(No Model.)

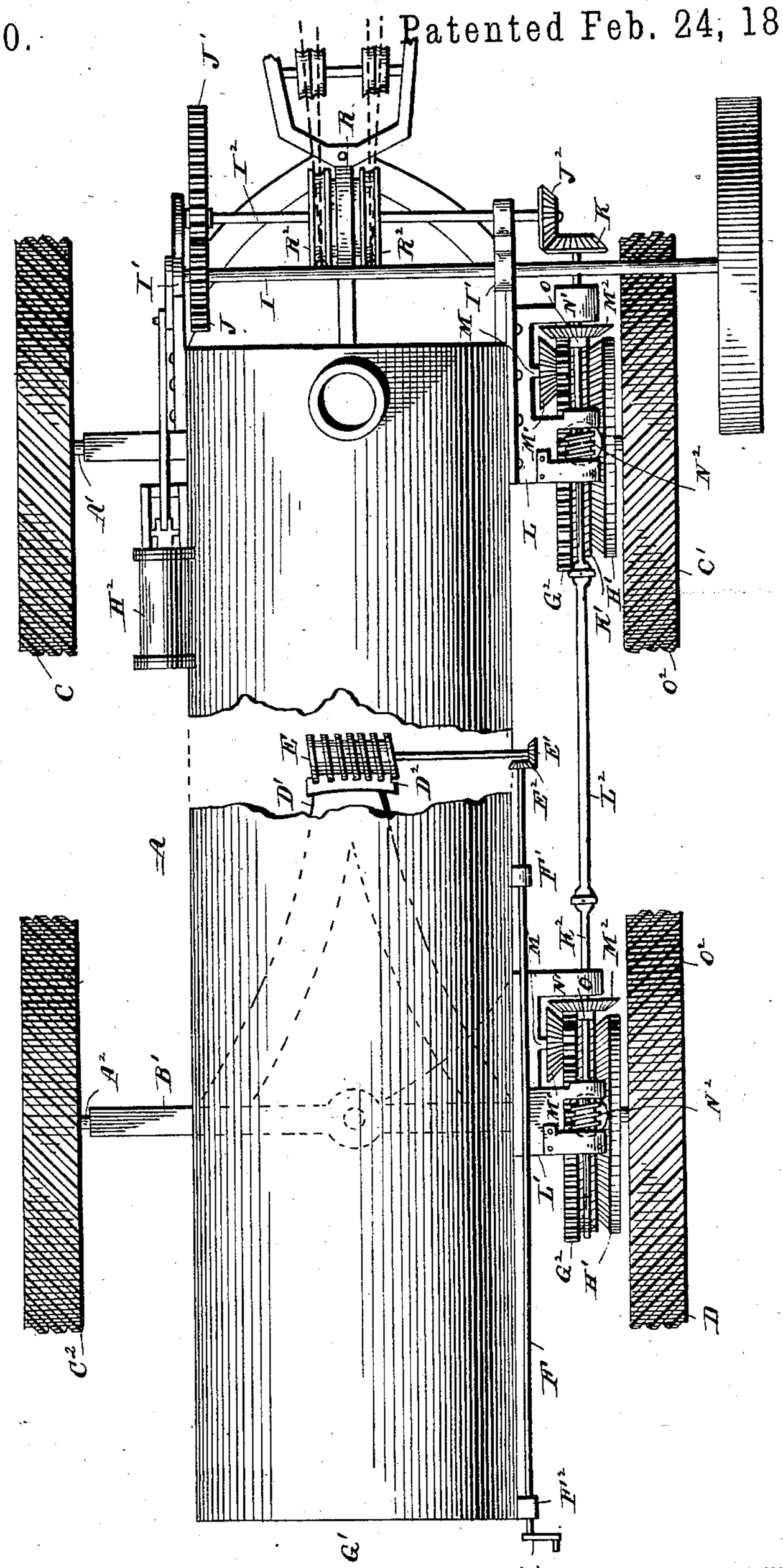
4 Sheets—Sheet 1.

J. C. HARKER.

TRACTION ENGINE.

No. 312,630. Patented Feb. 24, 1885.

Fig. 1.



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4 Sheets—Sheet 2.

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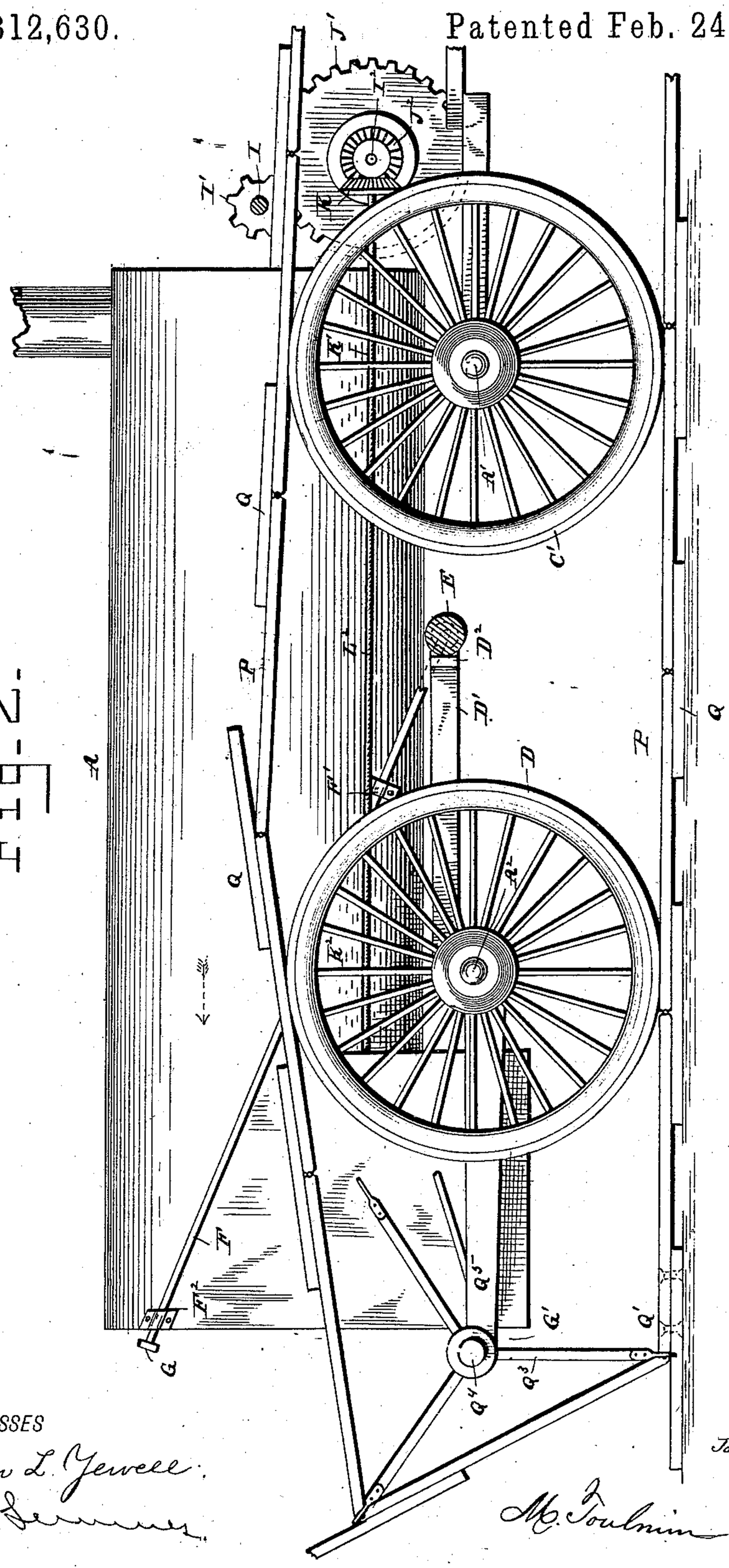
Fig-2-



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TRACTION ENGINE.

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Fig. 3.

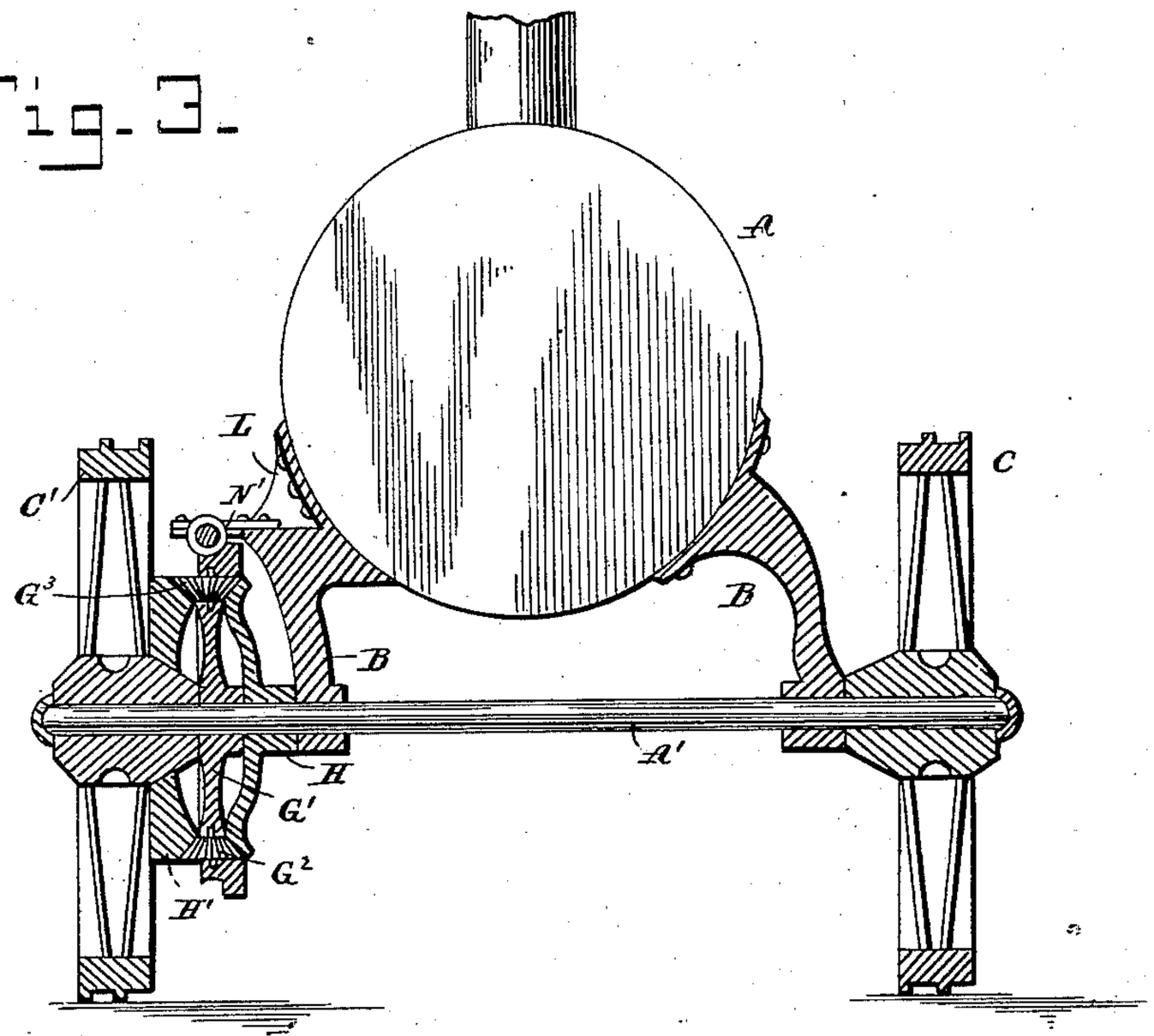
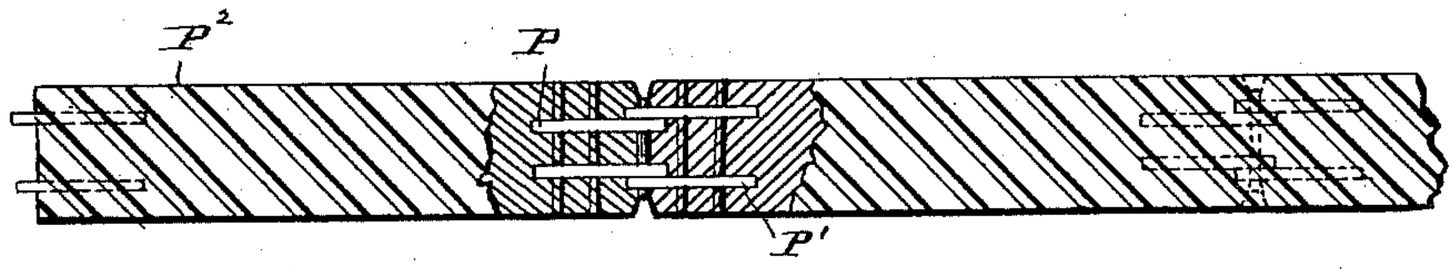


Fig. 4.



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(No Model.) 4 Sheets—Sheet 4.

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TRACTION ENGINE.

No. 312,630. Patented Feb. 24, 1885.

Fig. 5.

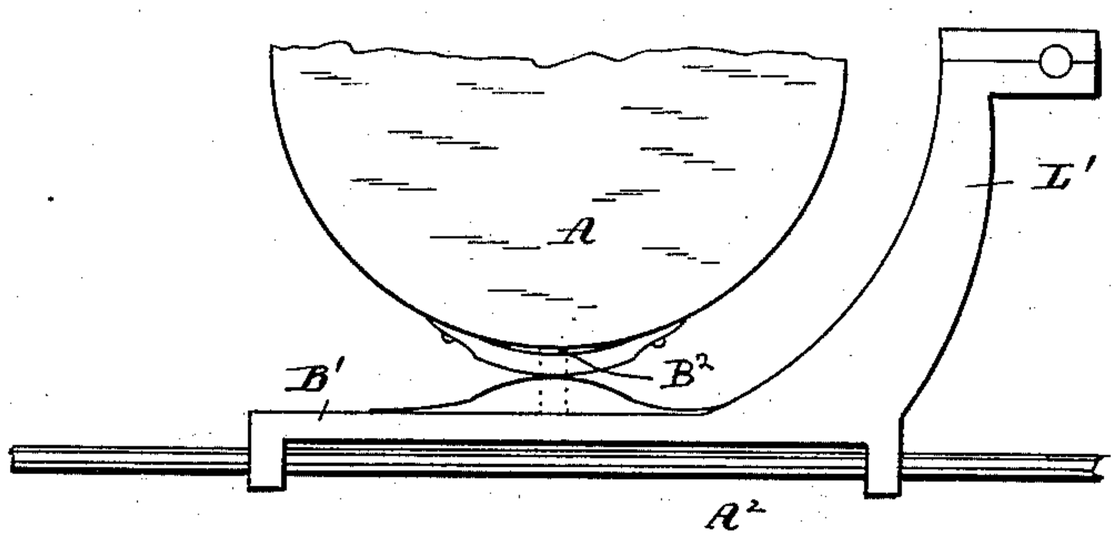


Fig. 6

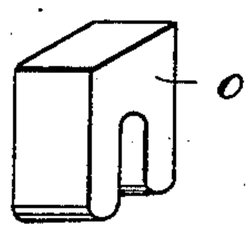
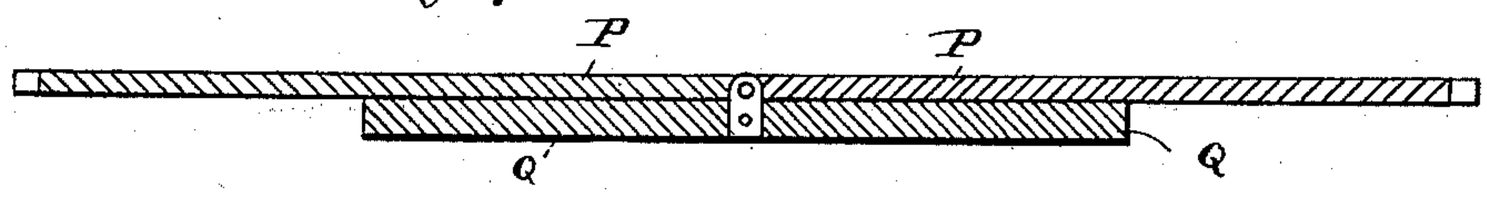


Fig. 7.



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UNITED STATES PATENT OFFICE.

JOHN C. HARKER, OF GRAND JUNCTION, IOWA.

TRACTION-ENGINE.

SPECIFICATION forming part of Letters Patent No. 312,630, dated February 24, 1885.

Application filed December 14, 1883. (No model.)

To all whom it may concern:

Be it known that I, JOHN C. HARKER, a citizen of the United States, residing at Grand Junction, in the county of Greene and State of Iowa, have invented certain new and useful Improvements in Traction-Engines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to certain new and useful improvements in traction-engines; and it has for its objects, first, to provide mechanism whereby the speed of the engine may be decreased and its power increased, or vice versa; second, to provide means which shall enable the engine to travel over soft, plowed, or boggy ground.

With these ends in view the first object of my invention is carried out by mechanism which consists, essentially, of a worm-shaft adapted to receive rotation through suitable gearing from the engine-shaft, and mounted in close proximity to a combined worm-gear and face cog-wheel mounted on the axle, this shaft being provided with a beveled pinion, which, through a beveled and face cog-idler, meshes with the cog on the axle, the worm meshing with the worm-gear of said cog-wheel, the said pinion and worm being adapted to engage the worm-gear and cog-wheel at different times. This wheel is loosely mounted on the axle, and carries two beveled pinions, which mesh with two beveled gear-wheels mounted, respectively, rigidly upon the axle and the hub of one of the wheels.

The second object is carried out by an endless track provided with strips which break the joints between the sections which constitute the track.

In the accompanying drawings, forming a part of this specification, and on which like letters of reference indicate corresponding features, Figure 1 represents a plan view of my improved traction-engine, showing a portion of a boiler broken away in order to show the steering mechanism, and having the tracks removed, the gearing being shown in position to decrease the speed and increase the power. Fig. 2 represents a side elevation of the engine, showing the arrangement of the endless track upon the wheels, the other devices being omitted so as to avoid confusion of parts. Fig. 3 represents a vertical cross-sectional view through the boiler, the standards which connect it with the rear axle, and the gears which operate the traction-wheels. Fig. 4 represents a view of a portion of the endless track, looking at the side upon which the wheels tread. Fig. 5 represents a detached view of the forward axle and bolster and the fifth-wheel which connects the same with the boiler. It also shows one of the standards which forms a support for the worm-shaft. Fig. 6 represents a detached perspective view of the block for maintaining engagement of the beveled pinion for giving speed to the engine, with the beveled idler; and Fig. 7, a longitudinal sectional view through two of the track-sections and one of the supplemental sections, showing the means of connecting them together.

The letter A indicates the boiler of a traction-engine, the same being mounted upon the axles A′ and A², the former by means of the standards B, as seen in Fig. 3, and the latter by means of the bolster B′ and the fifth-wheel and king-bolt B². The axle A′ is free to revolve in the standards B, but rigidly attached to the hub of the wheel C, and loosely fitted to the hub of the wheel C′. The forward axle, A², is rigidly secured to the hub of the wheel C², and loosely fitted to the hub of the wheel D. Extending rearwardly from the bolster B′ is the two-part arm D′, terminating at its end in a segment of a worm-gear, D². The worm E, suitably mounted under the boiler, engages the said segment D², and is operated through the instrumentality of the beveled pinions E′ and E², the latter being secured to the shaft F, mounted in the blocks F′ and F², and provided with a crank, G, at the forward end. By this arrangement of devices the direction of the engine is under perfect control of the operator. It should be observed that a platform is usually built at the forward end of the engine, as at G′.

Loosely mounted on the respective axles are the combined worm-gear and face cog-wheels G². These wheels G² are provided at diametrical points with slots, in each of which is located a beveled pinion, G³, for a purpose which will presently appear; also, mounted on the said axles, but rigidly, are the beveled gear-wheels H.

Rigidly mounted on the hubs of the wheels C′ and D are similar beveled gear-wheels, H′.

The beveled gear-wheels H and H′, respectively, mesh or intergear with the pinions G^3, and perform a function presently to be named.

The letter H^2 indicates the operating-cylinder secured to the boiler at any convenient point and connecting in the usual manner with the main driving-shaft I, mounted in journals I′. An auxiliary shaft, I^2, is also mounted in said journals, and receives rotary motion from the shaft I through the medium of the pinion J, secured to said shaft, and the gear-wheel J′, secured to the shaft I^2, this pinion and gear-wheel being adapted to mesh with each other. The auxiliary shaft I^2 is also provided with a beveled pinion, J^2, which meshes with the like pinion K, mounted upon the section K′ of the worm-shaft K^2. The respective sections of this shaft are each fitted in journals formed in the brackets L and L′, the former being firmly bolted to the boiler and forming the upper end of one of the standards B, as seen in Fig. 3. The end sections of the worm-shaft K^2 are connected together by means of the intermediate section, L^2. A ball-and-socket or universal joint is the preferred means of connecting the section L^2 with the other sections, a joint of this character being made necessary by the variable position of the axle A^2 relatively with the axle A′. The forward section of said shaft K^2 is capable of a longitudinal movement in the journals of the bracket L′, this provision being made necessary on account of the variable position of the axle A^2, as above described.

Mounted on the studs M, extending from the brackets L and L′, are the combined beveled and face pinions M′. The portions of these pinions provided with cog-teeth normally intergear with the corresponding portion of the combined worm-gear and face cog-wheel. Mounted on the outer sections of the worm-shaft K^2 are beveled pinions M^2. These pinions are provided with a feather-key, and the shaft with a feather-groove, whereby the pinions are capable of longitudinal movement independent of the shaft, but are made to rotate positively with the shaft. Sufficient space between the pinions M′ and the rear arms, N and N′, of the brackets L and L′, is left so as to permit of the pinions M^2 being disengaged from or engaged with the pinions M′ when the traction-engine is to be driven at an increased speed or decreased speed. These outer sections of the worm-shaft K^2 are further provided with worm-screws N^2, having each a feather-key which engages with the feather-groove in the respective sections, whereby the sections may have a longitudinal movement independent of the said worms. When it is desired that the engine shall have an increased power but a decreased speed, these worm-gears are put in the position shown in Fig. 1 of the drawings, when they mesh with the worm-gear portion of the cog-wheels G^2, the pinions M^2 being in such instance disengaged from the pinions M′.

In order that the operations of the combined worm-gear and face cog-wheel G^2 may be accurately understood, we will suppose that it is about to be made to revolve by the worm-gear N^2. Its revolution about the axle will cause the pinions G^3 to revolve with it, though not around their own axes, (when the engine is going straight ahead.) These pinions both engage with the beveled cog-wheels H and H′, through the former of which rotation is imparted to the axle and thence to the traction-wheel rigidly secured to the axle; and through the medium of the latter rotation is imparted to the traction-wheel upon whose hub it is secured. Should the engine, however, be traveling on a curve—as in turning around—then in that instance, if the wheels C and C′ be on the outer side of the curvature described, the result will be that the pinions G^3 will travel about their own axes as well as around axis of the axle, and will cause the beveled cog H to revolve more rapidly than the beveled cog H′. The reason of this is that the inner traction-wheel has less distance to travel than the outer one, so that if it revolves as fast as the outer one it would have to slip on the ground or in the endless belt; but as it cannot slip, on account of the frictional resistance, the result is that the speed of its rotation is retarded, and what it loses in speed is transferred to the outer wheel by reason of the revolution of the pinions G^3 about their own axes, while at the same time they are engaged with the beveled gears H and H′ and traveling around the axis of the axle. When the pinions M^2 are in engagement with the pinions M′, the same result is produced so far as concerns the traveling of the wheels which run on the outer side of the curve described in turning or traveling out of a straight line.

In order to run the traction-engine with increased speed and decreased power, it is simply necessary to remove the stop O from the forward side of the pinions M^2, slide the said pinions on the shaft-sections until they mesh with the pinions M′, and then place the said stop between the pinions M′ and the arms N^2 of the brackets L and L′, the function of the stops being to maintain the engagement of said pinions.

Before the engine is put in motion, when so geared the worm-screws N^2 are slipped on the shaft-sections far enough forward to disengage them from the worm-gear of the cog-wheel G′. For this purpose the forward journals of the brackets are removed. The feather-keyway is of sufficient length to admit of this disengagement of the worm-screws N^2. After the worm-screws are thus disengaged the journals are replaced.

The letter O^2 indicates a series of beads or ribs on the peripheries of the traction-wheels, the direction of these ribs being oppositely disposed in each pair of wheels. The object in reversing the direction of these ribs is to prevent the machine from traveling laterally, instead of directly forward or backward, as the case may be, when undergoing extreme

strain in the direction of the draft. This arrangement is devised to overcome the difficulty which I have found by actual experience when the ribs of the respective wheels run in the same direction.

The letter P refers to an endless track composed of a series of flexibly-connected sections constructed, preferably, of wood. A convenient form of joints between these sections is illustrated in Fig. 4, and consists in slotting the ends of the section and fitting in the slots strips of metal, P′, which are secured by bolts. These strips are so disposed as to lap each other, the slots being widened at their ends for this purpose, and are provided with slots, so as to make a joint capable of yielding laterally.

In some instances I contemplate providing the inner face of this track with a series of obliquely-disposed strips, P^2, of metal, arranged at such distance apart as to agree with the distance between the ribs on the peripheries of the wheels, whereby the one may work in the other.

An essential feature of my improved track consists of providing the same across the joint with supplemental sections Q, which are connected to the main sections at one side of the joint, as seen in Fig. 1, by bolts or rivets Q′, or may be connected at the joint by means of a lug through which extends the connecting-bolt, as seen in Fig. 8. These supplemental sections may be extended in length so as to nearly meet each other, or they may be shorter, as in Fig. 1. In either event their essential function is to prevent a depression of the track into the soft earth as the wheels pass over the joint.

The endless track P is supported in part by the traction-wheels themselves, and at the forward end of the engine by a reel consisting of three or more radial arms, Q^3, having bifurcated ends, so as to prevent the track from slipping off at either side. These arms are secured to the shaft Q^4, mounted in journals on the forward ends of the bars Q^5. These bars are secured or made a part of the bolster B′, so as to turn with the wheels C^2 and D, the flexible joints of the track allowing of the same. The track at the opposite or rear end of the engine is either supported by another reel of the same description and similarly mounted, or it may extend back and pass under and over the supporting-wheel of my ditching-machine, as shown and described in an application filed even date herewith, with which I contemplate using it, as I have already ascertained by actual trial that good results can be produced in this way.

Mounted on the auxiliary shaft I^2 are two operating chain or sprocket wheels adapted to operate ditching-machines, and which form a part of the subject of my application for a patent filed on or about September 25, 1884.

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

1. In a traction-engine, the combination, with a rotating shaft carrying a worm-screw, of the worm-gear carrying beveled pinions and mounted upon the axle, and the beveled gear-wheels mounted one upon the axle and the other upon the hub of one of the wheels.

2. In a traction-engine, the combination, with a rotating shaft carrying a beveled pinion and a worm-screw, and the beveled and cog face idler, of the combined worm-gear and face cog-wheel carrying beveled pinions, and the beveled gear-wheels mounted one upon the axle and the other on the hub of one of the wheels, the said beveled pinion and screw-worm being adapted to be thrown in and out of gear to change the speed and power of the engine.

3. In a traction-engine, the combination, with a rotating shaft having flexibly-connected sections capable of sliding in its bearings, and provided with a beveled pinion, of the beveled and cog face idler, the cog-wheel carrying beveled pinions, and the beveled gear-wheels mounted the one upon the axle and the other upon the hub of one of the traction-wheels, whereby speed may be applied to the guiding-axle.

4. In a traction-engine, the combination, with the rotating shaft having flexibly-connected sections capable of sliding in its bearings, and a worm-screw, of the worm-gear carrying beveled pinions engaging with beveled cog-wheels mounted the one upon the axle and the other upon the hub of one of the traction-wheels.

5. In a traction-engine, an endless track consisting of a series of elongated sections flexibly connected together, and provided with series of elongated supplemental sections attached to the main sections and extending across the joints sufficiently to prevent the depression of the track as the wheels pass over the joints.

6. An endless track provided with supplemental sections which break the joints between the main sections, the said supplemental sections being pivoted to the main sections at the joints between the same.

7. In a traction-engine, the endless track provided with supplemental sections which break the joints of the main sections, the latter being provided with obliquely-disposed cleats or ribs.

8. In a traction-engine, the combination, with the traction-wheels and the track-reel capable of moving with the guiding-axle, of the endless track having supplemental sections which break the joints of the main sections.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN C. HARKER.

Witnesses:
C. A. NEALE,
JOS. H. HUNTER.