(No Model.)

3 Sheets—Sheet 1.

# W. O. WORTH.

## TRACTION ENGINE.

No. 581,951. Patented May 4, 1897.

Fig. 1

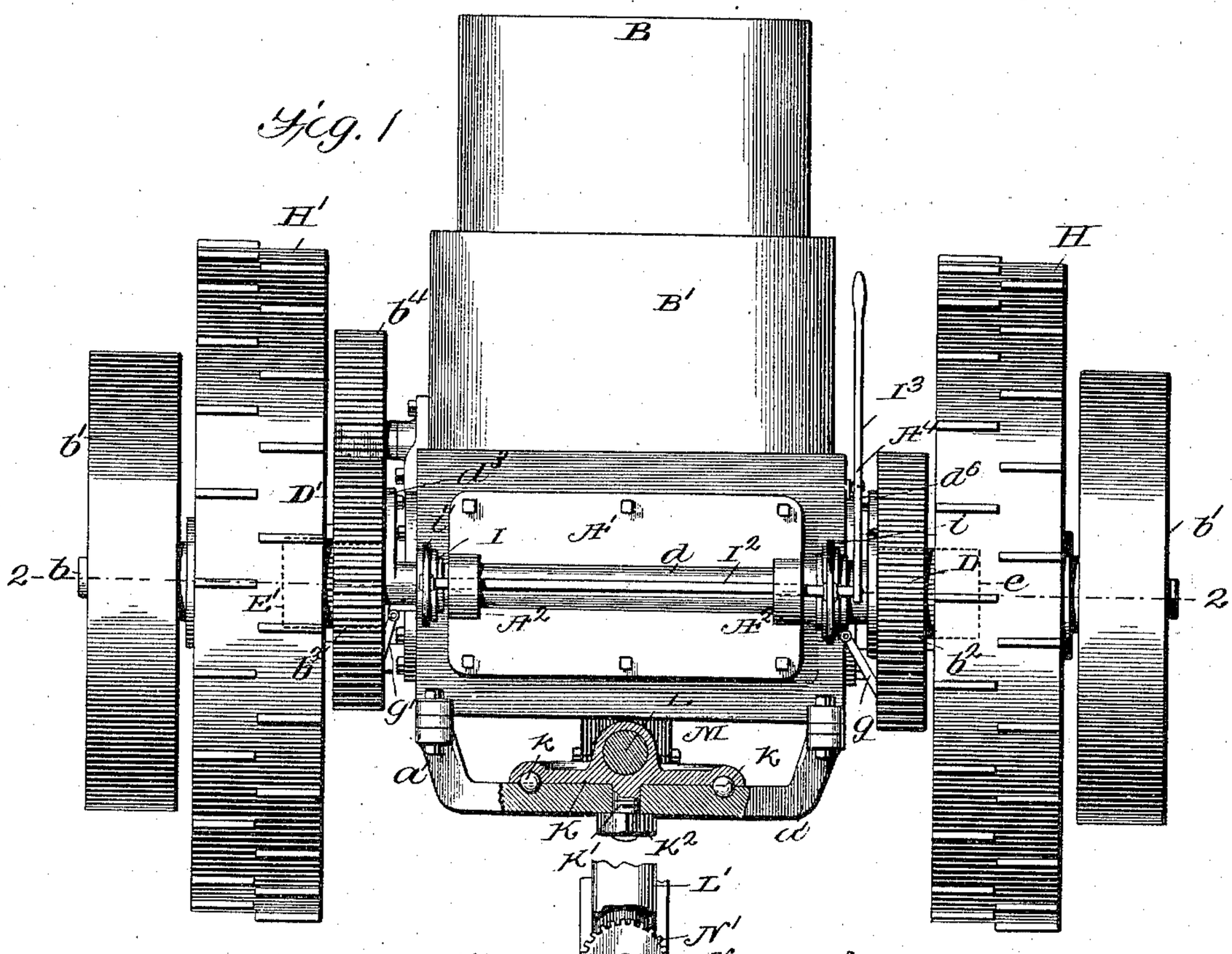


Fig. 2.

WITNESSES

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(No Model.)

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Fig. 3.

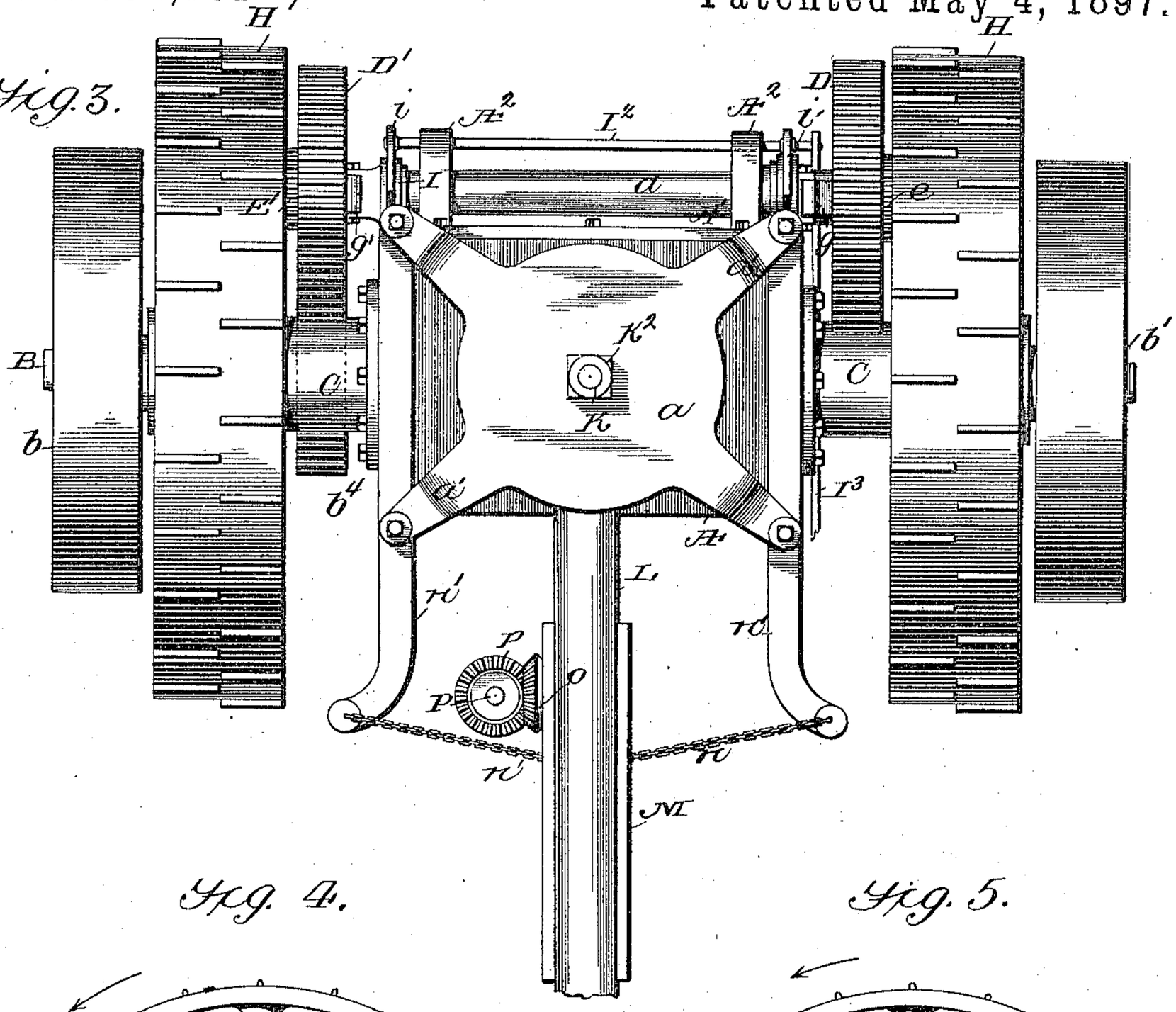
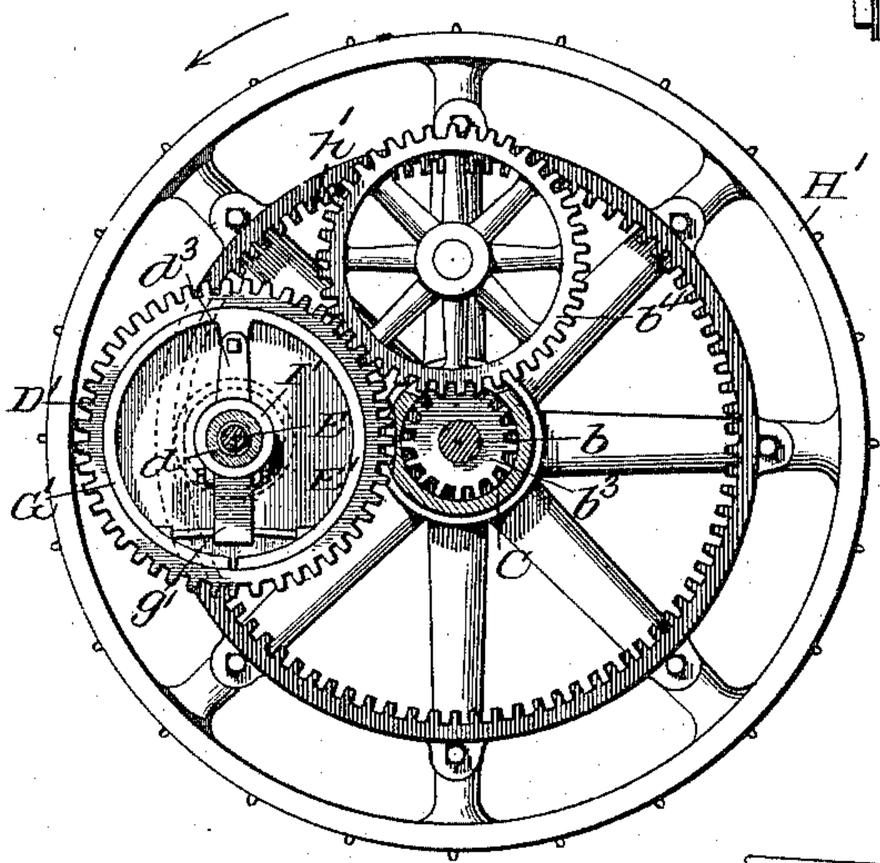
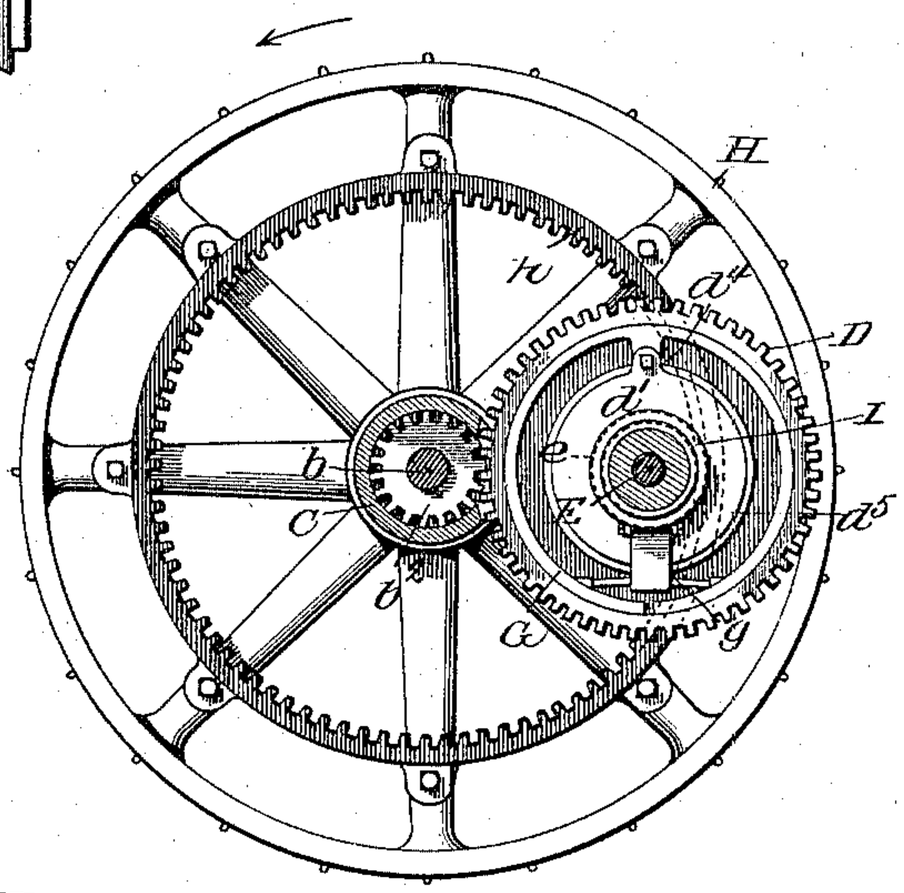



Fig. 4.

Fig. 5.



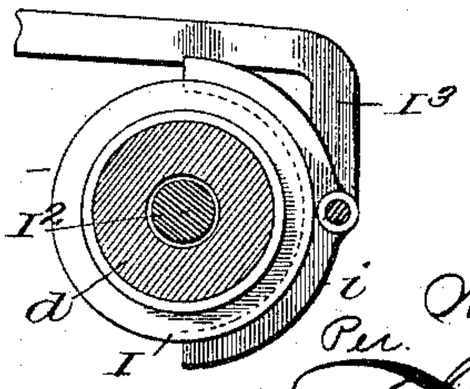




Fig. 9.

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# W. O. WORTH.

## TRACTION ENGINE.

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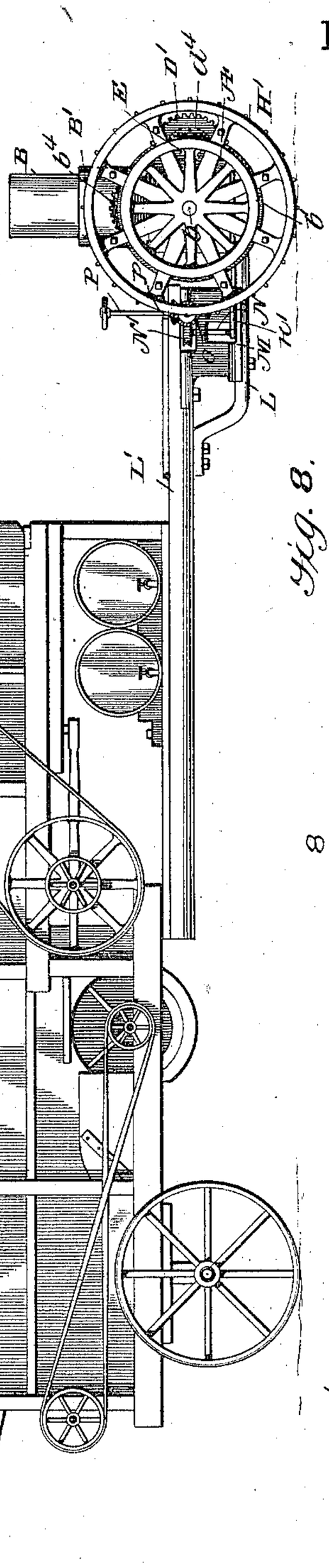

Fig. 6.

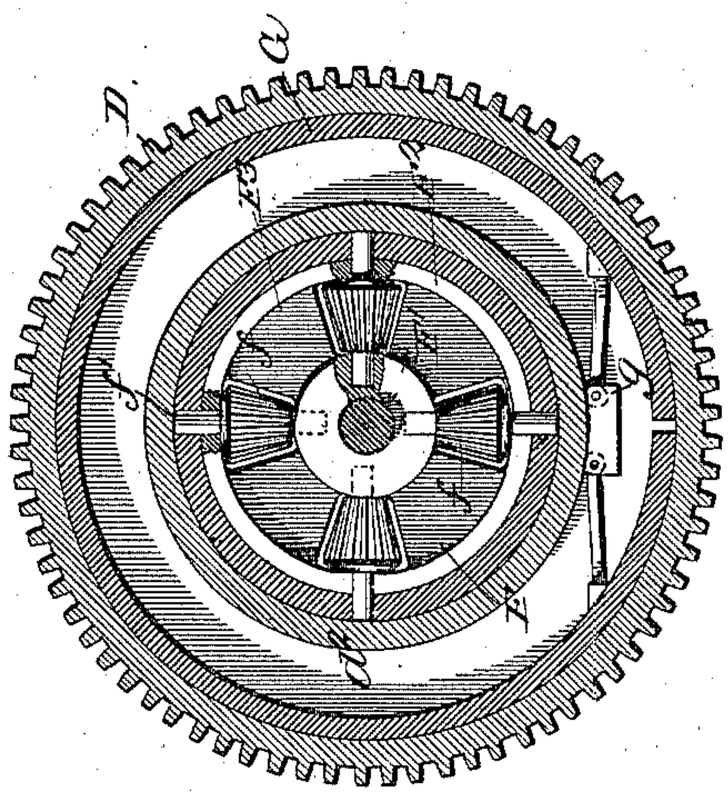

Fig. 8.

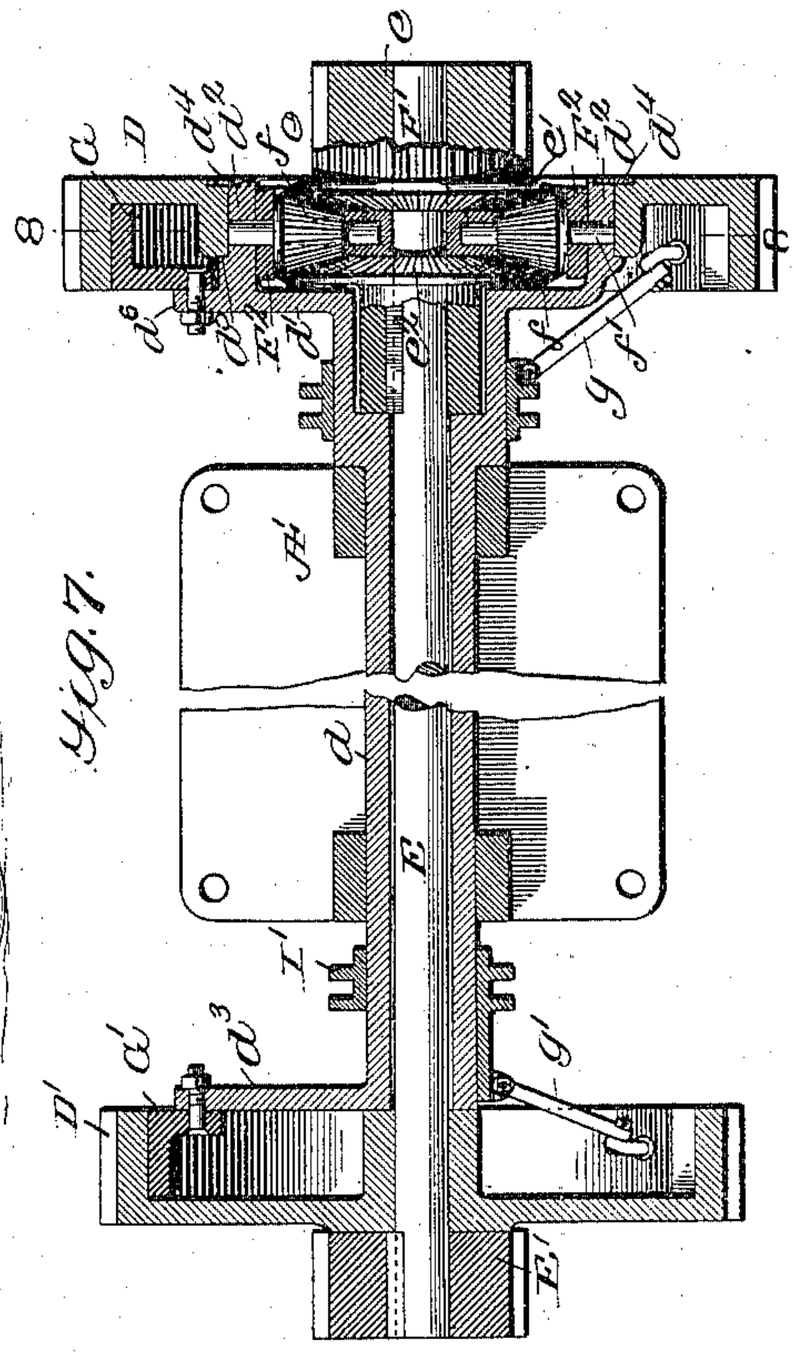

Fig. 7.

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# UNITED STATES PATENT OFFICE.

WILLIAM O. WORTH, OF BENTON HARBOR, MICHIGAN.

## TRACTION-ENGINE.

SPECIFICATION forming part of Letters Patent No. 581,951, dated May 4, 1897.

Application filed July 5, 1895. Serial No. 554,994. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM O. WORTH, of Benton Harbor, in the county of Berrien and State of Michigan, have invented certain new and useful Improvements in Traction-Engines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification.

This invention is an improved traction-engine especially designed for use in connection with plows, wagons, and portable machines—such as threshers, clover-hullers, &c.—and adapted to form part of the running-gear of such machine and the steering apparatus thereof.

The objects of the invention are, first, to make a two-wheel traction-engine wherein all the working parts and the entire weight thereof are supported on two main wheels; second, to use as the engine proper a hydrocarbon-gas engine; third, to provide means whereby the engine can be made to move bodily forward or backward without stopping or reversing the movement of the main shaft of the engine; fourth, to provide novel reduction-gearing and clutch mechanisms whereby the speed of the main shaft is properly reduced and the power thereof can be utilized either for propelling the engine and connected machine forward or backward or when at rest as the prime mover for driving the mechanism of the connected machine.

The invention consists in the novel construction and combination of parts set forth in the claims, and the accompanying drawings illustrate what I consider the best form of engine now known to me embodying my invention. I will proceed to describe it in detail, referring to the accompanying drawings as forming part of such description by letters of reference.

Figure 1 is a front elevation of the engine. Fig. 2 is a horizontal section through the engine on line 2 2, Fig. 1. Fig. 3 is a bottom plan view of the engine. Figs. 4 and 5 are detail views of the gearing between the engine-shaft and carrying-wheels on opposite sides of the engine. Fig. 6 is a side elevation of the traction-engine attached to a thresher. Fig. 7 is a vertical section on line 7 7, Fig. 2. Fig. 8 is a transverse section on line 8 8, Fig. 7. Fig. 9 is a detail section.

A designates a casting forming the frame of the traction-engine and the base of the working and pumping cylinders B B′ of a duplex hydrocarbon-gas engine preferably substantially the same in construction as the engine shown and described in my application for Letters Patent, Serial No. 553,091, filed June 17, 1895. I do not intend to limit myself to any particular form of hydrocarbon-engine, nor, indeed, to the use of any gas-engine, as the invention could be adapted to and used with a steam or electric motor. I prefer my hydrocarbon-gas engine, however, as being more compact, clean, lighter, and economical than other motors.

The main shaft *b* of the engine extends through tubular bearings C, bolted to the sides of the casting A and forming the journals upon which the main carrying and traction wheels H H′ of the engine are mounted. A peculiarity of the engine, therefore, is that the main engine-shaft extends through and rotates within the journals of the main wheels.

On the outer ends of shaft *b* are belt flywheels *b′*, as shown, and on said shaft within the chambered inner ends of journal-castings C are spur-pinions $b^2$ $b^3$. The pinion $b^3$ meshes with a gear $b^4$, journaled on a stub-shaft attached to the casting A above pinion $b^3$, and gear $b^4$ meshes with a gear D′, loosely mounted on a shaft E, lying within a tubular shaft *d*, journaled in brackets A′ on or attached to casting A. Pinion $b^2$ meshes with a gear D, loosely mounted on the opposite end of tubular shaft *d*, as shown. Shaft E extends through shaft *d*, and on its end exterior to gear D′ is keyed a pinion E′, meshing with an internal gear *h′*, fastened to the inner face of wheel H′, and on the other end of shaft E is loosely mounted a pinion *e*, meshing with an internal gear *h*, secured to the inner face of wheel H.

The gear *e* is attached to or formed with a bevel-gear *e′*, which corresponds to and faces a similar bevel-gear $e^2$, keyed on shaft E. (See Fig. 7.) Between bevel-gears *e′* $e^2$ is an idler-wheel F, having a hub F′ and a rim $F^2$, connected by spokes or webs $F^3$, Fig. 8, and between said spokes are idler bevel-pinions *f*,

journaled on radiating stub-shafts $f'$, secured in radial openings in the hub and flange of wheel F, as shown. The bevel-pinions $f$ mesh with both gears $e'$ $e^2$, and therewith form an equational box to compensate for the differences of rotations of the main wheels in turning curves. The end of tubular shaft $d$ is expanded into a boxing $d'$, inclosing this equational box, and the shafts $f'$ enter the flange $d^2$ of said boxing and lock the equational box securely to the shaft $d$. Wheel D has a very large hub to fit on flange $d^2$ of the boxing, and is confined thereon, but allowed to rotate freely between the shoulder $d^5$ and an annulus $d^4$. (See Fig. 7.)

Within the rim of wheel D' is a friction-clutch G', fastened to an arm or arms $d^3$, projecting from shaft $d$, and within the rim of wheel D lies a clutch G, fastened to a projecting arm $d^6$ on boxing $d'$.

Clutch G is spread or contracted by means of the toggle-lever's joint $g$, pivoted to the clutch and to a grooved collar I, slidably mounted on the shaft $d$, and clutch G' is operated by toggle-joints $g'$, pivoted to the clutch and to a grooved collar I' on shaft $d$, as shown.

The grooves in collars I I' are engaged by curved shifters $i$ $i'$, respectively mounted on the ends of a rod $I^2$, guided in eyes $A^2$ on journals A' or other suitable supports, so that when one clutch is applied the other will be released. This rod can be shifted by a hand-lever $I^3$, fulcrumed on a bracket $A^4$, attached to a suitable point on casting A. (See Fig. 1.)

Beneath casting A is a plate $a$, having upstanding brackets $a'$ on its edges, by which it is rigidly fastened to the casting A. Upon said plate, supported on ball-bearings $k$ thereon, is a fifth-wheel K, which has a central pivot-lug K', depending through an opening in plate $a$ and secured by a nut $K^2$, as shown. To said fifth-wheel is fastened a draft-bar L, which extends beneath the casting and is rigidly fastened to the beam L', supporting and connected to the front end of the machine X, which is illustrated as a thresher.

A casting M is fastened to and between the draft bar and beam, as shown, and in said casting at one side of the beam is journaled a vertical stub-shaft N, around which is wrapped a chain $n$, the opposite ends of which are connected to the rear ends of bars $n'$ $n'$, attached to the bottom of casting A and projecting rearwardly on opposite sides of the draft-bar, as shown in Fig. 2. On the upper end of shaft N is a worm-gear N', which meshes with a worm O on a short horizontal shaft O', suitably journaled in brackets rising from casting M, and on the worm is a bevel-gear $o$, which meshes with a similar bevel-gear $p$ on a shaft P, which rises through or beside casting A in convenient position to be operated by the driver. Practically I propose to operate shaft O' by power controlled by the driver.

Operation: Lever $I^3$ is shifted so as to disengage both clutches G G' from gears D D'. Then the engine is started and shaft $b$ rotated, driving said gears in opposite directions. If the lever $I^3$ be then shifted so as to throw clutch G' into engagement with gear D', the shaft $d$ will be driven from the main shaft through gears $b^3$ $b^4$ D', and clutch G' and pinions $f$ and gear $e^2$ cause shaft E to revolve with shaft $d$, and pinions E' $e$ transmit motion to gears $h$ $h'$, so that the engine moves forward, as indicated by the arrows in Fig. 4, while gear D rotates loosely on shaft $d$ contrary to the motion thereof. If the lever $I^3$ be shifted so as to disengage clutch G' from gear D' and engage clutch G with gear D, the motion of the engine is reversed, for now gear D is locked to shaft $d$ and through gears $f$ and $e^2$ rotates shaft E with shaft $d$ contrary to the rotation of gear D', and through pinions E' $e$ the motion of wheels H H' is reversed and the engine backs up. The gearing is so proportioned that the back-up gearing is slower than the forward gearing.

When it is desired to turn the machine, the engine is bodily shifted by throwing or holding back one wheel while the other goes on, and here the equational box comes into play by taking up or compensating for the unequal movements of the two wheels and shafts. This feature of guiding by bodily swing of the engine itself or the main driving-shaft, axle, and wheels is, I believe, entirely novel; also is the mounting of the main traction-wheels axially or concentric to the main driving-shaft. But obviously the driving mechanism could be readily adapted to drive traction-wheels not journaled axially of the main shaft, and I do not limit myself to this axial location of the traction-wheels except where so stated in the claims.

The principal bearings of shaft $b$ in practice will be within the casting A or independent of journal-castings C.

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

1. The combination of the main engine-shaft, and traction-wheels with the inner and outer auxiliary shafts parallel with the main shaft, gearing between said main shaft and loose gears on said auxiliary shafts, and gearing between said auxiliary shafts and the main wheels, with clutch mechanism for locking either loose gear to the auxiliary shafts, for the purpose and substantially as described.

2. In a traction-engine the combination of the main shaft, the traction-wheels, a pair of auxiliary shafts one within the other, independent gearing between the main shaft and loose gears respectively mounted on the respective auxiliary shafts, for driving said loose gears in opposite directions, and gearing between the auxiliary shafts and the traction-wheels; with means for locking the shafts to each other and to either of the loose gears, whereby the engine can be moved forward or backward without reversing the main shaft, substantially as described.

3. A traction-engine having a main driving-shaft and traction carrying-wheels concentric to said shaft, in combination with a train of reduction-gears for transmitting motion from the main shaft to the traction-wheels so as to move the engine forward; an independent train of reduction-gears for transmitting motion from the main shaft to the traction-wheels, to move the engine backward, and clutch mechanisms whereby either, but not both, of the trains of gearing may be thrown into action, substantially as described.

4. In a traction-engine the combination of the traction-wheels, with the main engine-shaft extending through hubs of said wheels, and independent trains of reduction-gears respectively adapted to drive the traction-wheels forward or backward from the main shaft; and clutch mechanism for throwing either train of gears into action, substantially as described.

5. The combination of the main engine-shaft, the traction-wheels, a train of reduction-gears for transmitting forward motion to the traction-wheels from the main shaft and a train of reduction-gears for transmitting back-up motion from the main shaft to the traction-wheels, without any reversal of motion of main shaft and clutches for throwing one set of gears into, and the other out of, action, for the purpose and substantially as described.

6. The combination of the two-wheel traction-engine, the fifth-wheel pivoted to the bottom thereof, the rigid beam attached to said fifth-wheel, and mechanism, substantially as described, whereby the engine is swiveled or turned on said fifth-wheel, for the purpose and substantially as described.

7. The combination of the main engine-shaft, a pair of auxiliary shafts one within the other and parallel with the main shaft; a loose gear on one end of the inner shaft, and a loose gear on the opposite end of the outer shaft, trains of gearing for driving said loose gears from the main shaft; gearing between the respective auxiliary shafts and the traction-wheels; an equational-box connection between the auxiliary shafts, and clutch mechanism whereby either loose gear may be locked to the outer shaft, for the purpose and substantially as described.

8. The combination of the inner and outer shafts, the fast or loose bevel-gears on the inner shaft, the wheel rigidly attached to the outer shaft and lying between said bevel-gears, and the bevel-pinions mounted on shafts secured radially in said wheels, said pinions meshing with both said gears, substantially as described.

9. In a traction-engine the combination of the main engine-shaft, the traction-wheels; a pair of auxiliary shafts one within the other parallel with the main shaft, loose gears on said auxiliary shaft meshing with trains of reducing-gears driven from the main shaft, gearing between said auxiliary shafts and the traction-wheels, and clutch mechanism for locking either loose gear to the auxiliary shafts; with a fixed and a loose bevel-gear on the inner auxiliary shaft, a wheel rigidly attached to the outer auxiliary shaft lying between said bevel-gears, and the bevel-pinions mounted on shafts secured radially in said wheel, said pinions meshing with both said bevel-gears, for the purpose and substantially as described.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

WILLIAM O. WORTH.

Witnesses:

ARTHUR E. DOWELL,

JAMES R. MANSFIELD.