UNITED STATES PATENT OFFICE.

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LOCOMOTIVE.

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To all whom it may concern:

Be it known that I, GEORGE A. BOTHWELL, of the town of Owen Sound, in the Province of Ontario, Canada, have invented certain new and useful Improvements in Locomotives, of which the following is a specification.

In railway operation one of the great difficulties met with is the provision of suitable means for mounting the heaviest grades on the line. A locomotive of sufficient power to transport the heaviest of the ordinary loads on the level, or over moderate grades, is often entirely inadequate to mount the heavy grades. The difficulty is ordinarily overcome in various manners, such for example as providing special engines to be used only on the heavy grades, or the use of an extra locomotive at such points. I aim to overcome the difficulty by so constructing a locomotive that, while ordinarily perfectly adapted for use on the level or moderate grades, it yet may be almost instantly adapted to surmount the heaviest grades met with. I attain this result by providing means whereby the ordinarily small idle wheels of the locomotive and tender may be used as drivers and the ordinary large drivers freed from driving engagement with the rails whenever power and increased traction is desired to enable the locomotive with its train to surmount a grade. I prefer to withdraw the ordinary large drivers from their driving engagement by means of small supplemental wheels vertically movable so that they may be engaged with the rails and the ordinary large drivers lifted therefrom. The supplemental wheels are preferably driven from the ordinary driving wheels, and the ordinary idle wheels of the locomotive driven from the supplemental wheels.

Figure 1 is a side elevation of a locomotive and tender constructed in accordance with my invention. Fig. 2 is an enlarged side elevation of part of the locomotive showing particularly the means employed for supporting and imparting vertical movement to the supplemental wheels. Fig. 3 is a longitudinal sectional elevation of parts of the locomotive showing particularly the means for driving the idle wheels. Fig. 4 is a similar view of parts of the tender. Fig. 5 is a plan view of parts of the locomotive showing more particularly the drive mechanism of the idle wheels and the clutches of the same. Fig. 6 is a sectional plan view of one of the bearing boxes of the supplemental wheels and its guides. Fig. 7 is a sectional detail of one of the clutches.

In the drawings like letters of reference indicate corresponding parts in the different figures.

In the locomotive and tender the main features are similar to those ordinarily employed.

On the locomotive 1 are the driving wheels and 2 the wheels of the bogie, normally running idle.

3 are supplemental wheels, adapted to run on the same track as the driving wheels 1. The frame work of the locomotive is, of course, suitably shaped to carry the different wheels and the other parts hereinafter to be described. The axles 4 of the driving wheels are journaled in boxes 5, carried in the frame work of the engine in the ordinary manner. These boxes are connected by suitable hangers with elliptic springs 6, which are of ordinary construction and arrangement and need not be specifically described. Suffice it to say that each spring is connected at one end to the frame work of the locomotive by the links 7, and the other ends by the equalizer system 8 of the usual type. The axles 9 of the supplemental wheels 3 are journaled in the boxes 10 which embrace the guides 11 formed on the frame of the locomotive in such a manner that the boxes are vertically and longitudinally movable within certain limits. (See Fig. 6). A vertical movement of three or four inches is ordinarily sufficient while the longitudinal movement may be considerably less. Before, however, describing the means for supporting and moving the bearing boxes of the supplemental wheels it will be necessary to describe the method employed for driving these supplemental wheels. At present it will be sufficient to say that means are provided for raising and lowering the supplemental wheels so that either the ordinary driving wheels or the supplemental wheels may be brought into driving connection with the track. The ordinary driving wheels are driven from the cylinders of the engine in the ordinary well known manner, and the driving wheels are connected by the