

Electric Substation for Mount Royal Tunnel.

The Canadian Northern Ry. will have finished at an early date a substation at the Mount Royal tunnel's west portal, near the top of the 0.6% grade, for supplying power to the locomotives for operation on the electrified zone, extending from the terminal station in Montreal to Cartierville. The building is 88 x 70 ft. x 34 ft. high, and consists of a machinery section and a switching and auxiliary section. The machinery room contains two 1,500 k.w. synchronous motor generator sets, with the foundation for a third set, and 3 exciter sets with space for a fourth. It also contains the switchboard. A 25 ton travelling crane is provided in this room to handle the heaviest pieces of machinery. Under this room there is a basement, where rheostats are located beneath the switchboard, and where there are also storage and locker rooms. The switching and auxiliary section is divided from the machinery section by a heavy fire wall. Underneath half of this is a basement containing rooms for oil storage and for the furnace which will heat the building. This section is divided into a busbar room, oil switch room, lightning arrester room, power transformer room, battery room and feeder entry room. Fire walls and doors fully guard against the possibility of any fire spreading. The machinery room has a glazed brick dado extending 10 ft. above the floor. Above this the room is lined with a light cream colored brick. Ample windows are provided for light and ventilation. Revolving ventilators are located in the roof over the machinery. The exterior of the building is finished with a dark red tapestry brick, with parapet, cornice and other trimming of moulded concrete imitating dressed sandstone. Three-phase 60-cycle 11,000-volt power will be delivered at the substation by the Montreal Light, Heat & Power Co., which distributes electric power from 6 water power stations, aggregating 170,000 h.p. All of these are connected to a central distributing station, which is only a short distance from the east end of the tunnel in Montreal. Two sets of cables, one set a spare, will be installed from the central distributing station through the tunnel in ducts and underground all the way to the substation. In addition to these underground lines, an overhead transmission line will connect the power company's Montana St. transformer station, just north of Mount Royal, with the substation. The switches on these incoming lines will be so arranged that the 11,000-volt busbars can be quickly changed from one to the other. Besides the water power generating stations the power company has 2 steam generating stations with a total output of 32,000 h.p. These act as a reserve only, and are connected to the central distributing station by underground feeders. Continuity of power supply is thus amply provided for.

The alternating current power will be converted into 2,400-volt direct current power for the trolley circuits by 1,500-k.w. motor-generator sets. Two of these sets are being installed at present, one of them being a spare. There will be space provided in the station for a third motor-generator set, which will be installed when the load increases beyond the capacity of one set. Each of these sets consist of two 750-k.w., compound wound, commutating pole generators wound for 1,200 volts, insulated for 2,400 volts, and direct connected to an 11,000-

volt synchronous motor operating at a speed of 600 r.p.m. These generators are permanently connected in series. The shunt fields are separately excited. The pole face winding, series and commutating filed windings are all connected on the ground side of the generators, so that the armatures are only parts subjected to the full potential of 2,400 volts. Separately exciting the shunt fields would ordinarily be objectionable, for the reason that if the commutator should arc over, due to a short circuit on the line, the generator voltage would tend to hold up and maintain the arc. To overcome this objectionable feature, a limiting resistance is placed in series with each of the shunt fields. This resistance is cut into the circuit by means of a contactor, operated by current coils excited from the 125-volt bus, and connected in series with the auxiliary switch attached to the main direct-current circuit breaker. When this circuit-breaker opens the auxiliary switch will also be opened, thereby allowing the contactor to open and cut in the additional resistance, thus reducing the voltage of the generators. A speed limit device is also used. The contacts of this device are connected in series with the trip coil of the circuit breaker. In case of about 15% over speed, or more, a revolving weight due to centrifugal force will open the switch, thus killing the low voltage release coil of the circuit breaker and causing it to open. These sets will have a continuous capacity of 1,500 k.w. each and an overload capacity of 200% for 5 minutes.

There will be three motor-generator exciter sets, each consisting of a 50-k.w. 125-volt generator of the commutating

pole type, direct connected to a 550-volt 1,200 r.p.m. induction motor. Normally one exciter will furnish exciting current to the fields of the synchronous motors, and another the current to excite 4 generators, the third exciter being a spare. Two banks of transformers, one a spare, each consisting of three 100-k.w. 60-cycle 11,000/550-volt single-phase transformers will be installed to furnish low voltage alternating current for operating the exciters and various motors. Other small transformers will step down from 550 volts to 110 volts for lighting the station. Emergency lighting will be taken care of by means of a storage battery, which will also furnish current for operating the oil switches in case of a complete shut down, when current from the exciter will not be available.

The switchboard is composed of 32 panels of natural black slate. These will control various outgoing circuits for signals, tunnel lighting and miscellaneous power, as well as the substation machinery. Nine of these panels comprise the 2,400-volt direct current board. The 2,400-volt circuit breakers and lever switches are mounted on panels, back of and above the main switchboard. They are operated by means of insulated handles on the front of the main board so as to eliminate any possibility of the operator coming in contact with the 2,400-volt circuit. The breakers are enclosed between fireproof barriers. They are equipped with powerful magnetic blow-outs to extinguish the arc, and are provided with a resetting device operated from the front of the board. The field switches are mounted back of the panels, with their operating handles on the front of the main board. The complete electrical equipment is being supplied by Canadian General Electric Co., Ltd.

The Canadian Pacific Railway's Honor Roll No. 17.

Adamson, Richard L.	Draughtsman	Strathmore	Wounded
Bland, William G.	Asst. baggage master	Medicine Hat	Killed in action
Buckingham, E. H.	Assistant agent	Claresholm	Wounded
Chapman, Andrew G.	Stower	Winnipeg	Died of wounds
Clarkson, Lorne	Conductor	Calgary	Killed in action
Connors, William P.	Carpenter	Fort William	Died of wounds
Craik, William	Laborer	Ogden Shops	Killed in action
Douney, Thomas E.	Fire inspector	Cranbrook	Wounded
Drybrough, David	Clerk	Vancouver	Died of wounds
Eaton, Judson W.	Trainman	B. C. Dist.	Killed in action
Ferguson, James D.	Comptometer operator	Winnipeg	Killed in action
Fraser, John S.	Stower	Winnipeg	Died of wounds
Grant, Fred C.	Trimmer	Angus	Killed in action
Green, Robert H.	Clerk	Toronto	Gassed and prisoner
Hacking, William S.	Stenographer	Montreal	Wounded
Horwill, William B.	Boilermaker's app.	Ogden Shops	Wounded
Howell, Harry	Miner	Lethbridge	Suffering from shock
Hughson, Henry E.	Wireman	Calgary	Killed in action
Keating, Harold G.	Wiper	Kamloops	Wounded
Kidd, George	Waiter	Winnipeg	Killed in action
Landstrom, G. A.	Locomotive man	Brandon	Killed in action
Long, William H.	Sleeping car cleaner	Toronto	Killed in action
McArthur, Thomas	Machinist	McAdam	Killed in action
Macdonell, Hugh W.	Assistant Solicitor	Toronto	Wounded and prisoner
McLean, Norman	Locomotive fireman	Winnipeg	Wounded
McNaught, James	Solicitor	Montreal	Killed in action
McReynolds, John	Telegraph operator	Toronto	Wounded
Maunsell, J. Q.	Law student	Toronto	Wounded
Montanelli, John	Tire setter	Angus	Killed in action
Morris, Glendon E.	Clerk	Montreal	Wounded
Nixon, John	Steamfitter's helper	Angus	Suffering from shock
Price, Herbert	Iron machinist	Angus	Suffering from shock
Reader, Charles P.	Ticket clerk	Medicine Hat	Wounded
Rogers, Henry G.	Bridge inspector	Montreal	Wounded
Rushworth, George	Car oiler	Winnipeg	Died of wounds
Taylor William A.	Operator	London Div.	Killed in action
Thompson, Harry M.	Clerk	Winnipeg	Wounded
Walrond George W.	Solicitor	Toronto	Wounded