

of water is sufficient in ordinary weather to prevent dangerous formation of ice. An additional precaution is the passing of the water in the rising main through an annulus surrounding the exhaust pipe from steam pump cylinder. The ascending column of water acts as a condenser, and absorbs a degree or two of heat, so that no trouble is experienced even with India rubber water valves, at a temperature 20° below zero.

In shops there is an increased use of milling tools, and of the portable twist drill, by which much handwork is displaced.

Increasing cost of fuel has stimulated the manufacture of engines with independent slide valves for steam supply and exhaust, such as the "Brown Engine."

Mr. Brown, Mechanical Superintendent of the Canadian Pacific Railway, has kindly contributed the following notes:

"Progress in locomotive designing and building made by the Canadian Pacific Railway Company, in connection with increasing the haulage capacity of the locomotive by adding to the weight and raising the boiler pressure without increasing the size of the Cylinders.

For instance, in 1883 the standard 17 in. x 24 in. cylinder locomotive built by the company weighed 83,000 pounds in working order, the boiler pressure being 150 pounds to the square inch. To-day the same class of engine with similar size of wheels and cylinders and duplicating patterns in all important parts, weighs 88,000 pounds in working order; this additional weight being all on the driving wheels, and the boiler pressure being 160 pounds to the square inch, enables the improved locomotive of '87 to haul on a 1 per cent. grade three average loaded cars or two fully loaded cars more than locomotives of '83, with same size cylinders. On the level the increased haulage power may be put at double the above.

This class of engine is also used for light passenger service, 69 inch wheels being substituted for 62 inch. The Westinghouse Air Brake with brakes on driving wheels being added, making a total weight in working order of 90,500 pounds, the boiler pressure is here raised to 170 pounds to the square inch.

In designing other types of locomotives these principles are adhered to, with a view on the one hand to increasing the efficiency and economy in fuel consumption, and maintenance; and on the other hand of avoiding the great fault of having an over cylindered engine, bringing with it its attendant evils in the shape of high fuel consumption combined with heavy cost of maintenance and repairs.

The first locomotive constructed in Canada was built by Kinmond Brothers in 1852 for the Grand Trunk Railway, and about 650 engines have since been constructed in Canada.