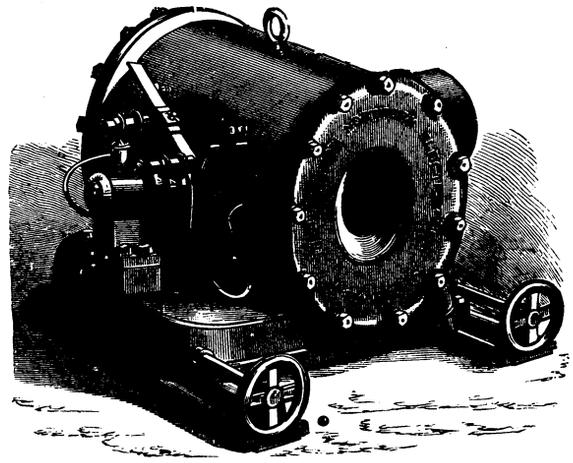


FIG. 1.—WENSTROM DYNAMO.

for by the circular apertures in the shell through which the armature is put into place.

The armature is of the drum pattern, built up in the usual way of thin disks of iron, well insulated, so as to prevent heating from eddy currents. These disks are perforated near the periphery, the perforations being round, ovoid, or hexagonal in shape, and connected with the periphery by a slit, narrowest at the outer part, and only wide enough to admit the winding, one wire at a time. In the grooves formed by these perforations the wire is wound. This peculiar construction admits of the armature revolving in very close proximity to the pole-pieces, materially reducing the resistance of the magnetic circuit, and affording a protection to the armature winding from the effects of centrifugal force, no binding wires being required. A new method of winding is employed, and diametrically opposite sections are connected together, making necessary only two brushes, which are set 90 degrees apart.

The one hundred light machine absorbs eight horse-power, running at a speed of nine hundred revolutions per minute. The total weight of the dynamo is eleven hundred pounds, mainly cast-iron, the weight of copper wire on the armature being only thirteen pounds, and on the field magnet cores ninety-four pounds, or one hundred and seven pounds of copper in all. The two hundred and thirty light machine runs at a speed of seven hundred revolutions per minute, its total weight being twenty-five hundred pounds, of which thirty-six pounds are of copper on the armature, and three hundred and eight on the field magnets. The eight hundred light machine runs at a speed of five hundred revolutions per minute.

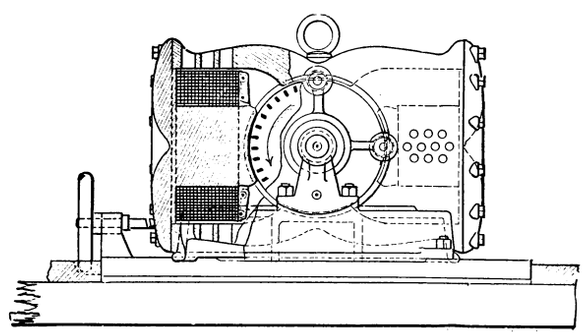


FIG. 2.—WENSTROM DYNAMO.

The advantages claimed for this construction are that there is no waste field, all the magnetic lines of force being utilized in the armature in producing work; neither is there any field outside of