thus derived, it is evident that it can be used for any purpose for which any direct current of electricity is employed. The current from the plant which I am describing, I use to run a one-horse power motor for domestic purposes such as churning butter, sawing wood, etc., and for lighting a dwelling-house, within which are twenty sixteen candle-power, one hundred-volt, incandescent lamps.

As it would be next to impossible to give an accurate answer to the questions regarding energy and cost, especially since the conditions affecting both are so varied, I trust it will be satisfactory to state the expense of my own plant, and the energy it develops, and from these data draw the best deductions possible. In the first place, the position of my wheel is unfavorable. It stands in a valley running north and south and the most prevalent wind is from the west. The valley is about a quarter of a mile in width, and there is a hill on either side rising to the height of three hundred and fifty feet. But regardless of the unfavorable position of my wheel, I am able to run the one-horse motor, to which I have already referred, on an average, about six hours out of every twenty-four, and besides this, light six sixteen-candle power lamps four hours each evening. The motor and lamps together would be equivalent to running the motor alone for about eight hours out of every twenty-four. Among the many conditions affecting the amount of energy which it is possible to obtain from such a plant is one which must be taken into consideration, and that is the size of the dynamo best suited to a given size of wheel. Of course the larger the dynamo the less hours out of the twenty-four it will run, the wheel being the same size in both cases; but just how large to have the dynamo in order to store the most ampere hours of electrical energy or to produce the most horse-power hours of mechanical energy, would require a very expensive and extensive investigation; but it is safe to say that it would be advisable to use a dynamo a little larger than a one kilowatt machine with a sixteen-foot steel wheel. Then by using a larger dynamo and larger cells of battery than I have, and by placing the wheel on an elevation or in a flat, level section of country, I think it is reasonable to conclude that nearly double the amount of energy which I store might be produced.

In regard to "What would be the cost of one horse-power hour?" of course a great deal depends upon the first cost of the installation, as it requires a very little attention afterwards. This being the case, the cost per horse-power hour depends a great deal upon the cost of material and labor in the country in which the plant is installed. Consequently the most practical answer I can give to this question is to state what one horse-power hour costs me, giving the price of labor and material in the country where I put in my plant, and then by comparing these expenses the cost per horse-power hour may be closely estimated in other countries:—

Windwheel, vertical shafting and footgear..........	$150
Pulleys, countershaft and belting..................	25
3,000 feet of lumber in tower and building..........	25
Building tower, dynamo room and hanging shafting..	50
Storage battery..................................	125
One kilowatt dynamo	125
One one-horse power motor.......................	90
Automatic switch and regulator	10
Total cost..................................	$600

The average rate of interest on money in this country being six per cent. per annum, the interest on this investment would be $36 per year. Allowing $14 more per year for oil, insurance and taxes, the annual expense would be $50.

(To be continued.)

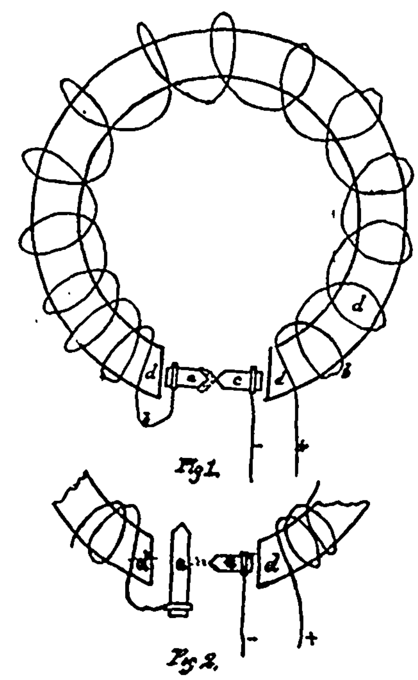
For The Canadian Engineer.

THE DIRECT CURRENT ARC IN A MAGNETIC FIELD.

BY J. B. HALL, B.A. SC.

Some time ago the writer made a series of investigations concerning the action of the electric arc in a magnetic field, which is probably original, as the author, after extensive search, has not been able to find any references bearing directly upon this subject.

Photographs were prepared to accompany the article, but all the plates used in taking the negatives were "fogged," so that that desirable assistance to the effects obtained must needs be omitted. The apparatus used is indicated by Fig. I.; *d* is the magnet of soft iron, *b* the coils for energizing the same, *a* is the anode and *c* the cathode. The coils were arranged so as to produce three strengths of field, viz.: 250, 500, and 1,000 c.g.s. lines per square centimeter. The electrodes were plain $\frac{1}{2}$-inch cored carbons.



THE DIRECT ARC IN A MAGNETIC FIELD.

The first test was the starting of the arc uninfluenced by magnetism. It burned quietly, with the carbon anode assuming the usual crater-like form. The distance between electrodes being about $\frac{5}{16}$ inch, the heated currents of air caused it to move from side to side. The current was 9.5 amperes and 51 volts.

Then the arc was started, influenced by the field, having a strength of 250 c.g.s. lines, the carbons being so placed that the axis of the arc was parallel to the lines of force. It was very noisy, and the arc spread to the outer edge of the anode (leaving the inner core untouched), in the form of an inverted cone, numerous points of light brighter than the rest of the arc being seen, while the flame rotated in the direction of the flow of current in the coil. The carbon was consumed very slowly in proportion to what was burned in the uninfluenced arc, and the apparent temperature of the arc seemed one-half of the uninfluenced arc. The resistance in the gap between the electrodes decreased so that the current passing was 11.2 amperes and 47 volts. (The primary voltage was 110 volts, current from an incan-