

UNITED STATES PATENT OFFICE.

EPHRAIM SHAY, OF HARING, MICHIGAN.

LOCOMOTIVE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 242,992, dated June 14, 1881

Application filed March 30, 1881. (No model.)

To all whom it may concern:

Be it known that I, EPHRAIM SHAY, of Haring, in the county of Wexford and State of Michigan, have invented a new and useful Improved Locomotive-Engine, of which the following is a full, clear, and exact description.

The object of this invention is to construct a cheaper and lighter locomotive-engine than those of ordinary build, especially to work on tramways and light rails with reduced wear on the track.

The invention consists of a locomotive having its bogie-wheels formed with bevel-gear teeth combined with a horizontal and longitudinally-arranged shaft, also having bevel-gear wheels, which shaft is rotated by a direct connection with the engine; also, in novel means for providing for the horizontal and vertical adjustment of the connecting-shaft between the crank-shaft and the bogie-wheels, and in novel means of conveying the power of the engine to said bogie-wheels, as will be hereinafter set forth.

Figure 1 is a side elevation of the improved locomotive-engine. Fig. 2 is a plan of the bogie or truck frame, bogies, and connections. Fig. 3 is an enlarged longitudinal section of an expansion-coupling. Fig. 5 is an enlarged partly sectional elevation of a universal joint used in this device.

Similar letters of reference indicate corresponding parts.

In the drawings, A represents the frame of the locomotive supporting the water-tank A', the fuel box or crib A², and the boiler and attachments A³. Geared Steam Locomotive Works

B represents the steam-cylinder of the locomotive.

The locomotive-frame A sits upon trucks or bogies C, pivoted, as indicated at C', to the frame A.

The axles D of the bogie-wheels D' have beveled-gear wheels E secured on their ends outside of the wheels D'.

Beneath the locomotive-frame A, about the center of its length, there is journaled, in suitable boxes a a, a double-crank shaft, F', with cranks at right angles to each other, that carries on its outer end a driving bevel-cog wheel, F, which is revolved in a vertical plane by the connection of the crank-shaft F' with the loco-

motive-cylinder piston-rod B'. The motion of the bevel-wheel F is conveyed to the bogie-wheels D' by means of the lines G of shaft-connections, which at their inner ends are provided with beveled-toothed wheels I, that gear with the wheel F and at their outer ends with beveled-gear wheels M, that gear with the beveled wheels E of the bogie-axes D.

To compensate for the horizontal motion of the bogies on their pivots C' in turning curves, and also to compensate for the vertical irregularities of the track, which are very considerable on rough roads, (to which my improvement is especially adapted,) I divide the lines G of shaft-connections at suitable places, and combine with the shafts suitable couplings that permit a change of the lines G of shafts both horizontally and vertically, as the nature of the track and the curves require.

Each line of shaft-connections G consists of a round-shaft section, b, having one end journaled in the box H of a beveled pinion, I, keyed on said shaft-section b, and gearing with the bevel-wheel F, of a universal coupling-joint, K, coupling the shaft-section b with a square-shaft section, c, of a sleeve, L, connecting the shaft-section c with a square-shaft section, d, of a universal coupling-joint, k, connecting the shaft-section d with a round-shaft section, f, and of two beveled pinions, M M, keyed on the shaft-section f, and gearing with the gear-wheels E of the bogie-axes D. Said lines of shaft-connections G are suitably journaled in boxes H H² H³ H⁴, as indicated in the drawings.

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A universal coupling-joint, K, consists of two socketed yokes, g g, each having two lugs, h h, projecting laterally in opposite directions, which yokes g g are arranged with their respective lugs h h at right angles to each other, and are held in place by and between two grooved plates, i i, that are bolted together, said plates i i being cross-grooved, as shown at k, on their inner faces to receive the lugs h h, and being set over the yokes g g at right angles thereto, as shown in Fig. 5. A yoke, g, is securely fitted on the opposite and contiguous ends of the shaft-sections b c and d f, so that lines G of shaft-connections may conform themselves to the curves in the road when the locomotive is moving. These universal