

In England the express engines, some of them burning the best Welsh coal, have a very different array of circumstances to contend with: which is usually overlooked when comparing the relative performances of the two types of locomotives.

The general designs of the engines which form the subject of this paper are of the American type, as being the best adapted for overcoming climatic difficulties, giving as it does a flexible wheel-base to suit the road when disturbed by frost and thaw, affording easy access to all parts of the mechanism, and enabling necessary repairs to be effected with the greatest facility: all of which points are of great moment for enabling the traffic to be carried on without stoppage for repairs.

*S.A. Light Engines for Freight and Mixed traffic.*—The lightest class of engine which the writer will describe is designated S.A.; of which a longitudinal section and plan, one quarter full size, are shown in Figs. 1 and 2, and cross sections, half full size, in Figs. 3 and 4. This class was specially designed by himself with a view to condense the stock of patterns, and at the same time to give the best and most satisfactory results, whether working on the Atlantic or Pacific coast or on the prairie or rocky sections intervening, with all the extreme variations in class of coal from anthracite to almost lignite, and of water from lime to alkali, which are encountered in operating a railway across 3,000 miles of country: so that a locomotive of this class might be transferred to any portion of the line and give equal satisfaction. This system also reduces to a minimum the stock of duplicates for repairs; and enables the repairs to be effected without loss of time, and at a low cost.

For obtaining the requisite adhesion with this class of wheel-base—consisting of a four-wheeled lateral-motion truck in front, and four coupled drivers behind—and for economising weight, great care has been exercised to reduce the weight of the front end of the engine without impairing its strength, or diminishing the protection in case of collision; and the maximum weight obtainable has been placed on the driving wheels. Equalising bars are placed between each pair of truck wheels and also between each pair of driving