quantities to do the work required of it. The work done by the prime mover upon the dynamo is converted into electric energy and conducted through carefully insulated cables to the motor from which the work is done.

The distance between the motor and the generator may be almost said to have no limit, as at distances of ten miles from 50 to 60 per cent. of the power transferred to the dynamo has been returned in useful work at the motor. This would seem to be sufficient to warrant its adoption, providing that anything approaching absolute safety could be guaranteed, which unfortunately is not so, the chief danger arising from the ready transformation of electric energy into intense heat, a feature not very desirable in coal-mines, where the ventilating-currents are liable at any time to become so charged with carburetted hydrogen as to form a highly explosive mixture, which would undoubtedly produce serious results in case of contact with sparks, such as are frequently given off from the commutators, which at regular intervals are arranged to break the current at the motor and so set up motion; sparks are also given off from broken cables, which frequently occur from falls of roof or through high-speed sets leaving the rails. Shocks are another source of accidents arising from the use of electricity in mines, and are sufficient in most cases to produce instantaneous fatal results; and, though electricity is the cause, the effect is solely due to the ignorance of those affected, consequently we may infer that with increased knowledge, due to more extended use, this source of accident would in time disappear.

The method just referred to is known as the continuous-current system, deriving its name from the fact that the flow of the current is continuous, a feature which renders it very suitable for electric lighting, when steadiness in the light can only be got by a uniform and continuous supply. As previously stated, the system involves the use of commutators at the motors, which invariably causes sparking even under ordinary working-conditions, while with excessive resistances the heat developed is sufficient to fuse and consequently destroy the working-parts.

Since the presence of commutators must invariably under certain conditions be accompanied by sparking, much attention has been given to the devising of some reliable means of preventing the sparks from coming in contact with the outside atmosphere, and so dispense with the danger of igniting gaseous mixtures; and it is very satisfactory to know that some advance has been made by enclosing the motors in gas-proof steel cases, in which are suitable doors that can be opened and closed as required for inspecting and lubricating the working-parts. These arrangements are all very well so far as the attainment of their original object is concerned, but unfortunately their adoption shuts off the working-parts from the sight of the person in charge, and so admits of damaging effects going on unknown to those whose duty it is to prevent them.

Sparks arising from broken cables can scarcely be said to incur so much danger, for the simple reason that they are to a great extent carried along the main intake airways, where explosive gas, even in infinitesimal quantities, may never be expected to be present. Consequently, the chief danger from this source would be the liability to fire any combustible material, such as a very sensitive coal, timber, or canvas, any of which might form a primary cause to serious secondary effects. The protection of conducting-cables has also received some attention, such as having them enclosed in wood casing or in iron tubes, the latter of which is preferable, though it offers some trouble to the locating and repairing of any damaged part, which at times must be necessary. This case is by no means general, nor can it be said to be actually necessary, but simply a precaution. I have known two extensive plants used for underground haulage, pumping, and coal-cutting, where the cables were simply of the best insulated type, and conducted together along the side of the roadway to the point required, and though these have been in use for some years there has never been one single accident traceable to them.

The continuous-current system of distribution is the one which up to the present has been mostly employed in this country, and as these are costly to replace they may be expected in many cases to remain, even in the face of the more modern multiphase or alternating-current system, which has been largely introduced in America and on the Continent. In this system the current is transmitted alternately to the motor as required, and so dispenses with the commutators, and gives almost absolute freedom from sparking even under the most extreme conditions of unequal loads, which would cause the continuous-current motor to destroy itself. Again, in the latter system the conductors which carry the high-tension currents revolve and consequently cannot be insulated, while in the alternate-current system these are stationary, and so admit of perfect insulation, thus limiting the risk of sparking to the switches and broken cables, both of which exist in the first system. Alternate currents do not commence the load so readily as continuous currents, neither are they so applicable to perfect lighting, while the force of shock from the alternate system is about one and a half times more powerful than that of the continuous system; hence we see that even the latter has many disadvantages, each of which offers a fair field for the inquiring student.

The great advantage of the alternate system is that currents of almost any voltage may be produced, and by the use of transformers reduced to any voltage required by the particular class of work to which it is to be adapted. Consequently, in it we have an ideal system for the formation of central power-stations from which the supply necessary to meet the wants of a fairly large district may be drawn. This has been carried out on a rather extensive scale in America, where nature has abundantly supplied a cheap and efficient motive power in the numerous waterfalls, thus requiring little more outlay than that incurred in laying out the generating plant, which are used to create currents of from ten to twenty thousand volts, for distribution at the required tension to meet individual wants. Some idea of the economic aspect of the system may be drawn from the fact that the Niagara Electric-power Supply Company are prepared to supply power for continuous night and day loads at the rate of £3 12s. per horse-power per annum, and calculations have been made in which it has been shown that the company can afford to distribute power within a radius of two hundred miles at a less cost than it can be generated by users with