J. E. PRAUL.

Traction-Engine.

No. 221,354. Patented Nov. 4, 1879.

Fig. 1.

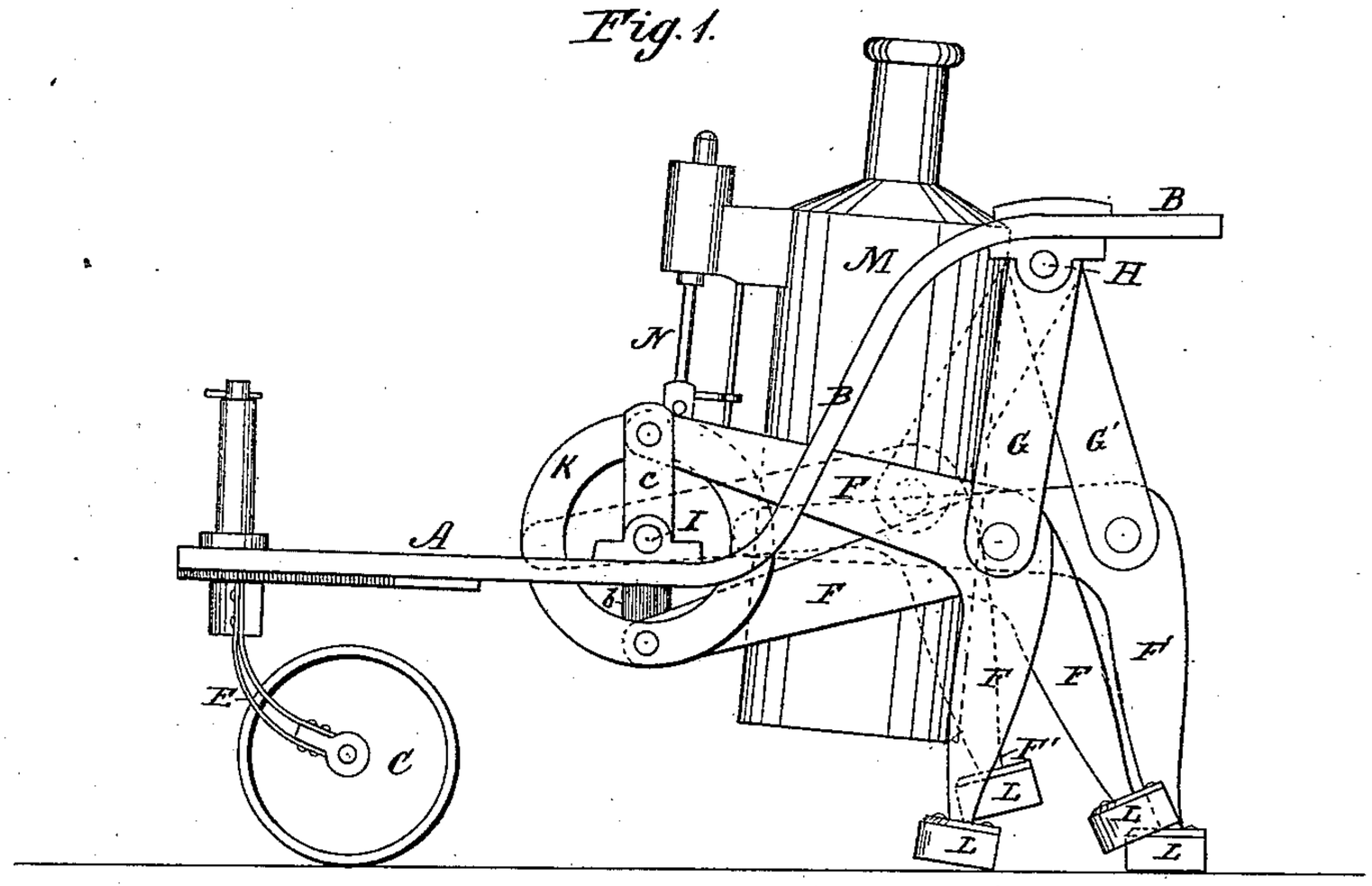


Fig. 2.

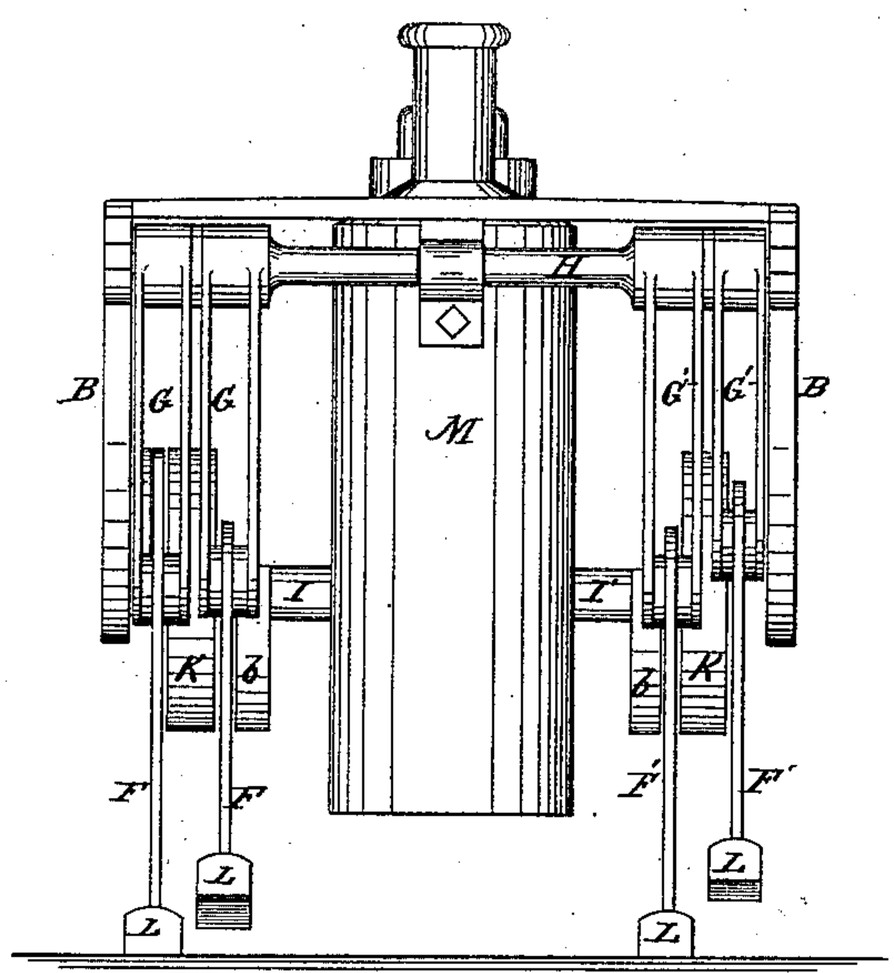


Fig. 3.

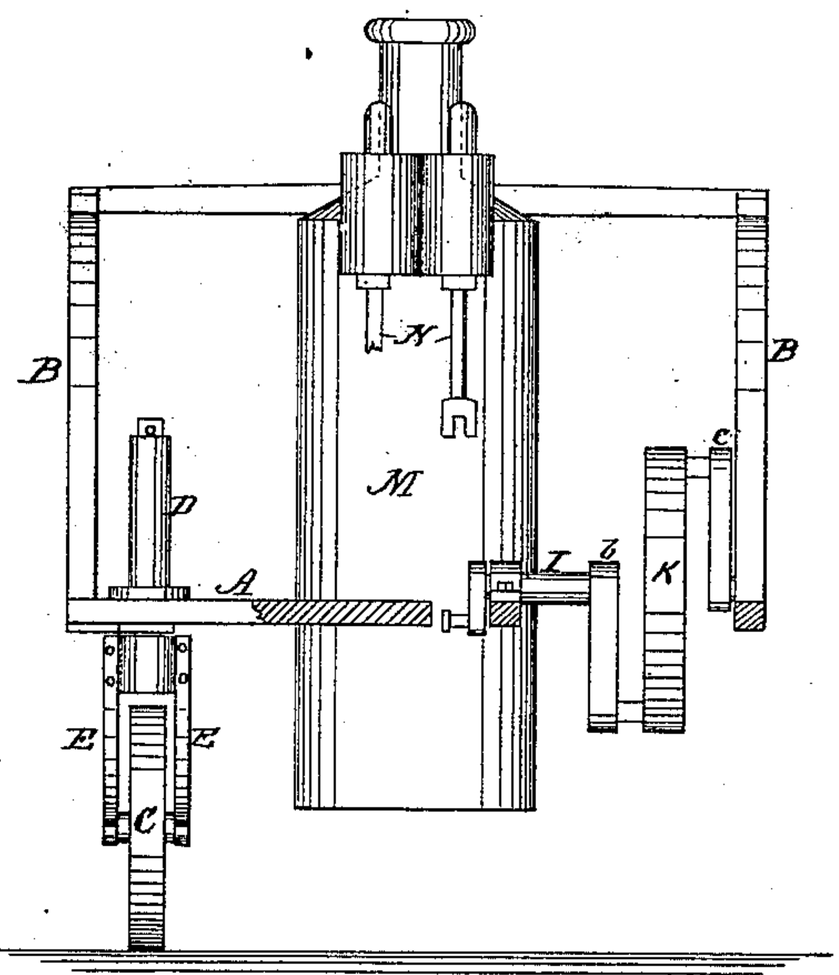
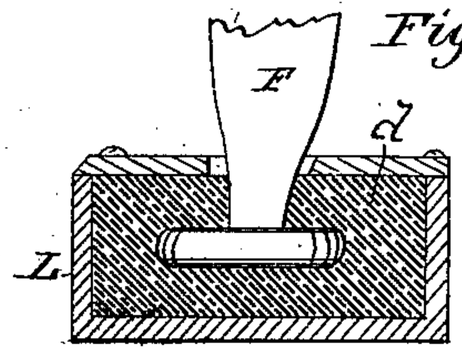


Fig. 4.



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UNITED STATES PATENT OFFICE.

JOHN E. PRAUL, (UNITED STATES NAVY,) OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR TO HIMSELF AND JOHN CASEY, OF SAME PLACE.

IMPROVEMENT IN TRACTION-ENGINES.

Specification forming part of Letters Patent No. **221,354**, dated November 4, 1879; application filed September 26, 1879.

To all whom it may concern:

Be it known that I, JOHN E. PRAUL, United States Navy, stationed at Washington, District of Columbia, have invented a new and Improved Traction-Engine; and I do hereby declare that the following is a full, clear, and exact description of the same.

The object of my invention is to furnish an improved traction-engine or steam road-carriage of that class in which propulsion is effected by vibrating push-bars, or equivalent devices.

The construction and arrangement of parts embodying my invention are as hereinafter described and claimed, reference being had to the accompanying drawings, in which—

Figure 1 is a side view, and Fig. 2 a rear view, of my improved traction-engine. Fig. 3 is in part a front view and in part a section of the same. Fig. 4 is a longitudinal section of one of the feet of the walking-legs employed.

A indicates the platform or frame of the engine, and B B side bars, which constitute upwardly-curved rear extensions thereof. The front end of the platform is supported on caster-wheels C, which are each connected with their pivots or journals, D, by means of two pairs of curved plate-springs, E. The latter have a degree of elasticity which allows the wheels C to pass over such obstructions as are ordinarily encountered on rough ground without imparting serious jar or vibration to the engine as a whole.

The rear supports of the engine are the two pairs of walking-legs or vibrating levers F F F′ F′, which also constitute the means of propulsion. These legs F F′ are of right-angular shape, and connected at their apices by links or parallel bars G G′, with a cross-shaft, H, which connects the rear ends of the side bars B of the frame A, while their forward ends are attached to the wrists of crank-shafts I. These crank-shafts are aligned, but independent, and in place of constructing each of them integral, or in one continuous angular piece, I form it in two parts, *b c*, Fig. 3, and rigidly connect them by an interposed annulus, K.

The wrists of the two parts *b c* of each shaft I are attached to the ring K at opposite points on its side, and the walking-legs F F being also attached at the same points, it will be seen that the revolution of a crank-shaft and its annulus K will impart a complex movement to the walking-legs similating the movement of the hind legs of certain species of quadrupeds, such as bovines.

The feet L of each pair of legs will be alternately lifted from the ground, carried forward and again brought down, thus describing an approximately-elliptical figure, while the legs, as a whole, will have a forward and back movement, alternately rising and falling in consequence of the links G vibrating in the arc of a circle. The pendent portion of the legs F F′ is nearly alinged with the links G G′, or has a nearly vertical position when moving backward, and the feet L move in a nearly horizontal plane, so that the rear part of the body of the engine is carried steady, or has a scarcely perceptible rising and falling movement during the time the legs are making their backward movement.

The alignment of the links G G′ and the pendent portion of the legs F F′, while the latter are moving backward, and thereby effecting propulsion of the engine, is particularly important, since it is at that time that the entire weight of at least half of the engine is thrown on the legs, and the supporting parts subjected to the greatest strain; but by the arrangement which secures such alignment I am enabled to make the legs and links comparatively small and light without danger of breaking them or their connections. As the legs F F′ move backward the feet L, then resting on the ground, constitute the fulcra of the second-class levers into which the legs are for the time converted. The legs thus push backward against the ground, and the engine is propelled forward with a speed proportionate to the rapidity of vibration of the legs.

The annuli K are made thick and heavy, so that, in addition to their primary functions as parts of the crank-shafts I I′, they serve as balance-wheels which steady and regulate the movement of the legs F F′, so that the engine has a much steadier progressive motion than would be practicable without such balance-

wheels. The annuli have far greater power of resistance to strain than would be possessed by simple straight bars connecting the cranks *b c*, since the strain is distributed around the circle.

The feet L of the walking-legs are made of an outer metal portion and an inner elastic portion, *d*. The latter is composed of caoutchouc or equivalent elastic adhesive substance, which is preferably cast or molded on and around the enlarged ends of the legs, and thus forms a cushion which breaks the jar incident to the contact of the feet with the ground.

The boiler M is shown arranged vertically, but it may be placed horizontal instead. The pistons to which connecting-rods N are attached work in cylinders, each having an independent valve mechanism, (not shown,) which enables its movement to be separately controlled, so that the engineer may increase or decrease the rapidity of vibration of one of the pairs of propelling legs, as compared with the other pair, and thus guide the engine to the right or left, or cause it to travel in a circle, as desired.

What I claim is—

1. The combined balance-wheel and annular crank-connecting device K, in combination with the parts *b c* of the divided crank-shaft I and the walking-legs which are attached to the ring K on opposite sides of its center, all as shown and described.

2. In a traction or road-engine, the combination of the right-angular vibrating or walking legs, the links pivoted at one end to the angles of the legs, and at the other end to the frame of the engine at points above said legs, and a crank-shaft, all arranged as shown and described, whereby the pendent portions of the legs are aligned with the links during the backward movement, as specified.

3. In a traction or road engine, the combination, with the walking-legs or pushers, of feet which are composed of an outer rigid portion or shell and an inner elastic portion which incloses the enlarged ends of the legs, substantially as shown and described.

The above specification of my invention signed by me this 18th day of September, 1879.

JOHN E. PRAUL.

Witnesses:

SOLON C. KEMON,

AMOS W. HART.