2 Sheets—Sheet 1.

H. H. BRIDENTHAL, Jr.

Road-Engine.

No. 212,889. **Patented Mar. 4, 1879.**

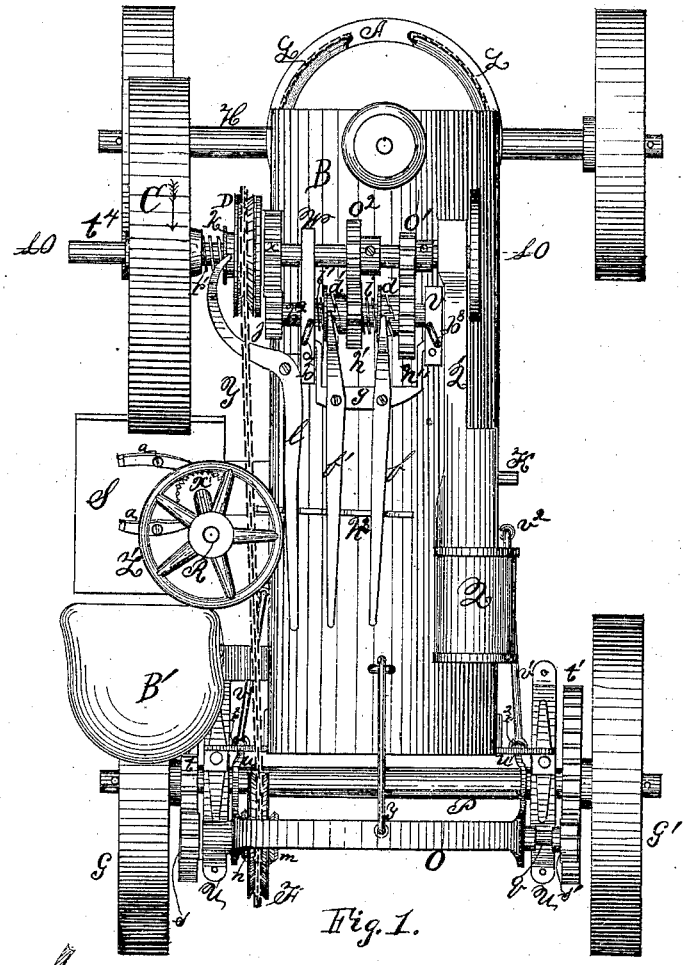

Fig. 1.

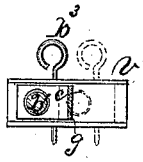

Fig. 6.

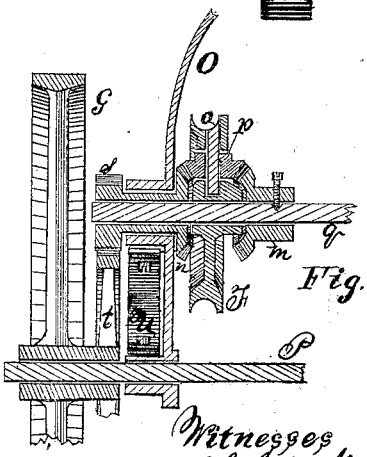

Fig. 2.

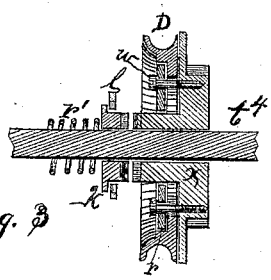

Fig. 3.

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2 Sheets—Sheet 2.

H. H. BRIDENTHAL, Jr.

Road-Engine.

No. 212,889. Patented Mar. 4, 1879.

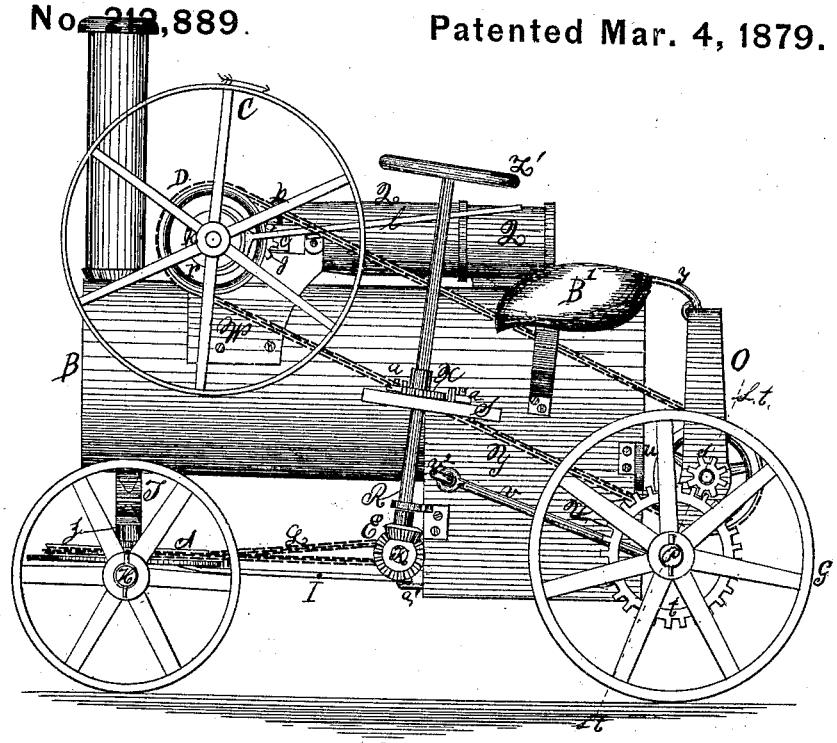

Fig. 4

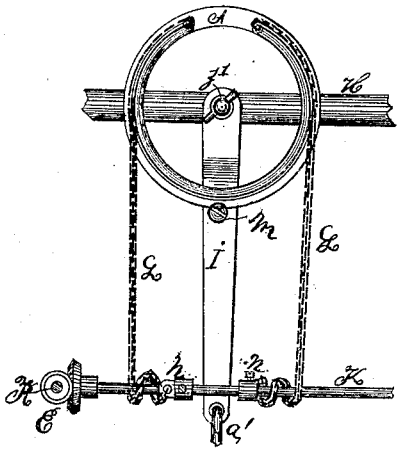

Fig. 5.

Witnesses,
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Wm. H. Bridenthal

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UNITED STATES PATENT OFFICE.

HARRY H. BRIDENTHAL, JR., OF LATROBE, PENNSYLVANIA.

IMPROVEMENT IN ROAD-ENGINES.

Specification forming part of Letters Patent No. **212,889**, dated March 4, 1879; application filed November 1, 1877.

To all whom it may concern:

Be it known that I, HARRY H. BRIDENTHAL, Jr., of Latrobe, in the county of Westmoreland and State of Pennsylvania, have invented a new and useful Improvement in Motor and Traction Engines, of which the following is a specification:

The invention relates to an engine adapted to be used where portable power is required, the object being to improve the design and construction of portable engines, adapting them to be used for traction purposes.

The invention consists in an arrangement of the axles and their connections with the framing and boiler, in the arrangement of the gearing connecting the engine and the driving ground-wheels, and in an improved clutch and speed-gear mechanism for regulating the relative speeds of the engine and driving ground-wheels.

Figure 1 is a top view of my improved machine. Fig. 2 is a vertical section of the equational gear upon the line S *t* S *t*, Fig. 4. Fig. 3 is a vertical section of the friction-clutch upon the line L O L O of Fig. 1. Fig. 4 is a side elevation of the machine. Fig. 5 is a detached top view of the steering-gear, and Fig. 6 is a side view of the speed-gear counter-shaft bearings.

Similar letters and figures of reference where they occur refer to like parts of the machine in all the drawings.

The rear end of the boiler B is supported upon the rear axle, P, by means of a pair of brackets or arms, *u u'*, firmly bolted to said boiler, while their opposite ends rest upon and are bolted to the springs U U, which are, in turn, fastened to and rest upon the axle P.

O is a stout curved bar, firmly attached to the rear axle, P, near the ends, thus forming a frame, which supports the ground-wheel driving-gear.

The frame O is connected with the boiler B by the rods *v v'* and *y*, which are provided with suitable joint-connections on the said frame and boiler, so as to allow the boiler to swing freely vertically upon the springs U U.

Beneath the forward end of the boiler B is firmly bolted a spring-saddle, to which is attached the spring T, which, in turn, rests upon a spring-saddle having a ball-socket bearing formed therein, which rests upon the ball-pivot *z'* at the center of the forward axle, H, as shown in Figs. 4 and 5.

By this construction the boiler and engine rest upon spring-bearings at both ends, thus enabling the machine to ride easily on rough roads.

The large circle-plate A is firmly bolted to the axle H, and is provided with a flange upon its upper inner edge, so as to form a groove, in which play the steering-chains L L, which are connected with said circle-plate near the forward side, as shown in Fig. 5.

In the forward end of a bar, I, is formed an eye, which fits loose over the base of the pivot-stud *z'*, and is held down upon the axle H by a pin passing through said stud, and in such a manner as to allow the bar to swing freely about the axis of said stud. The rear end of the bar I is connected with the boiler by a hook firmly attached thereto, and working in an eye in said bar. A suitable stud, M, holds the rear edge of the circle-plate A down upon the bar I in such a manner as to allow the axle H to swing freely, while it is prevented from rolling in the socket-bearing *z'*.

The shaft K is attached to the boiler by means of suitable bearings bolted thereto, and is connected with the vertical shaft R by means of the bevel-gear E. The shaft R is provided with suitable bearings at its lower end and in the foot-board S, where it is also provided with a ratchet-wheel, X', keyed thereto, and the pawls *a a*, while on the upper end is keyed the large hand-wheel Z', and within convenient reach of a person seated upon the seat B'.

The rear ends of the chains L L are coiled in opposite directions about the shaft K, and secured thereto by means of the adjustable lug-sleeves N N, which are secured in place by means of set-screws, so as to adjust the chains and keep them stretched tight.

By this construction the attendant seated upon the seat B' can easily steer the machine at will, and can operate the pawls *a a* with his feet, thus assisting his hands in managing the steering-wheel on rough or on straight roads.

On the ends of the rear axle, P, are formed ordinary spindles, upon which are hung the driving ground-wheels G and G', the hubs of

which are extended inward a short distance. To the inward extension of the said hubs are firmly connected the hubs of the large gear-wheels t t^1.

The wheels t could be connected directly to the arms of the ground-wheels G; but I prefer making the connection at the hub, as by this construction the gear-wheels can be boxed closely, which is very necessary for obvious reasons.

Motion is communicated to the driving ground-wheels G G′ by means of the chain-belt Y, pinions s s', and the equational gear F p on the shaft q, which is hung in bearings in the frame O.

The equational gear consists of the equal-sized bevel-wheels m and n and the pulley F, all rotating about the same axis and upon the shaft q.

The bevel-wheel m is fast upon the shaft q, while the pulley F and bevel-wheel n run loose.

The pulley F carries the idle or intermediate bevel-pinion p, which is hung loose upon the radial pin o in said pulley F, and which meshes in common with both the bevel-wheels m and n.

As before mentioned, the bevel-wheel m is fast upon the shaft q, while the opposite wheel, n, is rigidly connected with the inner end of a short sleeve, which extends through and has bearings in the frame O, while on the outer end of the said short sleeve is hung the pinion s, meshing with the wheel t on the ground-wheel G, while the wheel m is, through the shaft q and the pinion s', connected with the opposite ground drive-wheel, t^1. The shaft q being permitted to turn freely within the sleeve of the pinion and wheels n s and pulley F, it is obvious that, motion being applied to the pulley F, the force or power will be distributed equally between the ground-wheels G and G′ by the intermediate pinion, p, acting on the principle of a scale-beam, between the bevel-wheels m and n, and that when the machine is passing around curves, as in turning, as one ground-wheel must travel farther and faster than the opposite, the pinion p, turning on its axis-pin, allows the wheels m and n to rotate relatively, thus keeping the ground-wheels always tight in gear.

The design and construction of the engine proper and its connections does not differ materially from that of the ordinary well-known portable engine; hence it needs no description here.

On the main shaft of the engine is secured a series of speed gear-wheels, O^1 O^2, which mesh with a similar series of wheels, N′ N″, but reverse in order of size, hung loose upon the counter-shaft b^1, revolving in suitable adjustable bearings connected with the pillow-blocks of the main shaft or otherwise, as may be desired, and parallel with the main shaft t^4.

The wheels N′ and N″ are made fast with their shaft by means of their respective clutches d and d', which are, with the hub or clutch-faces of their respective wheels, provided with teeth, arranged to engage only in one direction.

The clutches d d' are provided with a single flange, which engages a stud on the upper and lower branches of the forked shipper-levers f f', pivoted to the frame g. The said levers $f f'$ thus serve only to disengage the said clutches and hold them out of gear when necessary, while the coil-springs i and i' serve to ship and hold them in gear.

On the main shaft of the engine is hung loose the gear-wheel X, which, with the pinion or gear-wheel j, secured on the end of the counter-shaft d', forms a third or the end step uniform with the speed-gears O^1 d O^2 d', and it is provided with a clutch, k, coil-spring r', and the shipper-lever l, all similar and also uniform with the said speed-gears O^1 d f, except that the shipper-lever l is pivoted directly to the pillow-block W. The gear-wheel X is provided with a projecting flange, to which is secured the chain-pulley D by means of a plate or disk, r, and the bolts w, the pulley D being provided with suitable flanges for the purpose. When excessive resistance is encountered by the ground-wheels or their connections, the pulley D will slip on the wheel X, thus forming a friction-clutch. The plate r, being of proper thickness, forms a spring. In consequence of the necessarily high speed of the engine, and the irregular resistance and motion of the ground-wheels, the friction-clutch serves a useful purpose in preventing breakage, especially on steep and uneven roads.

A rack-bar, N^3, is firmly secured to the top of the boiler and beneath the shipper-levers f f' l, which serves to hold said levers in position.

A greater or a less number of speed-gears may be used, as may be desired, so as to allow the engine and drive-wheels G G to run at any number of relatively different speeds. Four speeds arranged so as to allow the machine to travel at, say, one, two, four, and six miles per hour, with the engine running at a uniform rate, would probably be the best arrangement.

The operator, being seated upon the seat B′, can change the speed relatively between the ground-wheels and engine by the levers f l while the machine is in operation. When it is desired to run the machine at a high rate of speed, the clutch K is connected, thus driving the pulley D directly, when the clutches d d' may or may not be disconnected, as the counter-shaft b^1 will be rotated faster than the wheels N′ and N″; hence they cannot connect, but will slip past. The arrangement of the single flanges allows the teeth to pass without vibrating the levers $f f'$, as would be the case if said levers were geared tight with the clutch. When it is desired to slow the motion of the machine while in operation it is necessary to release the clutch of the speed-gear it is desired to use, when the coil-spring will bring the clutch-faces together, and the operating-

clutch may then be disconnected, when the previously-arranged gear will instantly engage without any serious jar.

When the machine is about to ascend a steep grade, or where extra drawing-power is required, the operator may, in the manner described, connect a slower-speed gear, and allow the engine to run faster and the ground-wheels slower, and thus augment the drawing-force of the machine. When the machine is traveling on level roads, or without load, the engine may be made to run as slow as will generate sufficient power for propulsion. Thus fuel and water may be greatly economized.

The counter-shaft b^1 is hung in sliding bearings *c*, rigidly connected with opposite ends of the bar or frame *g*, and are, by means of sliding connections, secured, respectively, to the pillow-block W and the engine-frame Q′, in a manner so that the said counter-shaft may be drawn back a distance sufficient to carry the speed-gears X *j* and O^2 N′ entirely out of mesh. The pins b^2 and b^3 pass through the slides and through the bearing-blocks *c*, thus holding said bearing-blocks in position.

By this construction, when the engine is used as a motor in driving other machinery, the counter-shaft b^1 may be drawn back, carrying the speed-gears out of mesh, as described, so that they cannot in any way interfere with the working of the engine.

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

1. The combination of the vertical gear-frame O, axle P, springs U, arms *u w′*, rods *v*, *v′*, and *y*, and boiler B, substantially as and for the purposes herein specified.

2. The combination of the vertical carrying and gear frame O, axle P, and counter-shaft *q*, with the gears *p n m* mounted thereon, pinions *s s′*, and the ground-wheels and gears G *t* and G′ t^1, substantially in the manner and for the purposes herein specified.

3. The combination, in the main-gear train of a steam road-engine, of two or more pairs of speed-gears, each provided with a spring ratchet-clutch adapted and arranged to engage in one direction only, and a shipping-lever for controlling said clutches, whereby the relative speeds of the engine and ground wheels may be changed at will while the machine is in motion, substantially in the manner and for the purposes herein specified.

4. The combination of the sliding bearing *g*, frame *c*, speed-gear counter-shaft b^1, mounted thereon, pillow-block W, frame and guides Q′ V, and the pins b^3, these members being all arranged substantially in the manner and for the purposes herein specified.

H. H. BRIDENTHAL, JR.

Witnesses:

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WM. MCKEE GALLAGHER.