ELECTRIC MINING LOCOMOTIVES.

BY FRANK C. PERKINS.

There are many features of the electric mining locomotive that render it peculiarly adapted to the transportation requirements of mining. In the first place, it lends itself readily to the restrictions as to size which are imposed by the limited width and height of the various tunnels and workings; for as compared with other forms of motors, bulk for bulk, the electric locomotive is the smallest in proportion to its tractive power. Furthermore, the transmission of the power involves nothing further than the stringing of the wires, which, as shown in our illustration, Fig. 3, may be carried in one of the upper corners of the tunnel, where they are entirely out of the way of passing traffic. Electric haulage, indeed, forms by no means the least valuable part of an important revolution which is being effected by the introduction of electrical power into mining practice.

There are three or four general types of electric mining locomotives as manufactured by the leading builders. The first class are centrally controlled, as illustrated in Figs. 1 and 3. These locomotives are built with the wheels inside the frame; though also frequently made with the wheels outside where the gage of the track permits of a choice. The second class of mining locomotives are controlled from one end only, as shown in Fig. 2.

The centrally controlled electric mining locomotives of the heavier type, weighing in the neighborhood of 15 tons, shown in Fig. 3, are frequently equipped with three sets of wheels and axles, and a motor located on each axle. One of this type is shown just coming out of a mine entrance in Ohio and is operating on a two per cent grade. The draw-bar pull is 5,500 pounds and the capacity of each of the three motors is 35 horse power. The frame is supported, as the reader will notice, upon springs which are connected together by links, thus allowing the equalization of the weight on uneven tracks.

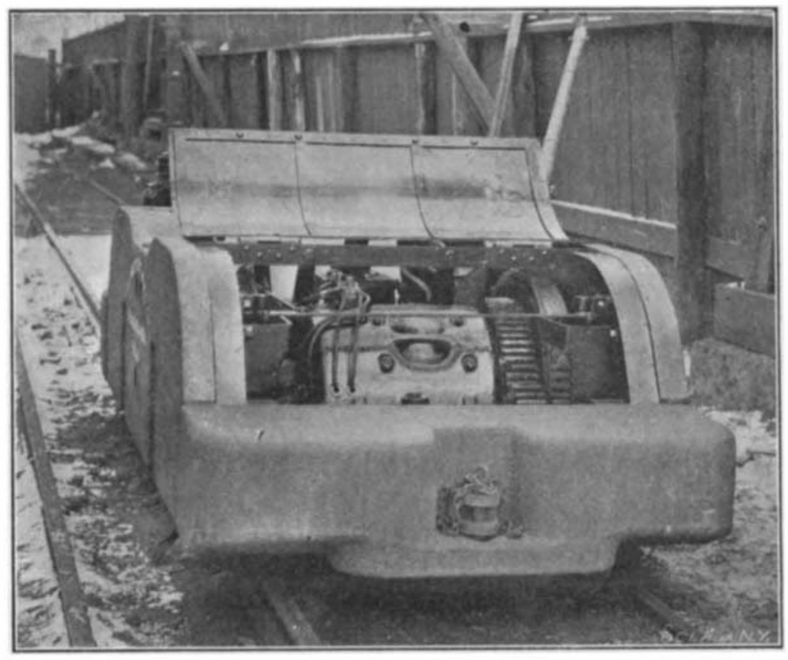

Fig. 1.—CENTRALLY CONTROLLED MINING LOCOMOTIVE.

Cover lifted, showing arrangement of motors, gearing, etc.

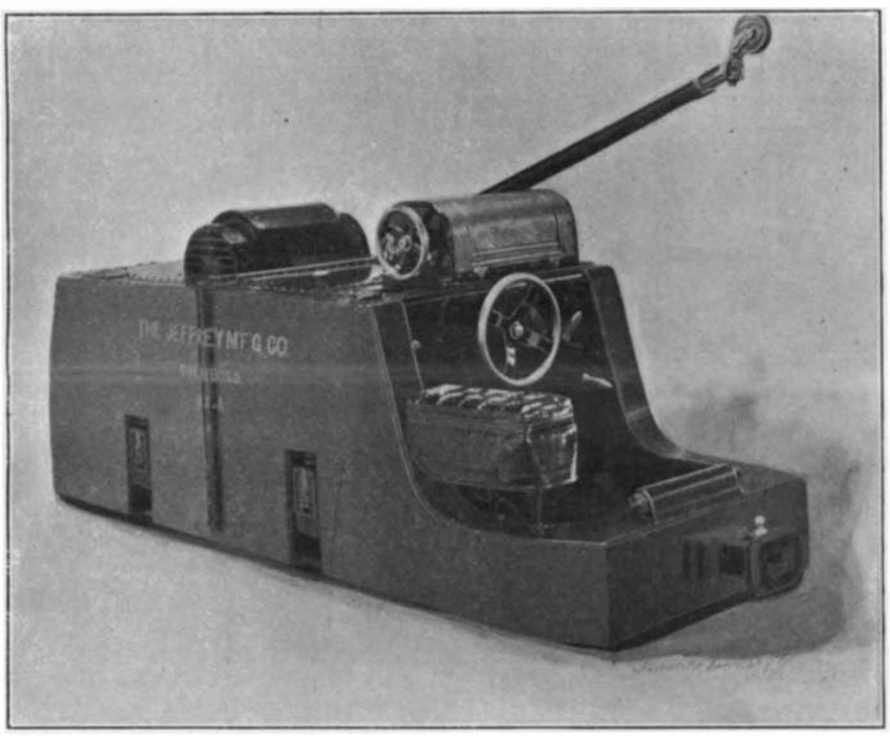

Fig. 2.—SINGLE-END, GONDOLA STYLE, ELECTRIC MINING LOCOMOTIVE.

Now in use at Paris Exposition. Weight, 8,000 pounds; drawbar pull, 1,000 pounds.

The Westinghouse single-end locomotive now being operated by the Shawmut Mining Company is equipped with two motors operating at 220 volts. The full-load speed of this locomotive is 8 miles per hour, and its total weight is 16,000 pounds. The draw-bar pull in starting is 3,500 pounds, and while running is 2,100 pounds. The drivers are 30 inches in diameter, and the wheel base 44 inches.

At the Paris International Exposition the electric mining locomotive shown in Fig. 2 is being used about the grounds. It is of the gondola style, and was manufactured by the Jeffrey Manufacturing Company for the Paris Exposition Company. Its total weight is 8,000 pounds, and it has a draw-bar pull of 1,000 pounds.

Two 20 horse power motors are used on the Paris Exposition locomotive and they are capable of operating at from 6 to 10 miles an hour.

The number of tons weight of train which an electric mining locomotive will haul, at standard speed, on straight track may be accurately estimated when the grade and frictional resistance of the cars are known. The frictional resistance varies greatly with the kind of cars, the condition of the journals and the conditions of the track.

The amount of friction varies from 20 pounds to 70 pounds per net ton for ordinary coal mine wagons: and if the track is out of surface or gage and the cars are overloaded, an indefinite amount of train resistance is added.

Electric mining locomotives are usually rated in terms of weight on driving wheels, which is the factor determining their tractive power, and not in terms of horse power, which varies with speed.

Dragon-Fly Nymphs.

In an instructive article by the Rev. Arthur East in Knowledge, some theories of the method of respiration of dragon-flies are brought forward. The writer says: "Of more than two hundred individual nymphs of Æschna cyanea observed, every one spent about the last two weeks of its aquatic life (minus the final two or three days) with the tip of the abdomen clear of the water, and the anal passage open to the air; when disturbed, the nymphs would descend a short distance down the stick they rested on into the water, and return very shortly to their former position. During the two or three days immediately preceding emergence the position was reversed, and the head and thorax were protruded into the air as far as two large breathing apertures on the fore part of the body, called the thoracic spiracles. These spiracles under a lens could be seen to be open, and they are connected with well-developed tracheæ. This habit suggests very strongly that during the last fortnight of its aquatic life the nymph breathes the outer air direct into the tracheal system. Being anxious to know whether this faculty is confined to the later nymph stages alone, the writer lately procured some nymyhs of Æschna cyanea, about 1¼ inches long, and kept them out of water in damp weed, and the result is not a little surprising.

"Two nymphs have been living out of water for more than two months, with only 'short intervals for refreshment,' and are as well and vigorous when put back into water as when first removed from it, and take their food with the wonted appetite of their kind; the intervals between visits to the water have varied from two days to twenty-eight days, and the times in the water have varied from two minutes to twenty hours; during its aerial periods the nymph is perfectly quiescent on the weed, and resumes its aquatic life exactly where it left off. Nor does this extraordinary faculty of living in both elements alternately seem confined to nymphs of which Æschna cyanea is an example."

The Perishability of Paper.

The perishable character of modern paper is due primarily to the use of wood pulp which is not thoroughly made, and the introduction of loading materials. The Prussian government took the matter up and passed very stringent laws upon the subject. Standards of quality were set up, and all papers for documents must be submitted to official tests.

Atomic Weight of Radium.

In a communication recently made to the Académie des Sciences, M. Curie states that he has succeeded in making an approximation toward the atomic weight of the new element radium. Since the commencement of his researches for isolating the new element, the progress of its concentration in the chloride of barium has been constantly observed by the study of the spectrum and determinations of atomic weight. Each time that the treatment of the mineral gave a new quantity of the chloride, this was submitted to a systematic series of crystallizations in order to give a small quantity of a product as concentrated in radium as possible. A part of this was treated with hydrochloric acid to give a very pure product, which M. Demarçay has found by the last series of spectrum analyses to contain only traces of barium, and may be considered as an almost pure chloride of radium. The quantity of pure salt isolated in this way is insufficient, however, to obtain the atomic weight of radium, and M. Curie, in his last determinations, used the product containing a larger proportion of barium, of which he had 6 grains. A determination was made at the same time upon pure chloride of barium as a check. After indicating the process used for finding the atomic weight of each product, M. Curie states that the weight found for barium gives the number 138, and that of the product containing radium, 174·1 and 173·6 in two cases. There is no means of finding the relative amount of radium and barium in the latter product, but M. Demarçay concludes from the spectrum that there is a greater proportion of radium. It is, therefore, certain that the atomic weight of radium is much greater than 174. The quantity of pure chloride of radium isolated is not sufficient to allow the study of the properties of this element in a pure state, but its existence is no longer a matter of doubt.

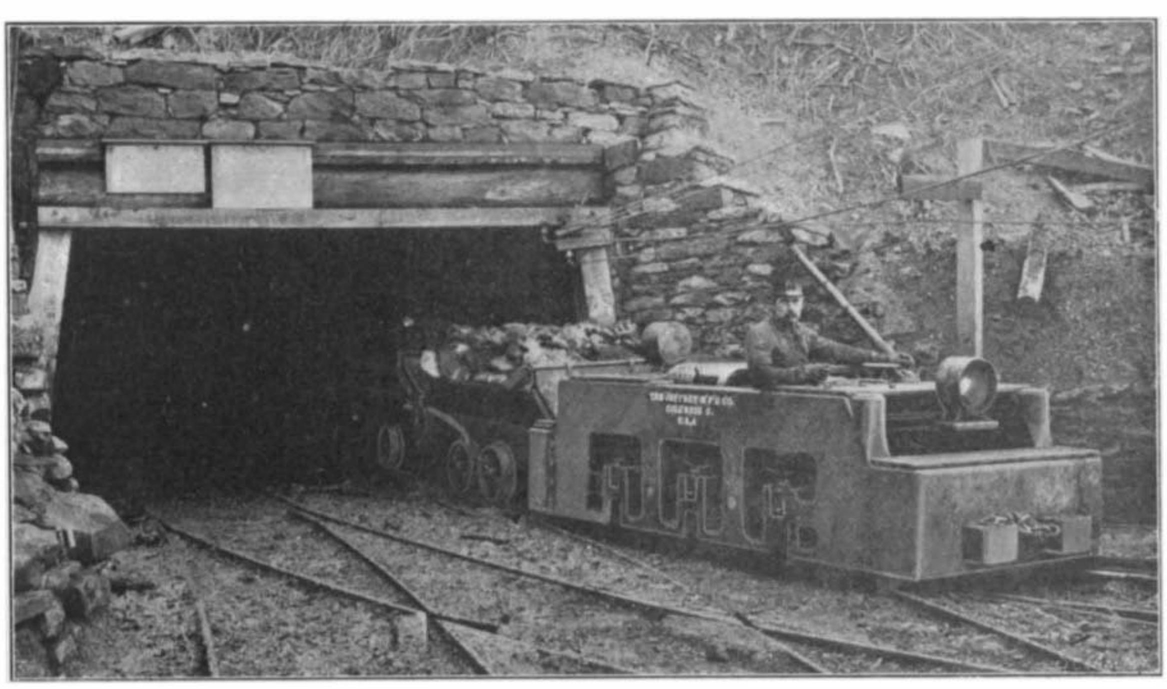

Fig. 3.—CENTRALLY CONTROLLED MINING. LOCOMOTIVE.

Weight, 15 tons; drawbar pull, 5,500 pounds.