The comparative cost of steel-tyred and cast-iron wheels, as here given (sterling money being converted to Canadian), is based on a two years' working, and for a total mileage of 60,000 miles for the two years. The scrap value of the cast-iron wheels is taken into account in the sum allowed for new wheels. It will also be noted that an amount of $9.73 per wheel has been allowed in the case of the steel-tyred wheels as the value of the centres, which point has been entirely overlooked in all previous articles dealing with the advantage of one type of wheel over the other. A sum of $4.87 per car has been allowed for re-turning steel tyres after one year's working, which could be omitted, as in many cases these wheels run the full mileage without returning, but it is safer to let this sum stand. No allowance has been made for taking out or replacing the wheels and axles, as in all well-managed car sheds these come out in any case for examination of axle boxes, etc. A year's working has been taken as 30,000 miles, as this mileage is a fair average for a car in most districts.

STEEL-TYRED WHEELS.

One set of four wheels at $19.47 each	$77 86
Re-turning at end of first year's working and 30,000 miles' wear, which in several cases has not been necessary	4 87
Total cost at end of second year's working and 60,000 miles' wear, tyres now worn out	82 73
One set of new tyres at about $9.73 each	38 93
Re-turning at end of third year's working and 30,000 miles' wear	4 87
Total cost at end of fourth year's working and 60,000 miles' wear, tyres now worn out for the second time	126 53
Value of the four wheel centres	38 93
Cost of wheels at end of fourth year, after allowing for material not requiring to be scrapped	87 60

CHILLED CAST-IRON WHEELS.

One set of four wheels at $5.36 each, after allowing for their scrap value	21 42
Four new wheels, with refitting on axles, at end of first year's working and 30,000 miles' wear	28 71
Total cost at end of second year's working and 60,000 miles' wear	50 13
Four new wheels, etc., at end of second year's working.	28 71
Ditto at end of third year and 30,000 miles	28 71
Total cost at end of fourth year's working and 60,000 miles' wear, a new wheel being required at the end of each year and 30,000 miles' wear	107 55

The foregoing figures show a saving at the end of two years of $6.33 per car, and at the end of four years $19.47 per car in the case of steel-tyred wheels, and is brought about entirely by allowing for the value of the wheel centre, which can be retained on the axle and does not depreciate. The figures have been carefully gone into, and facts obtained from an entirely unbiassed standpoint.

The following gives particulars of steel-tyred and chilled iron wheels manufactured by Hadfield's Steel Foundry Co., for whom Peacock Bros., of Montreal, are Canadian agents. These wheels consist of a cast steel centre, on which is fitted a renewable steel tyre.

Centres.—These are made of Hadfield's best toughened cast steel of a special grade. They are capable of withstanding a test load, applied by steady pressure to the centre of the boss, of about 112,000 lbs. without producing any permanent set, and will withstand a load of about 179,200 lbs. applied in the same manner, without showing signs of fracture. The centres are carefully turned up and recessed on the front side of the rim, the back edge being slightly tapered off. The boss is faced on both sides and bored for the axle.

Tyres.—These are 2½ to 2¾-in. thick, and are constructed of a specially hard and toughened rolled steel, having a tensile strength of 112,000 to 123,200 lbs. per square inch, with an elongation of 67,200 lbs. per cent. in 2-in. The tyre is carefully heated and shrunk on the centre mentioned above. The wheel is then placed in a lathe and has the projection on the back edge of the tyre folded over by a special appliance. In this way the tyre is so fixed that it is impossible for it to become loose laterally. The complete wheel is pressed on to the axle at a pressure of not less than 67,200 lbs.

Mileage.—These tyres will give a mileage of about 60,000 miles before requiring to be renewed. The wear for this mileage will be from 1½ to 1¾in. on the radius or ¼-in. on the diameter for every 5,000 miles run. At Sheffield, where the conditions are severe, due to the steep gradients, the average life has come out at 65,000 to 70,000 miles.

Weight.—The average weight of a 31¾-in. wheel is approximately 330 lbs.

Axles.—These are of a special quality of best toughened steel, and so far there is no breakage on record against these axles.

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THE "ANGUS SHOPS" OF THE CANADIAN PACIFIC RAILWAY.

From a Paper read before the Canadian Society of Civil Engineers.

BY HENRY GOLDMARK, C.E., ENGINEER IN CHARGE OF CONSTRUCTION.

(Concluded from March issue).

It may be added that the wooden Howe trusses in the car shop were adopted instead of steel trusses mainly to save time. The saving in cost did not exceed 12½ per cent. In the outcome there was probably no saving of time from the use of timber, but on the other hand no great disadvantage resulted from using this form of construction.

The heavy timber girder and post construction as used in the truck shop, etc., was adopted as being cheaper and better than truss work, and its use is believed to be fully justified.

The principles of mill construction were fully carried out, the purlins being in no cases less than 6 by 12-in. and in many buildings 8 by 16-in. They are spaced from 8 to 10 feet apart. The roof boards are 3-in. thick in all cases.

In the locomotive shop they are 11-in. wide, T. and G. In most of the other buildings this roofing was built up of strips of 3 by 3-in. laid with broken joints in random lengths and well nailed horizontally and vertically. These strips were surfaced on three sides, but were not tongued and grooved. On top of the boards a four-ply tar and gravel roofing of standard construction was laid. There is a galvanized iron flashing around the skylight, but there are no gutters or downspouts.

The flooring throughout consists of three-inch unmatched plank nailed to cedar sleepers 4 feet apart and bedded in from 15 to 18 inches of cinders. It may be added that the roof loads were taken at 70 lbs. per square foot. (total loading), and the stresses in the timber beams at 1,500 lbs. per sq. inch. The structural steel is of simple construction though every attempt was made to secure rigidity especially where crane runways had to be supported. Tensile stresses are 15,000 lbs. per sq. inch on the net section and compressile stresses 12,000 lbs. reduced for length. In the crane runway girders the tensile stresses were reduced to 12,500 lbs. per sq. inch.

HEATING.

The heating of the shops was the subject of an extended study in order to determine the most practicable and feasible system. This question was necessarily taken up in connection with the design of the power plant. The economy of producing power in an independent station is dependent on the utilization of the exhaust steam of heating. As exhaust steam possesses from 85 to 90 per cent. of the heat units contained in the steam before it has passed through the engines, it is clear that every consideration of economy will lead to its utilization if possible. Whether any additional boilers will be required over and above those necessary for power will depend, of course, on the amount of power, the size of the shops, and the prevailing temperature. In the "Angus" shop, about 26,000,000 cubic feet had to be heated in the various shops, while the horse-power installed in the engine room of the power-house is nearly 3,000.