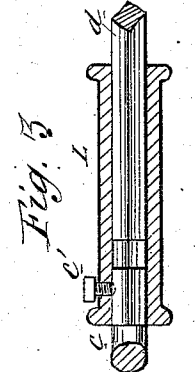
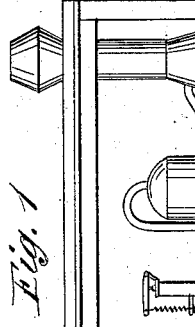
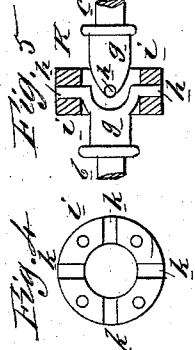
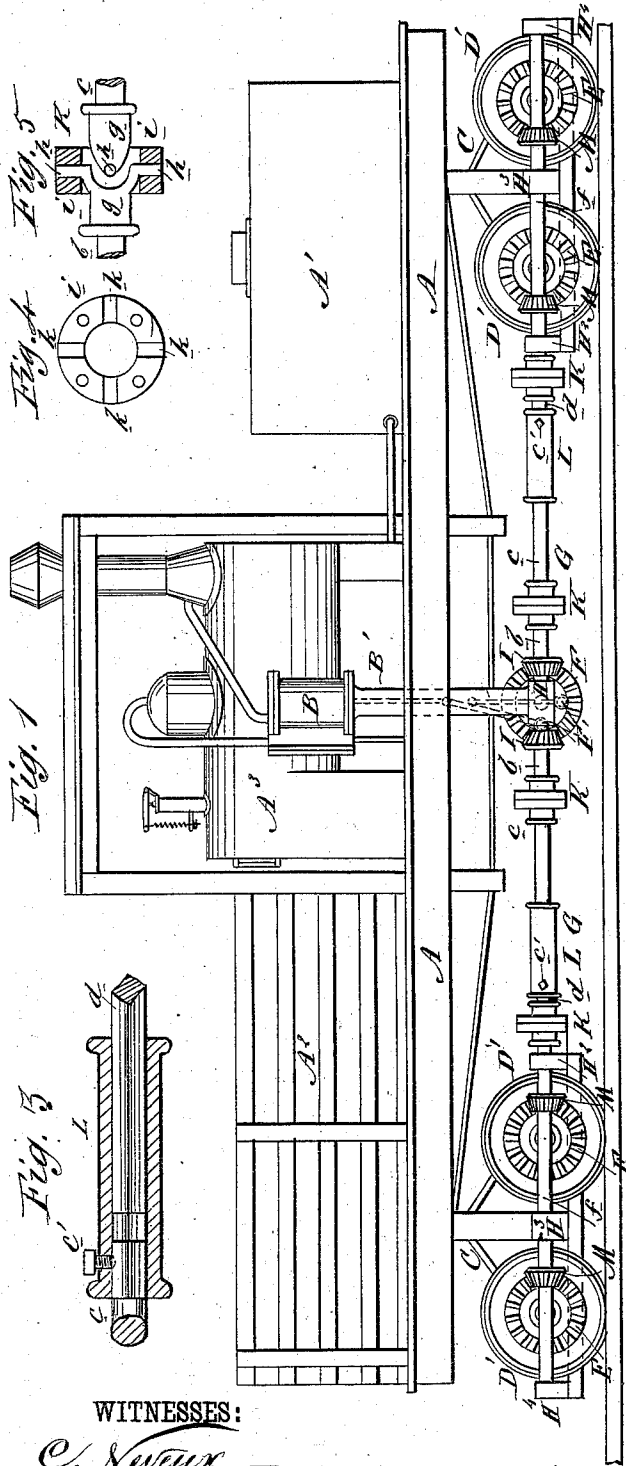


(No Model.)

E. SHAY.
Locomotive Engine.

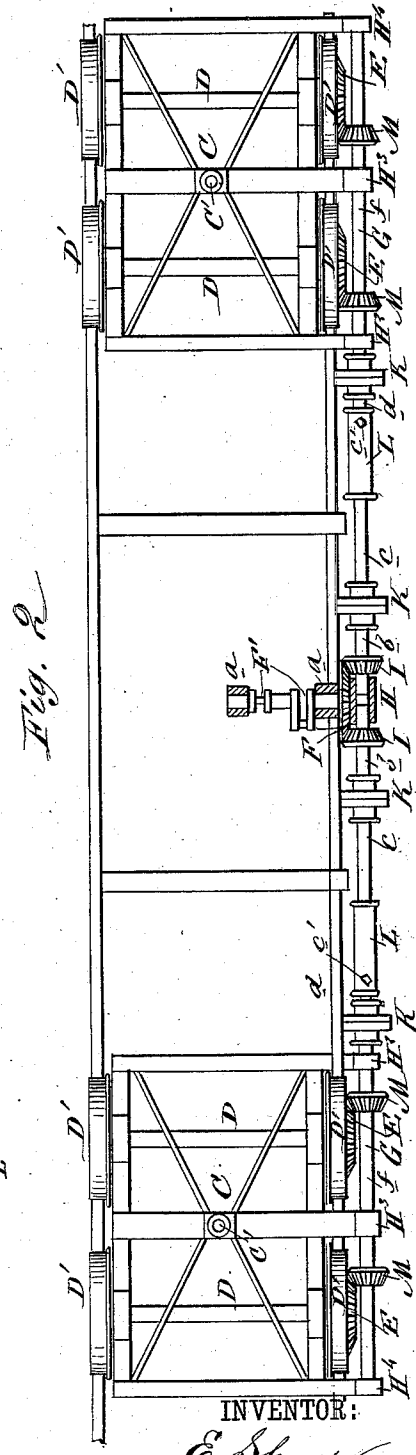
No. 242,992.

Patented June 14, 1881.



WITNESSES:

C. Newell
C. Sedgwick



INVENTOR:

E. Shay
BY *Munn & Co*
ATTORNEYS.

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.

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-axles 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-axles D. Said lines of shaft-connections G are suitably journaled in boxes H H² H³ H⁴, as indicated in the drawings.

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

coupling-joints K are of the ordinary construction, and I find them well adapted to the purpose for which they are here designed, though other styles of universal coupling-joints may be used in place of them without departing from my invention.

The sleeve L has, preferably, a central longitudinal square opening made through it, and an end of the shaft-section *c* is firmly held therein by set-screw C' or other suitable device, while the end of the shaft-section *d* plays loosely back and forth in said sleeve L, thereby giving additional flexibility to the line G of shaft-connections.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a locomotive, the combination, with the engine and the bogie-wheels having bevel-teeth on their sides, of a horizontal and longitudinal shaft having bevel-gears meshing with said teeth, the said shaft having in its length a universal joint for the purpose of taking up vertical oscillation, and having also a direct connection with the engine, as described.

2. In a locomotive, the combination, with the engine and the bogie-wheels having bevel-teeth on their sides, of a horizontal and longitudinal shaft having bevel-gears meshing with said teeth, the said shaft being connected to the engine and having in its length an

extension-joint, which secures a rigid revolution, but permits end-play for turning curves, as described.

3. As a means of transmitting power from a locomotive-engine to the locomotive-drivers, the double-crank shaft F', beveled-gear wheel F, shaft-connection lines G, and bogie-axle gear-wheels E E, arranged and operating substantially as herein shown and described.

4. In a locomotive, the combination, with the piston-rod and connection B' B² and axles D D, of the crank-shaft F', bevel-gears F F, shaft-sections *b c d f*, universal coupling-joints K, coupling-sleeves L, pinions I M, and bevel-gear wheels E E, substantially as and for the purpose described.

5. In the construction of the shaft-connection lines G, for transmitting motion from the engine to the drivers of a locomotive, the shaft-section *b*, carrying the pinion I, universal joint K, coupling-shaft sections *b c*, shaft-sections *c d*, coupled by sleeve L, the section *d* being longitudinally movable in said sleeve L, universal joint K, coupling-shaft sections *d f*, and shaft-section *f*, carrying pinions M M, arranged as herein shown and described.

EPHRAIM SHAY.

Witnesses:

JAMES R. BISHOP,

EUGENE F. SAWYER.