Summary of results to April 22—	
Average depth frost per hole, feet	2.05
Average depth of peat per hole, feet	6.73
Average depth of sand and gravel per hole, ft.	0.16
Average depth of clay per hole, feet	9.06
Average total depth, feet	15.95
Average cost per foot run of 1, 3, 4, cts.	15.9
Average cost per foot run of 2, 3, 4, cts.	11.2
Average cost per man-day	$2.80
Average man-days per hole	0.64
Average man-days per foot run, 1, 3, 4	0.057
Average man-days per foot run, 2, 3, 4	0.040
3-man gang—	
Average cost per day	$8.40
Average bored, 1, 3, 4, feet per day	52.8
Average bored, 2, 3, 4, feet per day	75.0
Cost of equipment—	
3 rod augers at $10.70	$32.10
6 spanners at 20 cents	1.20
3 monkey wrenches at 70 cents	2.10
1 pipe auger at $15.00	15.00
4 10-qt. galvanized pails at 21 cents	.84
1 doz. 3½-lb. axes at $1.00	12.00
Total	$63.24

Table I. gives the total and average costs for 645 feet of boring in which was used the small auger drill spoon with necessary wrenches, handles, drill rods, etc., of a Junior Empire drill set. This outfit cost $259.85 delivered at Winnipeg, and was supplied by the New York Engineering Company. The test holes put down were at 2,000-ft. intervals and averaged 22.2 ft. in depth. They cost 32.4 cents per foot run, including the peat in the depth.

In opening up the holes through frozen material axes were used on all hand auger work, and found to be more efficient than a chisel, crowbar or pick.

In Table II. is given data covering some 6,200 ft. of boring, where hand-operated rod and pipe augers were used. These hand augers give practically the same efficiencies for depths of 15 to 20 ft., but for depths under 15 ft. the pipe auger is the faster. The rod auger, consisting of 1 auger piece, 1 handle, 5 extension rods with 12 extra bolts ⅜ in. x 1¼ ins., cost $10.70. To this should be added cost of a couple of spanners and the lifting handle. The pipe auger, consisting of 1 auger piece, 5 rods with couplings and bolts, 1 handle, 1 extra set of bolts and 2 spanners, together with 2 only ⅜-in. steel chains 4 ft. long, with one grab and one side hook attached to each, cost $15.

BIG CAR ORDERS REPORTED.

A Montreal dispatch says that Mr. W. W. Butler, vice-president of the Canadian Car and Foundry Company, states that an order for 100 box cars, valued at $100,000, had been received from the Alberta and Great Waterways Railway Company, and the Edmonton, Dunvegan and British Columbia Railway. The company also secured an order from the same source for $10,000 worth of switch and frog material, which will be manufactured by their subsidiary, the Canadian Steel Foundries.

It is understood also that the National Steel Car Company, of Hamilton, received an order from the Edmonton, Dunvegan and British Columbia Railway for ten stock cars. The value of the consignment was placed at $125,000.

THE MODERN ELECTRIC MINE LOCOMOTIVE.*

By Graham Bright.

THE day of the small mine with small equipment is passing, and in the future most of the bituminous coal mining will be accomplished in larger mines using heavy equipment. The demand for larger capacity in equipment has been increasing rapidly of late, and owing to the restricted space available for the equipment on a mine locomotive, difficulty is being experienced in designing equipment to meet the conditions. A possible solution of the problem is in providing forced ventilation for the motors which are of a type that require very little ventilation to produce a large increase in the continuous rating. This scheme has been tried out on a large locomotive and the results indicate that forced ventilation will play a prominent part in meeting the extreme severe conditions that are frequently arising in the mine locomotive field.

Motors for mine locomotives are rated in the same manner as the railway motor, that is, the one-hour rating with a rise of 75 deg. C. This rating, unfortunately, does not determine the fitness of the motor to meet a certain set of conditions in mine service. The mine motor is essentially an entirely enclosed motor so that the losses must be dissipated by conduction through the casing. In a locomotive with a box type frame, the air about the motor is trapped in, so that very little ventilation is obtained. With the open bar type frame the conditions are not so bad, as considerable ventilation is obtained around the motor.

The continuous rating of a mine motor is generally given at a reduced voltage since the average voltage applied to the motor in service is considerably below normal. This rating will be found to range from 35 per cent. to 50 per cent. of the hour rating of the motor depending upon the capacity, speed and design. It is a much simpler proposition to design a motor to give a high one-hour rating than it is a high continuous rating. The hour rating depends largely upon the amount of material in the motor and consequently its thermal capacity. The continuous rating, however, depends upon the distribution of the material, the distribution of the losses and the ventilation. The majority of mine operators buy motors on the one-hour rating, while the real capacity of a locomotive for all-day service depends upon the continuous rating of its motors. For a given set of conditions the root-mean-squared current can be readily determined from a characteristic motor curve and this root-mean-squared current should not exceed the continuous capacity of the motor if the motor is not to be overloaded.

A number of operators and some engineers advocate a rating of so many horse-power per ton weight of locomotive. This method may meet a great many conditions, but at times fails utterly. Unless the speed is high, a high horse-power per ton cannot be utilized owing to the limited adhesion of the wheels.

The limiting dimensions, weight, gauge, and rail, greatly handicap the design of a mine locomotive, and in the last few years the operating conditions have become difficult to meet owing to the increase in length of haul, weight of cars, and number of cars to be handled per trip. Some manufacturers have endeavored to meet these conditions by increasing the one-hour rating of the motor

*From a paper to be presented at the Panama-Pacific Convention of the American Institute of Electrical Engineers, San Francisco, Cal., September 17, 1915.