

engine, is double crowned and is lapped over nearly the whole circumference by two belts as shown. The slip is less than 2 per cent. The speed of the machine is 180 revolutions per minute. The dynamo weighs 430 lbs., and the idler pulley and countershaft 100, so that the total weight of engine, dynamo and driving gear is 3800 lbs. A box 7' 4" x 2' 8" x 5' 2" would cover engine, dynamo, belting, idler pulley and countershaft, and the whole might be thus shipped to any distance completely set up ready for connection of gas and exhaust pipes. The arrangement of the plant was designed by Mr. Redpath, and is most compact and ingenious.

There are 42 cells of Gibson battery, capacity 150 ampere hours, and they are connected in two sets of 21 each in parallel, the charging current being 34 amperes at from 45 to 55 volts pressure. These cells are ranged on shelves in the engine room. The plates in this battery are placed horizontally instead of vertically as in other batteries, and have thus the advantage of being less liable to short circuiting through paste falling between them as it does in vertically arranged plates. A slight disadvantage is that the internal resistance is higher than some other forms of battery owing to the plates being farther apart; but this is compensated for by the longer life of the Gibson, the makers guaranteeing to keep it in order for ten per cent. per annum of the first cost. The electrolyte used is dilute sulphuric acid with the addition of sulphate of soda, the density of the combined solution being 1.220. This battery will stand heavier charging than any other, and has frequently been charged with a current of 75 amperes; but the most economical practical charging rate is about 30 amperes. In charging the current is measured by Weston ammeter and the pressure by a Weston volt meter. There is also another Weston volt meter in the library upstairs, and underneath it a resistance switch of German silver in series with the battery, by which the pressure in discharging is regulated, as the battery, when first connected to the lamps after charging, is higher in E. M. F. than when nearly discharged, and the lamps used are of course of such voltage that they will give their full light at the lowest pressure to which the battery in practice is reduced. The maintenance of perfectly uniform light is thus under control from Mr. Redpath's arm chair.

This is the first and only complete private installation for residential lighting in Canada, and was first started five years ago, shortly after the visit of the British Association to this country.

VALLEYFIELD AND BARRIE CENTRAL STATIONS.

Let us describe briefly and compare these central stations, both constructed by the writer, and both of which are good samples of their respective class. Both have water power, but the first is on the Edison three-wire system and the second is a Brush A. C. plant. In Valleyfield the power is in the heart of the town and in the centre of distribution, so that it is in the most favourable position for economical distribution by low tension, and the wire used is as small in area as consistent with even voltage at the lamps and best efficiency of the plant. Both stations were built with rooms for the man in charge over the dynamo room. The running expenses are the same or about the same in both places. Probably no other stations of similar capacity in the world cost less to run, the total annual expense in each being less than \$1600. The capacity of both stations is about the same, say 60,000 watts. The Valleyfield station complete cost \$38,000, including building, water-wheels and flume. The Barrie station, including the same items, cost less than \$22,000, including over \$3000 for the wire leading into town for the station, five miles distant. In the Barrie station heavily insulated wire is used throughout the 24 miles of street wiring, and rubber-covered wire in all buildings, whereas bare wire is used at Valleyfield for street wiring, and fire and weather-proof wire for inside work. House wiring in Valleyfield is all cleat work, while most of that at Barrie is concealed, the lights in the latter place being principally in private houses placed on brass fixtures, while at Valleyfield drop cords are used exclusively. The pressure in the houses in Valleyfield is generally 220 volts, the three wires being carried in all cases where this system is used, in order to maintain as even a load as possible on both sides of the circuit. In Barrie the pressure is 93 volts on the lamps in the houses, and nothing higher.