

made here rarely require more than the $\frac{1}{2}$ and $1\frac{1}{2}$ ton sizes. While in many cases the industrial track would be found of great service, it has been found that under ordinary circumstances the 10 ton electric crane down the centre bay is more useful in the handling of the ladles to and from the moulds, more especially as all the heavy work is handled in the central bay, and the light or hand ladle work in the east bay. In consequence, the service track in the building has fallen in disuse.

An air-operated elevator to the cupola charging floor, opens to the outside in the west wall, and is served by a service track along that wall. Parallel with the service track, there is a standard gauge track, as may be noticed in fig. 1, on which the scrap and pig iron is brought in car lots and piled on the ground on the side opposite to the foundry, from which it is drawn as required, and either run on the elevator in the small service cars, or what is more generally done, on wheelbarrows. Scrap iron is used for the most part, with an addition of from 10% to 20% of pig, depending on the class of work for which the casting is being made.

A small room adjoining the cupola room to the north contains the cupola fan, and the foreman's office in the southwest corner. In the section to the south of the cupola room there are two core drying ovens, both fired from a pit in that corner of the cupola room. The larger one opens to the centre bay, and has a 7 ft. gauge car running out into that bay for the reception of the larger cores. It is served by a 15 ft. jib crane, swinging from an adjoining column. To the rear of this oven, opening to the south, is located the smaller oven, with shelves ranged along both sides for cores of smaller size.

The core room occupies the south two sections of the west bay, and is equipped with a vibratory sand sifter and a small core machine. The sides are lined with core benches, and behind the north bench there is a small core rack. For the baking of these small cores for bolt holes, etc., there is a small oven on the east wall. With the exception of this part of the foundry, which is paved with concrete, the floor is of the usual moulding sand formation.

The casting cleaning room is the northwest corner of the building, and contains a large and small tumbling mill, as well as benches for the chipping of the larger castings. There is also a double 18-in. emery wheel for cleaning room purposes. The west wall of this room is set aside for the foundry carpenters. A service track runs across this room, connecting at the ends through turntables with the inside and outside systems of trackage.

Coke and core and moulding sands are stored in a corrugated metal building, 100 by 30 ft., to the north of the foundry, as noted in fig. 1. This is divided into three rooms, 50, 25 and 25 ft. in length, holding respectively coke, core sand and moulding sand. These supplies are drawn off from the west side of the building.

A yard track approaches the central doors on the north of the building, and on this track, close to the building, a flat car is kept spotted, as at the tube shop door, for the loading of the slag and clinker directly on removal from the cupola and core oven.

A service track leads from the south door of the building, a continuation of the service track through the blacksmith and machine shops. All castings are forwarded to the latter shop over this line. A cross track at the south end of the foundry, with turntables at each end, connects this through track with that along the west side of the building. This connection is of considerable value to the machine shop in facilitating the removal of cast iron scrap to the foundry.

dry pile. The smaller castings from the cleaning room are also brought along to the machine shop over this route instead of through the front door of the foundry.

A large proportion of the castings made up are for stock purposes, and are stored on the stores department platform. These stock castings are piled in the cleaning room until a sufficient quantity to fill a box car has accumulated, when a car is run along opposite the cleaning room door on the standard track, and when filled, it is re-

moved by the yard engine to the stores platform, minimizing trucking.

The system of heating the foundry is similar to that in use in the machine shop, a series of seven $1\frac{1}{2}$ in. coils of pipe passing along all four sides. The lighting is different, the flaming arc being used, suspended from the lower chord of the roof trusses.

The foundry equipment was supplied by the Whiting Foundry Equipment Co., Chicago, Ill. (To be continued.)

Grade Reduction on the Timiskaming and Northern Ontario Railway.

In the report of the T. & N.O.R. Commissioners, recently issued, one of the more important matters discussed is the proposal to reduce the gradients on the first section of the line, from North Bay to Liskeard, 112.6 miles. This is dealt with in detail by S. B. Clement, M. Can. Soc. C.E., Chief Engineer, and Superintendent of Maintenance. He points out that the line from North Bay to Liskeard was located as a colonization railway, and placed under construction before the National Transcontinental Ry. was projected. When the latter line was laid out, it was seen that the T. & N.O. Ry. would have to be extended to a junction with it, and handle a large amount of traffic to and from it. The extension of the T. & N.O. Ry. from Liskeard was therefore located on the same gradients and curvature as the N.T. Ry. The difference between the physical characteristics of the two sections of the line is strikingly shown in the following table:—

	North Bay to New Liskeard.	New Liskeard to Cochrane.
Distance.....	112.6 miles	140.0 miles
Ruling gradient—North bound..	1.45 p.c.	0.5 p.c.
South bound..	1.2 p.c.	0.4 p.c.
Maximum curvature.....	6°	4°
Curvature per mile.....	83°18'	27°56'
Tonnage rating (10 wheel class)—		
North.....	560 tons	1,460 tons
South.....	700 "	1,710 "
Maximum tonnage rating (new consolidation class)—		
North.....	1,070 tons	2,700 "
South.....	1,290 "	3,160 "

Surveys have been carried on at intervals since 1906 to see to what extent it is practicable to reduce the excessive gradients between North Bay and Liskeard. The shorter and lighter of these gradients can be reduced without changing the alignment, while the longer and heavier can only be eliminated by rebuilding on a new location, in some cases at a considerable distance from the present right of way. Wherever these diversions are necessary actual locations have been made and estimates of cost prepared.

The most striking feature of the profile of this section of the line is what is known as the Merrick Summit. The elevation of the North Bay yards at the junction with the C.P.R. is 652 ft. above sea level, and from Riddle north for about 25 miles the general elevation of the country is approximately 1,000 ft. above sea level. The intervening Merrick summit, with an elevation of 1,300 ft. above sea level, is the most serious obstacle to be overcome. In the original location, this summit was crossed by deflecting several miles to the east from North Bay, following the rugged shores of Four Mile creek and the North river to the summit. After an exhaustive examination of the country on both sides of the right of way, it was found that a lower grade from North Bay could be obtained by following Duchesnay creek and the summit could be crossed at an elevation of about 1,170 ft., or about 130 ft. lower than the present summit, connecting with the present line at mileage 35, just north of Riddle. If at all possible it is desirable that the ruling grades on the first division

should not exceed those on the second division, but it is a physical impossibility to obtain a 0.5% grade north from North Bay. This diversion, North Bay to Riddle, has been located with maximum curvature of 4°, and with maximum grades of 0.8% northbound and 0.6% southbound, all compensated for curvature. The diversion gives the lowest grade that can be obtained from North Bay without swinging the line far to the west to the Sturgeon river valley. With this diversion as a key to the situation it will be unprofitable to attempt to lower the grades between Riddle and Liskeard below 0.8% northbound and 0.6% southbound.

Having adopted these ruling grades, every grade in excess of them, between North Bay and Liskeard, was carefully examined. It will not be necessary to reduce a number of the shorter of these grades as they may be operated as momentum grades. The reduction of the grade between Liskeard and Cobalt from 1% to 0.6% can only be accomplished by a diversion that would pass at a considerable distance from the present station grounds, at Haileybury and New Liskeard. For this reason, it is advisable, for the present, to overcome this grade by means of a helper engine service.

The following summary statements show the proposed method of reducing all grades between North Bay and Liskeard to a maximum of 0.8% northbound and 0.6% southbound:—

Location, mile to mile	Method of reducing grade.	Estimated Cost.
2. 35.	Diversion	\$1,482,500
40. 41.2	Train filling	50,120
47.9 48.5	"	25,610
51.7 52.5	"	11,000
57.8 59.	"	39,100
60.4 61.8	"	33,280
62.5 63.3	"	9,200
66.7 73.2	Diversion	367,675
74.5 75.3	Train filling	16,225
90. 94.	Diversion	220,000
100. 100.5	Train filling	8,400
101. 112.	Helper engine service.
Total		\$2,263,110

The total length of the North Bay-Riddle diversion will be 30 miles, replacing 33 miles of present line. The curvature on diversion averages 71°, and on the present line 93° per mile. The total rise and fall is as follows:—present main line—rise, 747 ft.; fall, 374; diversion—rise, 634 ft.; fall, 258.

Railway Bridges Over Navigable Waters.

—The Board of Railway Commissioners has given notice in regard to applications for approval of bridge plans, that in all cases of bridge work over water in which there might be the slightest doubt as to it being navigable or not, railway companies must, in addition to the papers heretofore forwarded in support of their applications, furnish the Board with evidence showing that the question of the navigability of the water has been taken up with the Public Works Department and that, if the Department deems the waters to be navigable, the structure is satisfac-