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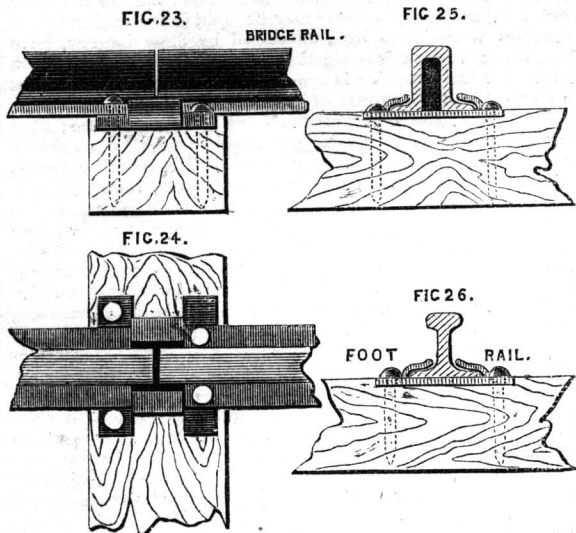
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RAILWAYS FOR THE COLONIES AND NEW COUNTRIES.

121-1 (Concluded from p. 243).

Permanent way.—Figs. 23, 24, 25, and 26, show the forms in general use on colonial railways. These rails and chairs are used largely on railways in the United States, and on the Great Western and Grand Trunk Railways of Canada. The chair weighs 9 lb., and is used only at the joints, the intermediate sleepers being secured to the rail by two strong flat-headed spikes, $\frac{3}{4}$ lb. each, which clip the rail. One end of the rail is cut with two slots to receive two of the spikes, which pass through



the chair. The rails weigh about 63 lb. to the yard, or 100 tons per mile of single way. The sleepers are 2 ft. 3 in. apart. The rails are manufactured with a cant in them to receive the bevel of the wheel. The sleepers should not be less than 10 in. by 6 in., and 9 ft. long, and made from oak, ash, hemlock, pine, cedar, or tamarack.

The construction of one mile of single line of railway in a new country may be estimated with safety, complete with full equipment, as follows:—

	Per Mile.
Land and legal expenses	£200 0 0
Clearing and grubbing away the bush	150 0 0
Fencing	175 0 0
Culverts and drainage	250 0 0
Excavations	1,800 0 0
Bridges	750 0 0
Road level crossings	200 0 0
Permanent way and ballast	2,000 0 0
Stations, warehouses, and extra sidings	300 0 0
Surveying, engineering, and superintendence	200 0 0
Telegraph and apparatus	50 0 0
Rolling stock	1,250 0 0
Contingencies	175 0 0
Total per mile	£7,500 0 0

3. Maintenance and working.—The maintenance of the permanent road in efficient working order should be the prime consideration. In new countries too frequently it is allowed to fall into a most perilous state at times from a deficiency of revenue and scarcity of labour. As a general rule, the first year two good experienced men should be employed per mile; then after the proportion of one and a-half man per mile for second year, and one man per mile afterwards. These men, of course, can be formed into any convenient number of gangs to suit the urgency of the moment. It is preferable for the company to maintain their road with an intelligent superintendent than let it out by contract, and run the risk of all the schemings of sub-contractors and those little men to whom the work is generally handed over to be done.

There will be required one locomotive for about every eight miles of railway at first. They should be constructed with truck carriage and small leading wheels in front to direct the locomotive safely over the unequal parts of road; made to burn the wood fuel cut out of the forest, with large funnels to regulate the draft; and provided with a bell, a very powerful whistle, and a glazed sash covering over the footboard to protect the engine driver and fireman from the severities of climate.

The carriages should be built about sixty feet in length, saloon fashion, and after the most approved American method, and capable of carrying sixty people, with passage down the centre, and in direct communication with the conductor, who is continually traversing the train for tickets, &c., and also with the engine driver by a rope passing along the top of the carriages

to the spring bell on the engine. They should be warmed in winter by a stove.

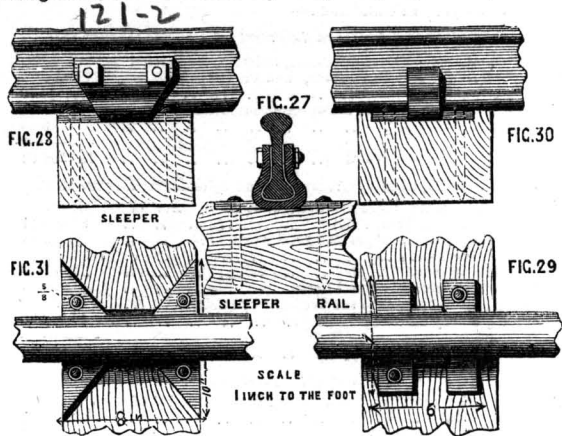
The station masters should have provided for them every facility for accommodating passengers and produce brought to the railway from those almost inaccessible parts of the bush, so far back in the rear of the country. The produce for transport can only be brought at certain seasons of the year, when the primitive roads are passable; and therefore all desirable accommodation should be provided for storing same until it can be gathered together in large quantities to be transported to market. The heavy traffic and revenue of the company will much depend upon arrangements of this kind, as the one great idea to be regarded is, the thorough development of the agricultural and mineral resources of the new country opened out by the railway.

The working expenses of a railway should not exceed the following.

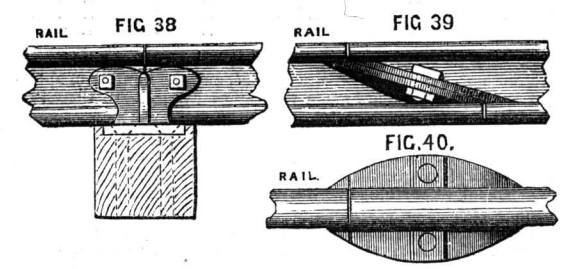
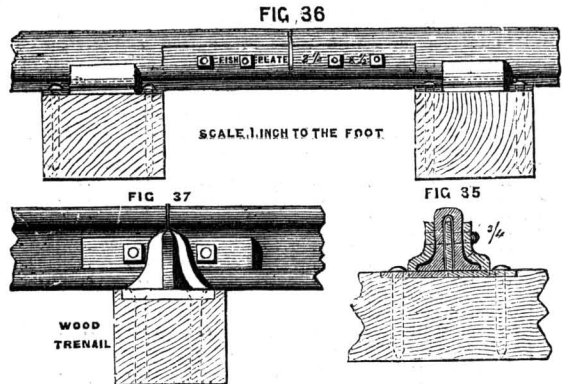
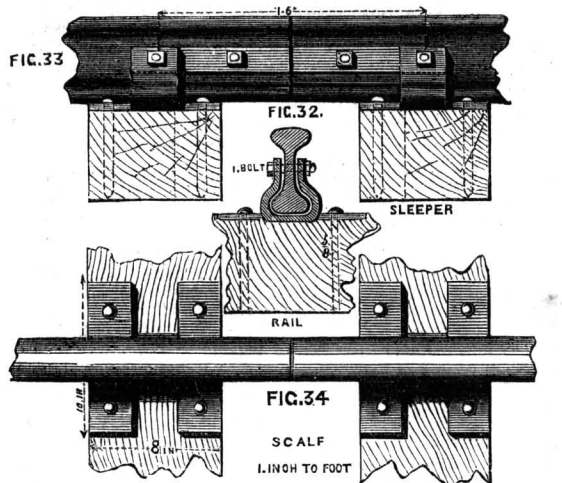
Maintenance of permanent road	4d. per mile per train
Locomotive power and repairs	9d. "
Carriage and wagon repairs	3d. "
General charges, taxes, &c.	6d. "
Total	1s. 10d.

The locomotives for passenger trains will burn 27 lb. of coke per mile, or a cord of wood measuring 128 cubic feet when stacked in piles, to 35 miles; the goods locomotives 42 lb. of coke per mile, or a cord of wood to about 25 miles. The total cost of maintenance of permanent way should not exceed £100 per mile.

Suggestions for improving permanent way of colonial railways.—The drawings, Figs. 27 to 40 inclusive, show details of various methods adopted by the writer to improve the joints of permanent way. They have been tried in short lengths, as examples, upon a colonial railway of extensive traffic, and have been found to succeed admirably, so far as the period of trial enabled the writer to judge. At any rate they each and all of them maintained a much better joint, and dispensed with much of that clattering, unpleasant sound which is experienced in riding over a colonial railway. Figs. 27, 28, and 29, show a



section, elevation, and plan of a joint chair, which unites in itself all the advantages of fish-plates. The chair is extremely simple in its manufacture, being simply cut out of a piece of half inch boiler plate, measuring 10 inches by 8 inches, and will weigh about 12 lb. The chair is secured to the ordinary cross



sleepers by means of four 6-inch spikes, $\frac{3}{4}$ -inch square. The ends of rails are connected with chairs by two fishing bolts, 1 inch in diameter. The holes at the ends of rails to receive bolts for fishing should be made one-eighth of an inch larger than the bolts, to allow of expansion. Figs. 30 and 31 show elevation and plan

of an intermediate chair, *bright nature*, to supersede the usual system of merely spiking the rails to intermediate sleepers without chairs. The chair is cut out of a piece of half-inch boiler plate, measuring 7 inches by 6 inches, and will weigh about 6 lb. The chair is secured to the sleeper by two 6-inch spikes, five-eighths of an inch square. The intermediate chairs to be placed with centres 2 ft. 7 $\frac{1}{2}$ in. apart. Figs. 32, 33, and 34 show section, elevation, and plan of joint chairs, to be used with a fish plate 2 $\frac{1}{2}$ inches by $\frac{1}{2}$ inch. The chairs are placed 9 inches from the joint, are cut out of a piece of half-inch boiler plate, 10 inches by 8 inches, weigh 12 lb., and are fished to the rails with four bolts, 1 inch in diameter. Figs. 35 and 36 show section and elevation of a bridge rail, fished in the interior with a plate 2 $\frac{1}{2}$ inches by $\frac{1}{2}$ inch, and four bolts. Fig. 37 shows an elevation of a cast iron joint chair, holding a wooden key 9 inches by 2 inches, and used with bolts to fish joint. Fig. 38

shows elevation of cast iron joint chair, used for fishing rails with two bolts. Figs. 39 and 40 show elevation and plan of a method of forming ends of rails, so that they may be fished with the assistance of two 1-inch bolts. These methods might be advantageously and economically employed in the case of branch railways at home, as well as incorporated upon the colonial systems in general use.