tric Company, Limited, will be of the three-phase alternating type, similar to that now being installed in the large power plant of the Lachine Rapids Hydraulic & Land Company at Montreal. The initial generating plant will consist of two machines, of the revolving field and stationary armiture type, having a capacity of 1,000 horse power each, from which the current will pass through step-up transformers, raising it to 20,000 volts, the highest pressure as yet used on any electric transmission line. At this high pressure the energy will be carried to a sub-station at Rossland, a distance of thirty miles, where it will be reduced to a pressure of 2,000 volts, for transmission to the motors used in connection with the different mining operations.

The electric power will be furnished for operating tramways, hoists, pumps, ventilators, stamp mills, compressors, drills, etc., and will be sold at a price which, in comparison with the present high cost of power generated from coal, means a greatly reduced expenditure in this direction by the different mining companies. The machinery is now in the course of construction and the plant is to be in full operation early in the fall.

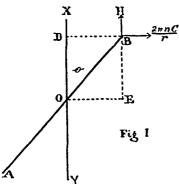
TORONTO TECHNICAL SCHOOL EXAMINA-TIONS.

As announced in our May issue, we publish below the answers to the Technical School examination questions in Electrical Engineering and Steam and the Steam Engine, as furnished by Mr. James Milne, lecturer in these subjects. The working of the problems in Electrical Engineering is shown in full, but in the case of Steam only the answers are given. Should any of our readers desire to see the working out of some of the most difficult of the questions we will be pleased to publish the same for our August issue. For the questions in Steam and the Steam Engine readers are referred to the May number of the Electrical News.

ELECTRICAL ENGINEERING.

1. What data do you require for determining the amount of current as measured by the Tangent or Sine galvanometer? Work out the formula, and make the necessary sketches to illustrate your answer.

Asswer, -Let X Y represent the plane of the coil and needle lving in the magnetic meridian and suppose A O B to represent the direction the needle has assumed under the influence of the



current. This direction will be the resultant of two forces, viz., the force 2mC r exerted by the current and the horizontal component of the earth's magnetism H. Since the needle is at rest

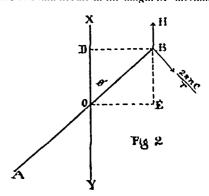
the moments of these forces must be equal, i. e. $\frac{2\pi\pi C}{\sigma} + D/O$

H+OE or
$$\frac{2\pi nC}{r}$$
 . H. $\frac{OE}{DO}$. But $OE = DB$ and $\frac{OE}{DO} = \frac{EB}{DO} = \frac{1}{100}$

The quantity $\frac{2\pi n}{s}$ is dependent on the form and size of the instrument. From the equation we see that the data necessary for determing the amount of current in the tangent, galvanometer are

the valves of n_i r_i H and the $\tan \phi$. Where n No of turns of wire, r - radius of the coil, and H - the horizontal component. In Toronto its value is about .1664 C. G. S. units.

In the sine galvanometer, instead of measuring the deflection as in the above, the coil is turned round so as to follow the needle, which, of course, deflects it still further; the coil is therefore turned still further round until finally the plane of the coil and the direction of the needles are once more parallel. In Fig. 2 let X Y - the original position of the coil and needle in the magnetic meridian and A B



the final position of coil and needle. Then 2 mnegr will be the force tending to send needle at right langles to the plane of the coil, but II will tend to bring the needle back to the magnetic meridian. If the needle is at rest the moments about the centre O must be equal, i. e:

$$\frac{2\pi nC}{r} \times BO = H. EO$$
or
$$\frac{2\pi nC}{r} = H. \frac{EO}{BO}, \text{ but } \frac{EO}{BO} \frac{DB}{BO} \sin \phi \text{ of deflection}$$

$$\therefore \frac{2\pi nC}{r} - H \sin \phi$$
or C in C G S units
$$\frac{H \sin \phi}{2\pi n}$$

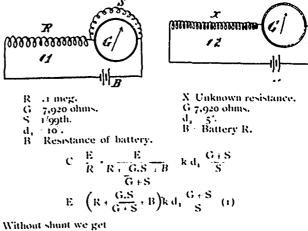
The data necessary being exactly the same as in the tangent galvanometer, the only exception being that the sin is substituted for the tan.

2. How would you determine the value of an unknown resistance if you were supplied with a Weston voltmeter, the resistance of which is known, together with a known E. M. F. and whatever wires, etc., are necessary for making the necessary connections? If voltmeter has 20,000 ohms R, and the E. M. F. is 600 volts, when the unknown R is put in circuit voltmeter shows 375 volts, what is the value of the resistance?

ANSWER.-Unknown resistance 6666.6 ohms.

3. With a shunted galvanometer, when a resistance of a megohm was in circuit, a deflection of 10' was observed when battery key was pressed. With same battery and shunt removed, there was a deflection of 5° when a certain resistance was in the circuit. Determine the value of the resistance. The resistance of the galvanometer was 7,920 ohms, and the shunt was 1/99th, Omit in the calculation the battery resistance. Make a sketch of the arrangement, and show clearly how you arrive at your

Answer .--



$$C = \frac{E}{\hat{X} + G + B} = k d_x$$

$$E = (X + G + B)k d_x = (2)$$