





# UNITED STATES PATENT OFFICE.

JOHN B. ROOT, OF NEW YORK, N. Y.

## IMPROVEMENT IN TRUNK-ENGINES.

Specification forming part of Letters Patent No. 56,993, dated August 7, 1866.

*To all whom it may concern:*

Be it known that I, JOHN B. ROOT, of the city, county, and State of New York, have invented a new and useful Improvement in Trunk-Engines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a central vertical section of a trunk-engine constructed according to my invention. Fig. 2 is a horizontal section in the plane indicated by the line *xx* in Fig. 1.

Similar letters of reference indicate corresponding parts in both figures.

In the short-stroke trunk-engines now rapidly coming into general use for driving screw-propellers, when the piston and crank are at and near half-stroke the short connecting-rod forms so great an angle with the line of the cylinder that it causes such great pressure of the piston against opposite sides of the cylinder alternately, and consequently such excessive friction between the piston and cylinder at such sides, that the bore of the cylinder is rapidly worn to an elliptic shape at the middle of its length, while at and near its ends it retains its original circular or an approximate form, and the consequence of this is that the expanding piston-packing cannot adapt itself to the varying form of the cylinder throughout the stroke, and there is much leakage and waste of steam between the piston and cylinder. At the same time that the above-mentioned great pressure of the piston against the sides of the cylinder is produced there is a great pressure of the trunk against the corresponding sides of the stuffing-boxes or their equivalents in the cylinder-heads, and consequently these also wear elliptical, and frequent renewal of the packing of the stuffing-boxes or their equivalents is required.

The object of this invention is to reduce the pressure of the piston and trunk against the sides of the cylinder and stuffing-boxes, and to counteract as far as practicable such pressure as is unavoidably produced by the diagonal positions of the connecting-rod. To this end I extend the trunk, like that of some of the trunk-engines now in use, through a stuffing-box or its equivalent in the end or head of the cylinder farthest from the crank, but to a greater distance, and provide for the so ex-

tended piston of the trunk outside or beyond that end of the cylinder a fixed guide or guides parallel with the cylinder, and I make the connection of the connecting-rod with the trunk and piston at such a point that it works within or between the said guide or guides, thereby not only obtaining a longer connecting-rod, and so reducing the angle of the said rod with the line of the cylinder at and near half-stroke and the consequent lateral pressure, but bringing the maximum of such pressure as is unavoidable upon the said guide or guides, instead of upon the sides of the cylinder, and affording greater convenience for oiling and tightening up the connection.

To enable others skilled in the art to make and use my invention, I will proceed to describe it with reference to the drawings.

A is the bed-plate of the engine, having erected upon it suitable standards or framing B, for the support of the upright cylinder C, and having arranged upon it, below the cylinder, the bearings D of the crank-shaft E. F is the piston, firmly secured to the trunk G, which works through stuffing-boxes or their equivalents H and I in the heads of the cylinder. The upper part of the trunk—that is to say, the part above the piston—is extended upward to a so much greater length than is usual that when the piston F and crank E' are at the lower end of the stroke a considerable portion of the trunk remains above the upper cylinder-head, as shown in red outline in Fig. 1. The cross head or pin J, by which the connection of the connecting-rod K is connected with the trunk and piston, is arranged as near as practicable or convenient to the upper end of the trunk. L L are the fixed parallel guides arranged above the upper cylinder-head to guide the upper part of the trunk. These guides may be bolted to the cylinder, the upper cylinder-head, or to a suitable fixed framing, and may be of circular, partly circular, or other form in their horizontal or transverse section, the upper part of the trunk, which always projects above the upper cylinder-head, being of corresponding form to fit snugly within the said guides. The said upper portion of the trunk may be fitted with suitable gibs or packing-pieces, of such construction as will suggest itself to the skilled engineer, to be set out by screws or other suitable means to compensate for wear, and so enable the



trunk to have a proper bearing against the said guides to resist the lateral pressure or thrust produced by the diagonal positions of the connecting-rod when the piston and crank are at or near half-stroke.

It will be readily understood that by the extension of the trunk in the manner described, and making the connection of the connecting-rod and the piston and trunk in the so extended portion of the trunk, a much greater than the usual length of connecting-rod in proportion to the length of crank is obtained, and that therefore the angle of the said rod relatively to the line of the cylinder when the piston is at and near half-stroke is much reduced; also that the pressure of the piston and trunk against the sides of the cylinder and of the stuffing-boxes or their equivalents is consequently much reduced, and as the greater portion of such pressure is met by the guides L L, the pressure and friction upon the sides of the piston and stuffing-boxes or equivalents

will be comparatively small, and hence the durability of the engine is greatly increased.

Instead of two separate guides, L L, a complete cylindrical guide may be used, and in such case there may be substituted for the stuffing-box in the upper cylinder-head a stuffing-box or packing-ring arranged within the said cylindrical guide and forming a steam-tight packing against the upper extended portion of the trunk.

What I claim as my invention, and desire to secure by Letters Patent, is—

The arrangement of the extended trunk G, connecting-rod K, cross-head or connection J, and guide L, in relation with each other and with the cylinder, piston, and crank-shaft, substantially as herein described, for the purpose set forth.

JOHN B. ROOT.

Witnesses:

J. W. COOMBS,  
A. LECLERC.