A. F. Smith,

Locomotive.

No. 42,233. Patented Apr. 5, 1864.

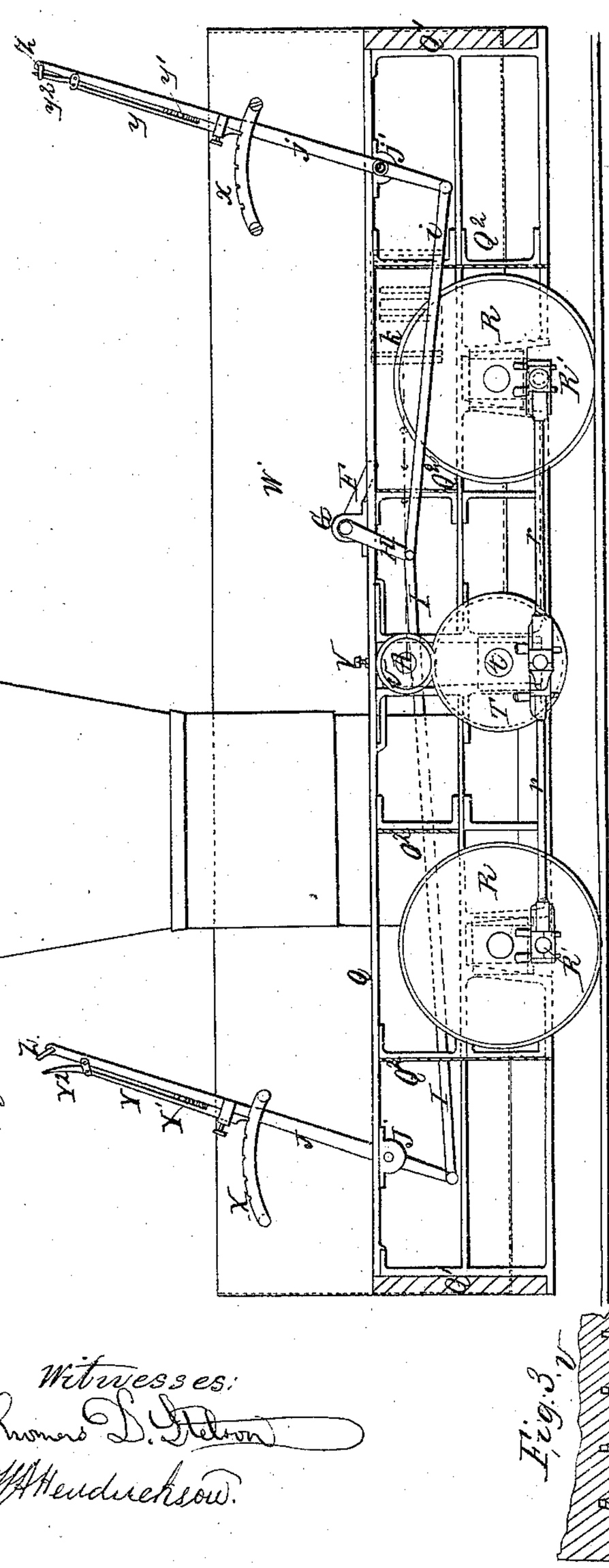

Fig. 1.

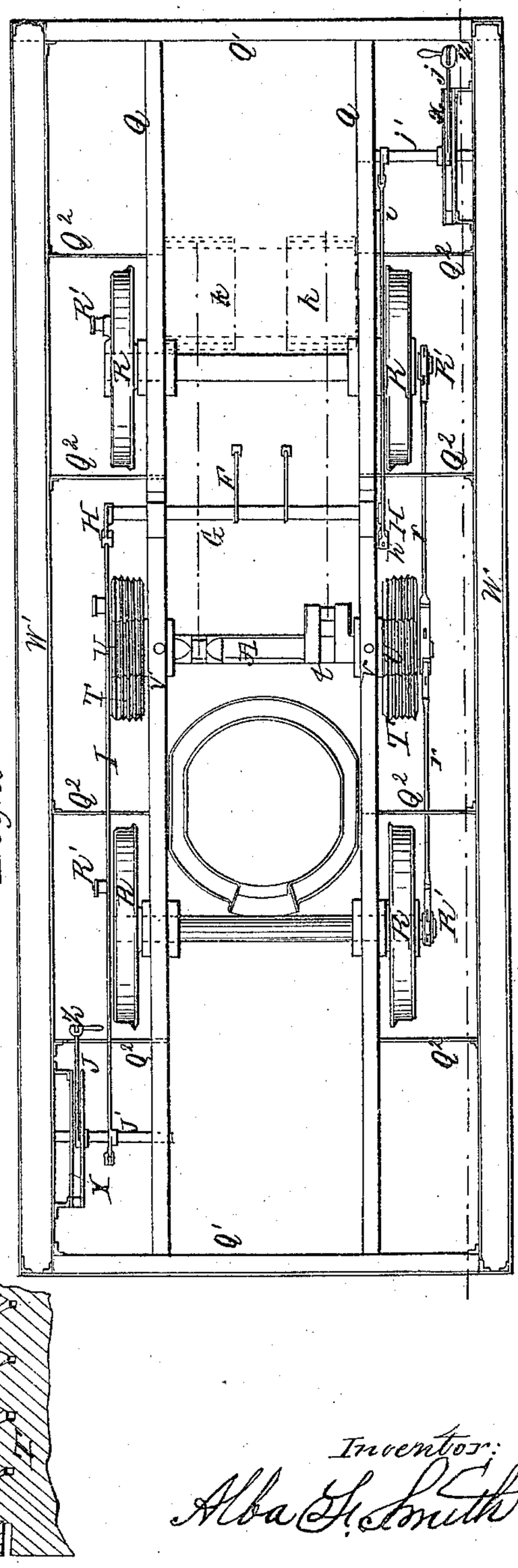

Fig. 2.

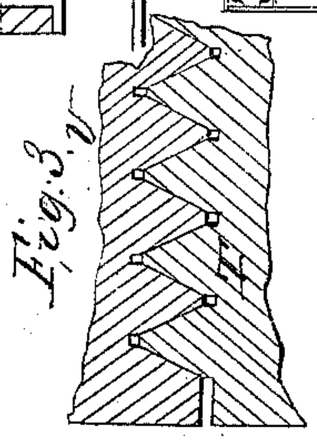

Fig. 3.

Witnesses:

Thomas D. Nelson

W. A. Hendrickson.

Inventor:

Alba F. Smith

UNITED STATES PATENT OFFICE.

ALBA F. SMITH, OF NORWICH, CONNECTICUT.

IMPROVEMENT IN LOCOMOTIVE STEAM-ENGINES.

Specification forming part of Letters Patent No. **12,233**, dated April 5, 1864.

To all whom it may concern:

Be it known that I, ALBA F. SMITH, of Norwich, in the county of New London, in the State of Connecticut, have invented certain new and useful Improvements in Locomotive Steam-Engines, intended mainly for those which are adapted by reason of their silence and of their other qualities to operate in the streets of cities, and which are known as "dummy-locomotives;" and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, forming a part of this specification.

These drawings represent the features claimed as novel introduced properly in a dummy, with only so much of the other features as seems to be required in order to properly explain the relations of the several parts.

Figure 1 is a longitudinal vertical section through the entire structure on the line S S in Fig. 2. Fig. 2 is a plan view of the same, and Fig. 3 is a section of a portion of the mechanism on a larger scale.

Similar letters of reference indicate like parts in all the drawings.

The tints are employed merely to aid in distinguishing parts, and do not indicate the kind of material employed, which may be all iron or steel.

To enable others skilled in the art to make and use my invention, I will proceed to describe it by the aid of the drawings, and of the letters of reference marked thereon.

Q Q are side frames provided with jaws, which inclose boxes supporting the axles of the driving-wheels R in the ordinary manner. Connections *r r* lead from stout pins R′ on the exteriors of R to a pair of large wheels, T, mounted on opposite ends of the shaft *t* in the positions represented, so that by the revolution of the wheels T all the wheels R may be powerfully rotated in the obvious manner. The surface of each wheel T is turned or otherwise formed in grooves, as represented, as is also the surface of each of a pair of smaller wheels, U, which are rigidly keyed on the main driving-shaft A, mounted in boxes carried in the framing Q Q. The surfaces of these wheels U U and T T are pressed together with any degree of force desired by the screws V. These screws are tapped through the framing Q Q, and transmit pressure through plates of metal and sheets of rubber, or the like elastic medium, (not represented,) to the boxes in which the shaft A is supported.

Locomotives usually contain, as a part of themselves, two cylinders, two pistons, two valves, &c. I will, for convenience, designate the two cylinders, with their accompanying parts, as two "engines." Two such engines are mounted in the positions indicated by the slight outlines done in red, (marked *k k*.) The working parts of these engines *k k* are of ordinary character, except that all are smaller and lighter and are adapted for quicker action than the corresponding parts, which may with equal propriety be termed the "engines" of ordinary locomotives of equal power. The valves are operated from eccentrics (not represented) on the shaft A, and what is commonly known as the "link-motion," or "Stevenson link-motion," is employed to communicate the right movements to the valve of each engine. These well-known parts are constructed and arranged in the manner which is obvious, and are omitted from the drawings to avoid confusion. Two water-tanks, W W′, formed of sheet metal of sufficient thickness, are mounted in the positions represented, and are rigidly connected to the framing Q Q and to each other by the stout cross-frames Q′ and the braces Q^2. These tanks are narrow, but have much depth and extend the entire length of the structure, so that the quantity of water they contain is sufficient for all the purposes of supplying both boiler and condenser. The two tanks are connected to each other by pipes (not represented) above and below the water-line, so that the level of the water and the pressure of any steam or air therein is always equal, or very nearly so, in the two. These tanks stiffen the structure, and in case that a carriage or any other mass impinges against the structure, one of the tanks is simply indented, or, at worst, ruptured, and the evil is readily repaired.

The Stevenson links (not represented) perform only their usual functions of reversing the motion of the engines and of varying the point of "cut-off" according as they are raised and lowered; but the raising and lowering

of these links and the locking and unlocking of the parts are effected by the engineer while standing at either end of the structure, and the means for doing this are peculiar and are represented in full.

J is a hand-lever pivoted to the framing at J′, and playing between two fixed segments, or "quadrants," X, provided with rectangular notches. A catch or locking-bolt, Y, is carried on the side of this lever J, adapted to hold in the rectangular notches in X. A spring, Y′, forces the catch Y into these notches and holds it there, so as to retain the lever J in any position in which it may be left.

Y^2 is a handle or sub-lever pivoted to both J and Y, and adapted to allow the lever J to be moved at will whenever the hand of the engineer grasps the parts properly and holds the sub-lever Y^2 closely in contact with the lever J, so as to lift and hold Y out of the notches. Z is a ring or clip pivoted on the upper end of J and adapted to confine Y^2 in contact with J or to release it, according as it is turned down or turned up.

I is a connection from the lower end of the hand-lever J to an arm, H, on a transverse shaft, G. This shaft G may thereby be partially rotated, according as the lever J is turned. Arms F on the shaft G support the Stevenson links by the aid of connections depending from F in the usual manner.

With the exception of the slight clip, ring, or link Z, the construction and the arrangement of the hand-lever J, and of all the parts connected thereto, are substantially the same as in those locomotives of the usual character in which the Stevenson link is employed.

I mount at the opposite end, and by preference on the opposite side of the dummy, a hand-lever, *j*, precisely similar in every respect to the lever J, already described. It is connected by a rod, *i*, to an arm, *h*, on the shaft G, so as to control the position of the latter in the same manner and to the same extent as the lever J, and is similarly hung on a center, *j′*, and similarly provided with notched quadrants *x*, locking bolt *y*, spring *y′*, handle y^2, and a clip, *z*. Now, by forcing down the clip Z properly upon the handle Y^2, so as to hold up the locking-bolt or catch Y, the engines *k k* may be controlled by the engineer through the medium of the lever *j* and its connections, while the lever J and its connections will swing idly. On the other hand, by forcing down the clip *z* upon the handle y^2, so as to hold the locking-bolt or catch *y* out of its notches, the engineer puts *j* and its attachments out of use, after which he walks to the other end of the dummy, and lifts Z, and thenceforward commences to start and stop or to regulate and control the engines *k k* by means of the lever J, while *j*, in its turn, sweeps idly around between its quadrants *x*. My invention therefore allows my locomotive to be operated through either J or *j*, as may be most convenient. The throttle-valve, being usually held in place by friction alone, requires nothing more than a simple connection of levers at each end.

Some of the advantages due to certain features of my invention may be separately enumerated as follows:

First. By reason of my employment of the friction wheels U T in a locomotive, connected properly to the other parts, I am able with large driving-wheels to reduce the progressive motion of my machine relatively to the rotative velocity of the working parts, and thus to exert the proper force for the work required with much smaller cylinders and pistons than with the ordinary arrangement, and consequently with a smaller loss of steam in heating up the same and allowing the same to cool at short intervals. If large cylinders, or, in other words, large engines, working slowly, were employed to act directly upon the wheels R, which support the load, the same or nearly the same effect would, after the parts had become properly heated, be produced by the same quantity of steam, but the same effect could not be produced when steam is first let on. In the use of a locomotive in moving cars through the streets of a city the distances traveled are short, and the performance of the machine consists in a great number of short efforts with intervals of rest. In these intervals of rest the cylinders and pistons become partially or entirely cold, and they must be again heated on the admission of steam in commencing each effort. In the use of large cylinders much time and much heat are lost in thus preparing for each effort; but my small cylinders *k k* economize both these elements. Small cylinders connected to driving wheels by toothed gearing have been at various times experimented on or described by others; but in such the teeth are liable to strip, and the entire working mechanism consequently to fail at the most important crises—to wit, when the engines are suddenly reversed at full speed to avoid a collision with persons or carriages on the street. The Hudson River Railroad has several miles of double track lying in the city of New York. Three dummy-engines, constructed in all respects in accordance with this specification, have been in successful use for several months on this part of the line, moving cars on the portions of such track which are most encumbered by the ordinary travel of streets. I am superintendent of the road, and I ascribe much of the success of these dummies to the rapidity with which they can be started even when cold, the great tractive force with which they operate, and to the freedom from danger of fracture with which they can be stopped and reversed in consequence of this feature of my invention. All previously-known means of using small quick-working engines in such machines, and consequently of realizing any

of these advantages, were liable to such objections as to be almost or absolutely impracticable.

Second. By reason of my mounting and supporting the bearings of both the shafts A and *t* in one set of pedestals, which pedestals serve to guide and strongly connect the boxes of both shafts, I am able to adjust the relations of both to the other parts at a single operation to urge them together with great force without involving any sensible tendency to spring or strain the framing, and also to allow for wear of the brasses, and a consequent distortion or change of position of the boxes of each or both bearing to an almost unlimited extent.

Third. By reason of my arrangement of the clips Z *z* on two handles or starting-levers, J and *j*, one lever, J, adapted to be used when the engine is running in one direction, and the other, *j*, to be used when the engine is running or is about to run in the opposite direction, both of these levers J and *j* being connected to the same operating mechanism, G F, and to the links thereon depending, and each adapted to be either locked in the positions desired or to be allowed to swing freely, according as it is or is not for the time being the lever by which the operation is controlled, I am able to conveniently attend to the working of the engine in either direction with the highest degree of ease and certainty, and to adjust the parts therefor without delay and without expensive or cumbrous mechanism for the purpose.

Fourth. By reason of the fact that my deep tanks W W′ are extended longitudinally of the structure, in the manner represented, and are rigidly connected to the framing Q Q by the parts Q′ Q′ Q² Q², &c., I make the metal of such tanks contribute to support and stiffen the entire frame-work, and thus to increase materially the strength and durability of the machine.

Fifth. By reason of the fact that these tanks W W′ are outside of the working parts and of the entire running-gear, I make the metal composing the tanks, and also the pipes or other contained parts, and even the water therein, serve as a defense against the injurious effects of possible collisions with animals, and with carriages, &c., so as to reduce the injury accruing to both my machine and the impinging mass; and by reason of the entire arrangement, connection, and disposition of these tanks, when employed as a condenser or in connection with means for circulating water therefrom through a condenser, I secure a large amount of radiating-surface favorably exposed to the wind for cooling the water, without the expense and complication due to the ordinary arrangements, and contribute to the evenness of the load upon the several wheels and to the general efficiency of my machine.

Having now fully described my invention, what I claim as new therein, and desire to secure by Letters Patent, is as follows:

1. In locomotives, transmitting motion from the crank-shaft A to the bearing-wheels R through the medium of friction-wheels U T, so arranged as to be both out of contact with the rails, as herein set forth.

2. In connection with the above, mounting the bearings of the driving-axle A in the same pedestals with the bearings of the driven axle *t*, substantially as and for the purposes herein set forth.

3. The employment in locomotives of a slight clip or catch, Z, arranged relatively to separate hand-levers J *j*, or their equivalents, connected each to the same starting and controlling mechanism, substantially in the manner and for the purpose herein set forth.

4. In locomotives, so constructing and arranging the tanks W W′ that they are of little width but greatly extended in longitudinal and vertical dimensions, and are rigidly framed together and to the framing Q Q, or its equivalent, substantially as and for the purposes herein set forth.

5. In locomotives, so constructing and arranging the said tanks W W′ that they are of little width but greatly extended in longitudinal and vertical dimensions, and are mounted outside of the working-gear, substantially as and for the purposes herein set forth.

ALBA F. SMITH.

Witnesses:

THOMAS D. STETSON,

W. A. HENDRICKSON.