The Cost of Building Locomotives.

THE following concise but most valuable article appeared in the *National Car & Locomotive Builder*. The writer is Mr. Francis R. F. Brown, Mechanical Superintendent of the Canadian Pacific, an authority on this and cognate questions:

The cost of a finished locomotive necessarily depends to a large extent on the design, class and materials used in its construction, and to insure success in economy of production the designing and building departments should work together in harmony, and under an undivided authority; so that while on the one hand any improvement in design, or means of cheapening construction which may be brought to light by shop experience may be considered by the head of the department, and if advisable adopted without being blocked by the draughtsmen, who as a rule forcibly object to their designs being interfered with or their drawings altered; yet, on the other hand the draughtsmen should be allowed free access to the shops, and full opportunity given them to inspect the work as it goes on, and to report to the superintendent whenever they find that drawings are not adhered to, inferior workmanship is being allowed, or materials used such as are contrary to specifications.

Under such circumstances, combined with some years experience in building the class of engine described, the results given below are attained in Canada by the writer:

The engine is an eight-wheeled road engine, American type, cylinders 17 in. by 24 in.; drivers 62 in. diameter. Boiler pressure, 160 lbs. to the square inch, and weight of engine in working order, 87,000 lbs.

The weight of the engine empty is 77,400 lbs., and that of the tender 30,100 lbs., making a total of 107,500 lbs., and the cost of ten engines, lately built with ten per cent. added on to both material and labor, was $5,740 each, or 5.34c. per lb, this cost including a complete set of tools, jacks, lamps, headlight and U. S. packing in pistons and valve stems. Some of the principal detailed costs with 10 per cent, added to both material and labor are given below.

Frames.—Both back and front frames are forged from No. 1 scrap, they weigh when machined and finished ready for the erecting shop 4,220 lbs. per set, and cost 5.3c. per lb.

Boiler.—The finished boiler, without tubes, weighs 14,680 lbs. and costs $1,116, or 7.6 cts. per lb.

Cylinders.—Fitted up ready for erecting, with steam chests, all covers and studs weigh 5,460 lbs. per pair, and cost $517.46, or 4.16 cts. per lb.

Wheels, Axles and Tires.—Finished ready to put under the engine, weigh per set for the engine, 12,440 lbs, and cost $517.46, or 4.16 cts. per lb.

Crank Pins.—Are made from Low Moor iron and case hardened, they weigh per set of four, when finished ready for use, 287 lbs., and cost 10.5 cts. per lb.

Side Rods.—Are made with ends and oil cups forged solid, then slotted out and fitted with half brasses and cotter, and when complete for erecting weigh 580 lbs. per pair, and cost $87, or 15 cts. per lb.

Brass Boiler Mountings and Fittings.—Including injector, check and steam valves, whistle, water gauge mountings, try cocks, etc., cost on the average 50 cts. per lb.

Smoke Stack.—With cast iron top, fitted with netting and cone ready for use. Weighs 630 lbs., and costs $37, or 4 cents per lb.

Cab.—The cab, fitted with doors and sashes glazed, weighs 750 lbs. and costs $55.

Pilot.—Ready for use weighs 420 lbs., and costs $14.

Tender.—The tank is so designed that every rivet in it can be closed by the hydraulic machine. The capacity of the tank is 2,800 imperial gallons. The trucks are made of wrought iron, with semi-elliptic spring, and the frames are of oak.

It weighs, complete, 30,100 lbs., and costs $924, or 3.07 cents per lb.

Commenting on this article the *Car & Locomotive Builder* says:

The article in another column by Mr. Francis R. F. Brown, mechanical superintendent of the Canadian Pacific Railway, on "Cost of Building Locomotives" gives detailed and valuable information on a subject which is of living interest to nearly all railroad men. The Canadian Pacific Railway has an excellent system of keeping the record of the cost of all work done, and the information given in Mr. Brown's article is of the most reliable character. The cost of work and material is very low, as viewed from an American stand point, but both material and labor are cheaper in Canada than they are in the United States, and the system under which Mr. Brown gets his work done compares favorably with any system in operation for facilitating the production of work accurately and cheaply.

The paper by Mr. Brown on Construction of Canadian Locomotives, read last May at the meeting of the Institution of Mechanical Engineers, in London, which we have largely quoted, excited unusual interest, and the cost of the engines has been the subject of considerable controversy. British locomotive builders were unwilling to admit that locomotives could be built more cheaply in Canada than they could be made in the British shops that had much cheaper labor, cheaper material and had been in the business for half a century. Some American critics, on the other hand, taking the cost of locomotives built by the Pennsylvania Railroad Company as a basis of comparison, questioned the possibility of a Canadian shop producing good work at a cheaper rate. Yet it appears to be done. In all essential particulars the system of building locomotives followed by Mr. Brown is the same as that followed in all first-class railroad and contract shops in the United States. The work is produced on a manufacturing basis, with first-class tools and good workmen operating on the subdivision of labor plan and as far as practicable under contract. For some departments of work, Mr. Brown's figures agree very closely with the cost of work in certain American shops noted for economical production; but the run of his material, owing to the lighter tariff, is cheaper than that which has to be paid for by railroad companies in the United States, which tells on the total cost of the Canadian locomotives. Having recently enjoyed the opportunity of minutely examining the locomotives built by Mr. Brown, we willingly testify to the excellent work put upon them. They have received no superfluous finish, but the working parts are all well fitted and designed to produce a durable and serviceable engine. We are convinced that the real test, viz., that of hard service, will demonstrate that Mr. Brown has produced not only a very cheap locomotive, but one that will work satisfactorily and wear as well as anything built on the American continent.

Steel Lace for Feminine Wear.

THE question of making laces of iron and steel for ladies' and children's wear is again being discussed in art, mill and fashion circles. At the Centennial in 1876 a piece of steel rolled by a Pittsburgh mill was on exhibition, which was so thin and light that it weighed much less than a book leaf, and could be blown from the hand easier than a piece of paper of the same size. The iron leaf was rolled on a train of rolls upon which heavy tank and boiler iron is now rolled.

Experts say that curtains and other fine laces can be made of soft malleable iron, and in every way be used with greater satisfaction than cotton laces. The sheets will necessarily have to be rolled down to an exceedingly low gauge and then pressed into any desirable pattern and shape. There will be no trouble in furnishing iron laces for ladies' and children's wear, with their names and other ornaments in a filagree design. An introduction of steel lace would establish in Pittsburgh an industry that would give work to at least 3,000 men, and consume annually not less than 76,000 tons of steel, which is now a drug in the market at less than two cents a pound. Steel lace, unlike cotton, can be made light or heavy without affecting the grade, color or brightness. We may yet see fashionable ladies wearing steel shawls and trimmings for their hats and dresses.—*Pittsburgh Chronicle.*

Legislation.

THE following notices relating to railway affairs are published in the *Canada Gazette*:

By Hon. Senator Billa Flint, of Belleville, for a charter from Belleville to Tweed and Bridgewater and on to Bannockburn to connect with the Ontario Central, with running powers over that road to Coe Hill and to continue the line to meet the Canadian Pacific main line at Lake Nipissing or some other point, also with power to build to some point in the Province of Quebec.

For the incorporation of the Tobique, Gypsum & Colonization Company, the road to run from Perth Centre on the New Brunswick Railway to the mouth of the Tobique River and thence along that river to "The Plaster Rock" and on to connect with the proposed Restigouche & Victoria Colonization Railway.