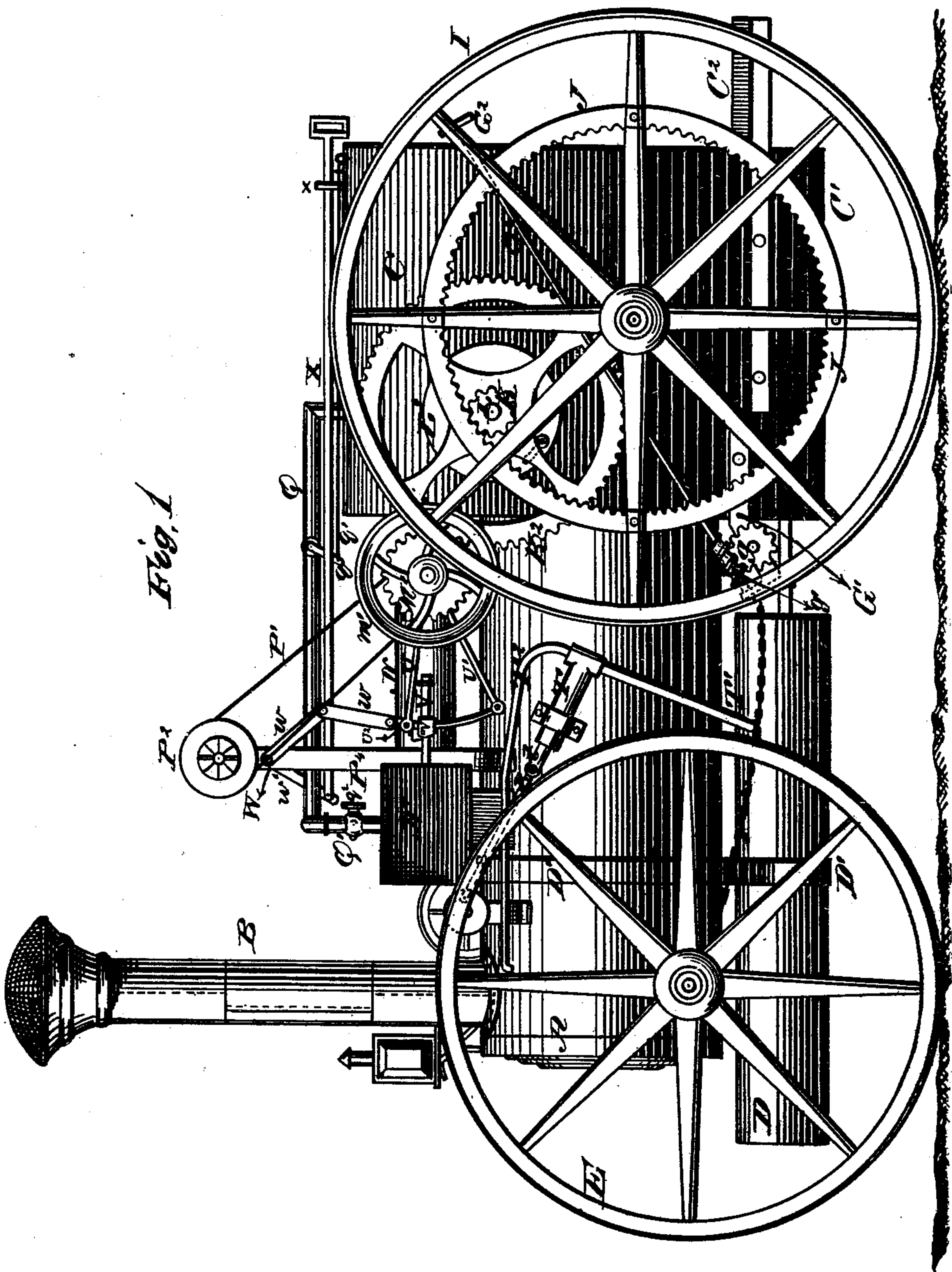


2 Sheets—Sheet 1.

N. M. DAVIDSON.  
PORTABLE AND TRACTION ENGINE.  
No. 188,866. Patented March 27, 1877.



WITNESSES  
*E. H. Bates*  
*Frederick Ackerly*

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*Gilmore, Smith & Co.*  
ATTORNEYS

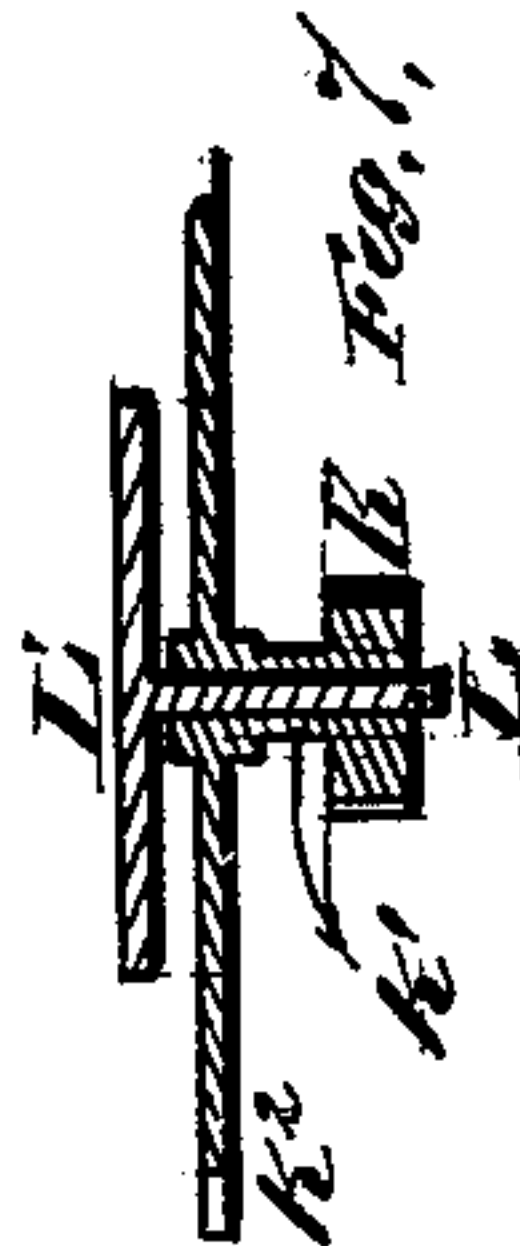
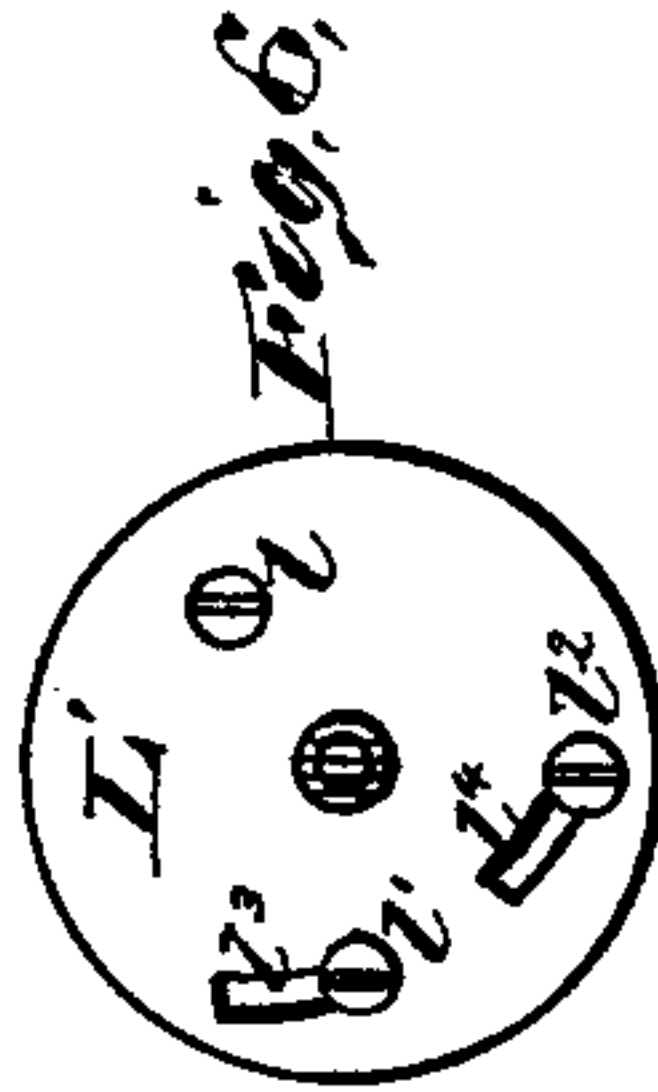
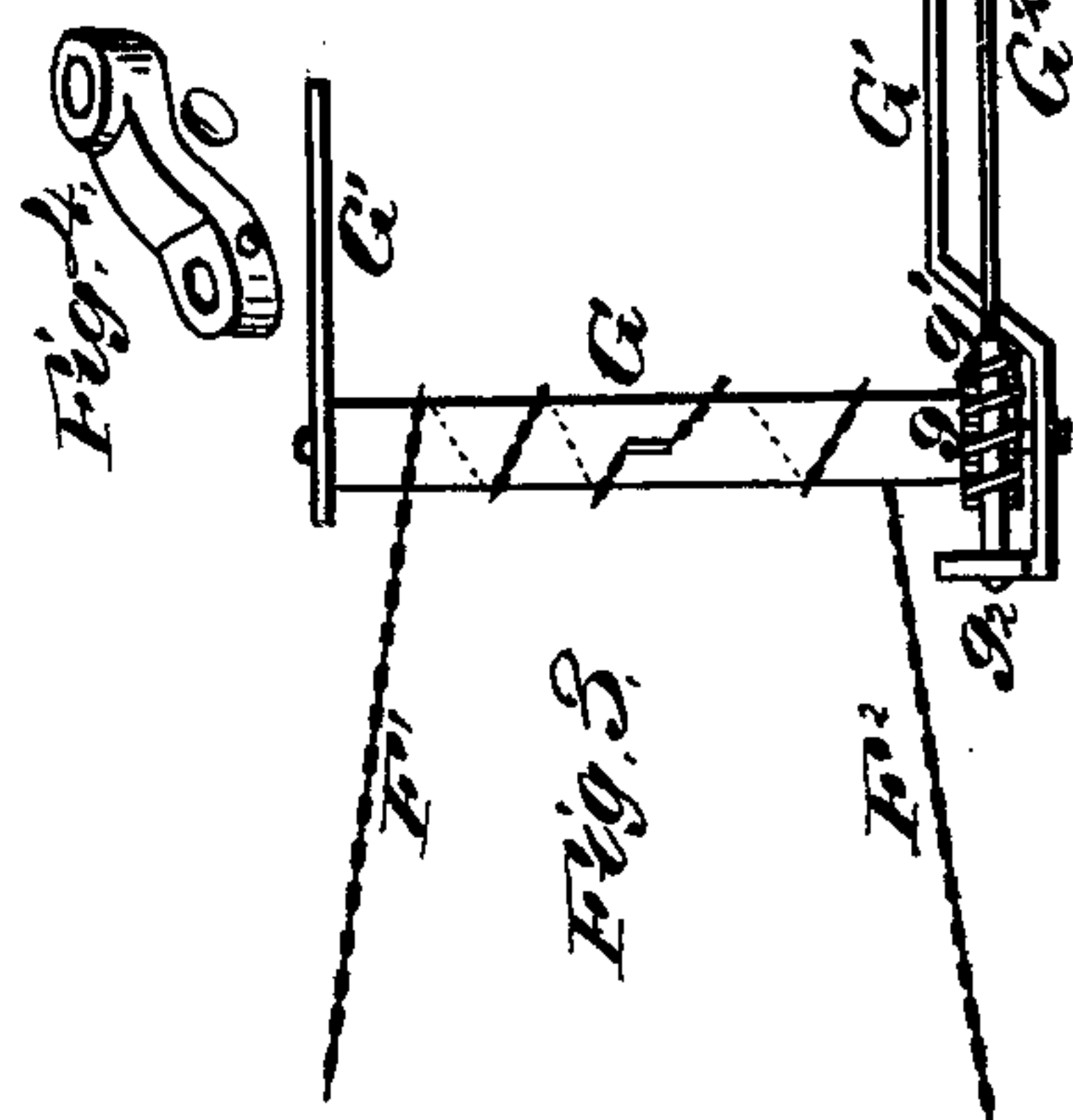
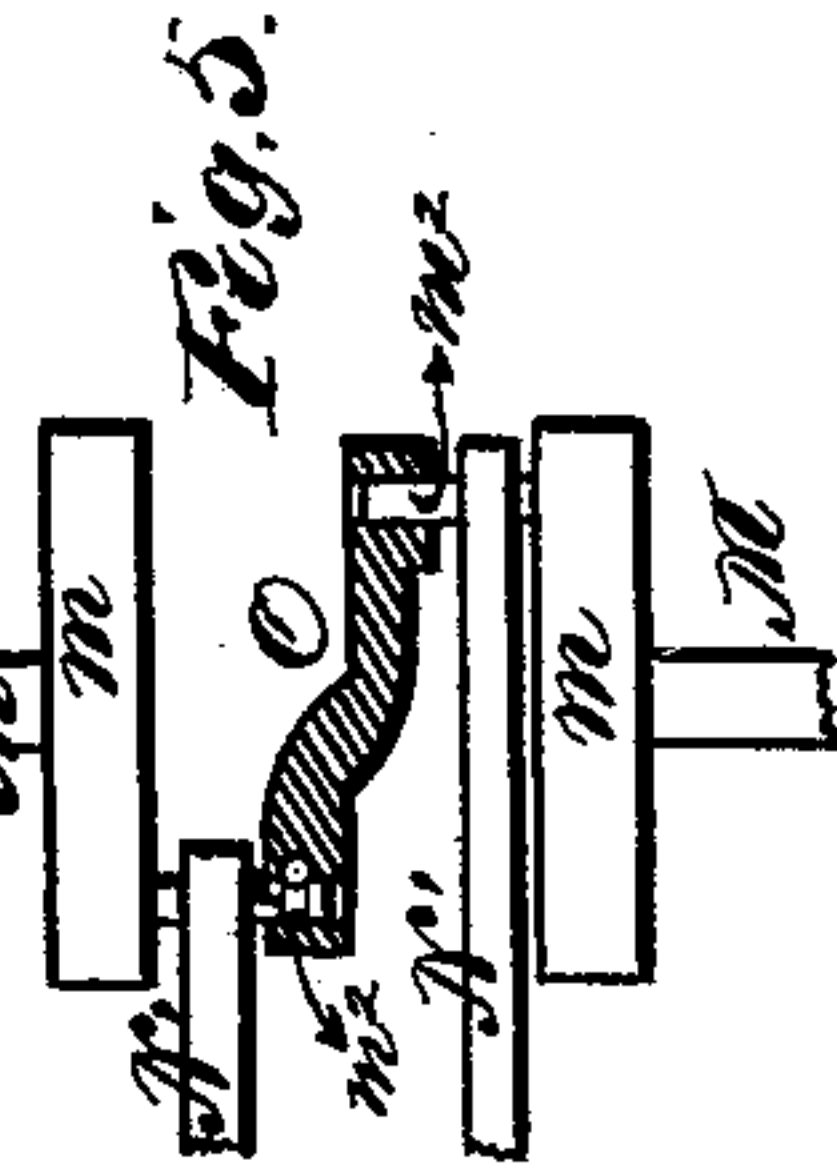
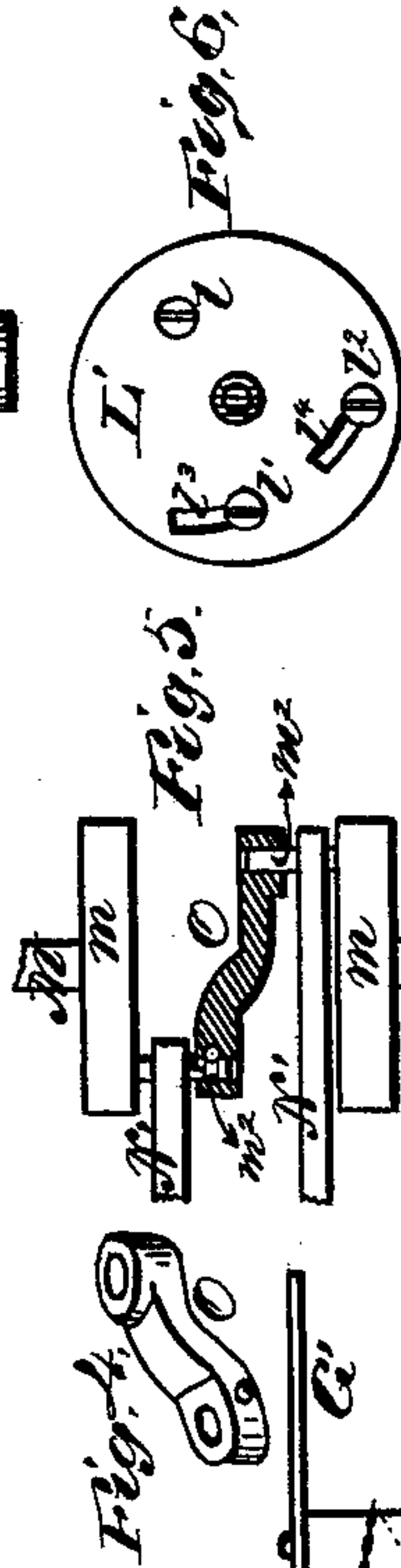
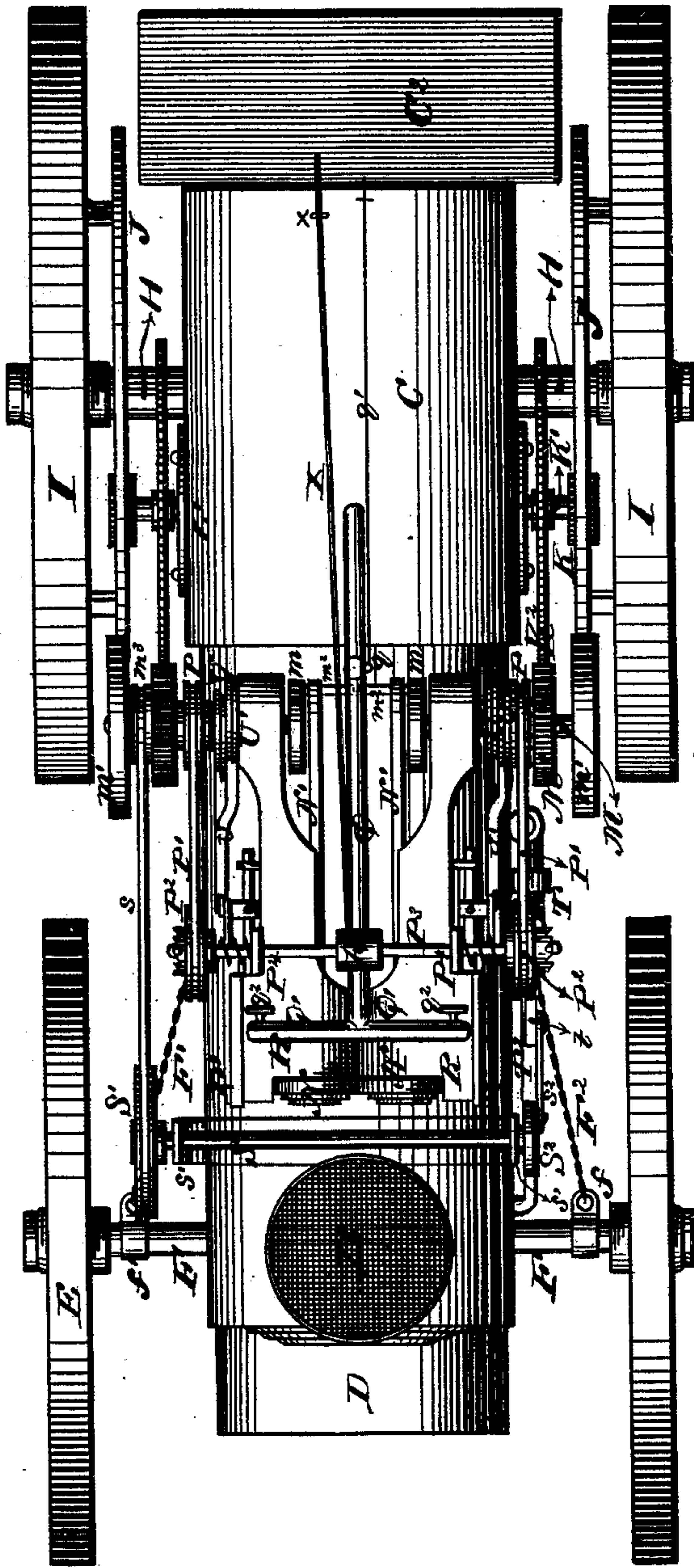
N. M. DAVIDSON.

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Fig. 2.



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# UNITED STATES PATENT OFFICE.

NOBLE M. DAVIDSON, OF ADA, OHIO.

## IMPROVEMENT IN PORTABLE AND TRACTION ENGINES.

Specification forming part of Letters Patent No. 188,866, dated March 27, 1877; application filed January 27, 1877.

*To all whom it may concern:*

Be it known that I, NOBLE M. DAVIDSON, of Ada, in the county of Hardin and State of Ohio, have invented a new and valuable Improvement in Traction-Engines; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making a part of this specification, and to the letters and figures of reference marked thereon.

Figure 1 of the drawings is a representation of a side elevation of my traction-engine, and Fig. 2 is a plan view of the same. Figs. 3, 4, 5, 6, and 7 are detail views thereof.

This invention has relation to traction-engines. The nature of said invention consists, first, in certain devices whereby either or both of the rear transporting-wheels may be disconnected from the motors without changing the gearing. It also consists in the combination of two steam-cylinders and their driving-shafts, with a detachable connecting link or crank, whereby said engine-cylinders may either be operated together or separately, as preferred.

It also consists in the combination, with two driving-shafts, operated by separate engine-cylinders, of a single rotating shaft which gives motion to a governor.

It consists, finally, in certain additional devices and combinations hereinafter particularly set forth.

In the accompanying drawings, A designates the cylindrical casing of the boiler and smoke-box of a traction-engine, and B designates a smoke-stack applied to said smoke-box in the usual way. At the rear of said boiler is a raised steam-chest or steam-dome, C, connected therewith; whence the steam passes to the working-cylinders, hereinafter described. Under said steam-dome, though inclosed in the same external casing, is a fire-box, and under that an ash-box, C<sup>1</sup>, extending below the lower line of boiler-casing A. To the rear of said ash-box C<sup>1</sup> is secured the operator's stand or platform C<sup>2</sup>. In the space in front of said ash-box, and under said boiler and smoke-box, a water-tank, D, is suspended from casing A by means of a metal strap, D', which passes over the top of casing A.

E designates the two front transporting-wheels, and F the axle of said wheels, which is downwardly curved in the middle, and there pivoted to the bottom of boiler-casing A, near the front thereof. To the ends of said axle, just inside of said wheels, I attach chains F<sup>1</sup> F<sup>2</sup> by means of small clips or collars *f f'*. Said chains extend backward to a cylinder or long drum, G, Fig. 3, which is journaled in bearing-plates G<sup>1</sup> G<sup>1</sup> attached to the sides of the fire-box already described, and extending forward therefrom. Said drum or cylinder is provided at one end with a small spur-wheel or pinion, *g*, which gears with, and receives motion from, a worm, *g'*, on the end of an upwardly and rearwardly inclined crank-shaft, G<sup>2</sup>. Said crank-shaft has its lower bearing in a lug or small bearing-block (indicated by dotted lines in Fig. 1) formed on one of said bearing-plates, G<sup>1</sup>, and its upper bearing in an eye secured to the side of steam-dome C. Said crank-shaft may also be braced by passing through a groove or perforation in one of the short rear axles H. Said crank-shaft is conveniently operated from the operator's stand or platform C<sup>2</sup>. When rotated to the right it causes the right chain F<sup>1</sup> to wind upon drum or cylinder G, and thereby makes axle F swing in that direction. By rotating said crank-shaft G<sup>2</sup> to the left the opposite effect is produced. The traction-engine is thus guided in any direction desired. In order that only one chain, F<sup>1</sup> or F<sup>2</sup>, may be drawn upon at a time as said guiding-shaft G<sup>2</sup> is rotated, said chains are attached to drum G, as shown in Fig. 3, one of them passing around said drum from above, the other from below.

I designates the two rear transporting-wheels, which turn on the journals of short axles H H (bolted to the boiler) already referred to. To the inner side of each rear wheel I, an internally-gearied metal ring, J, is rigidly attached. Said annular gear J engages with and receives motion from a pinion, K, on a sleeve, K<sup>1</sup>, which carries at its other end a spur-wheel, K<sup>2</sup>. Said sleeve with the gears attached turns loosely upon a shaft, L, on the inner end of which is formed or rigidly secured a disk or plate, L'. Said plate (shown in detail in Fig. 5) is secured to the side of



steam-dome  $C^2$  by means of three set-screws  $l^1 l^2$ . Set-screw  $l$  passes through a perforation in said plate, but the other two set-screws,  $l^1$  and  $l^2$ , pass through slots  $l^3$  and  $l^4$ . Said slots are given such an inclination or curve that the said plate, swinging on set-screw  $l$  may be adjusted, when screws  $l^1$  and  $l^2$  are loosened, so as to throw pinion  $K$  at will into, or out of, engagement with annular gear  $J$ . By again tightening said set-screws  $l^1$  and  $l^2$ , said pinion is secured in either the engaged or disengaged position. The same movement above described also makes or breaks the geared connection between spur-wheel  $K^2$  and a pinion,  $M'$ , on a short driving-shaft,  $M$ , which is operated by connecting-rod  $N'$  of one of two similar steam-cylinders,  $N$ . Said cylinders constitute two independent engines, which may be used at the same time for different work, or one may lie idle while the other is in use. The disconnecting devices previously described (which are the same on each side of the engine) enable both of the rear transporting-wheels  $I$  to remain stationary while one or both of said engines are working; or, for the purpose of making short turns during transportation, one of said wheels may be rotated more rapidly than the other. In any case no change or shifting of gearing is required, except the pivotal adjustment of plate  $L'$  and the parts attached thereto, as already described.

The two corresponding driving-shafts  $M$   $M$  are arranged in the same line at right angles to the axis of boiler-casing  $A$ . They are provided at their inner ends with small crank-wheels  $m$   $m$  (turned by connecting-rods or pitmen  $N'$   $N'$ , already referred to,) and at their outer ends with belt-wheels  $m^1 m^1$ , which are adapted to operate machinery of any sort. Driving-shafts  $M$   $M$  may be used independently, as already stated, or they may be connected by means of a bent link or connecting-arm  $O$ , so as to operate together. Said link or connecting-arm  $O$  is perforated at each end, as shown in Fig. 4, and sets upon small studs  $m^2 m^2$  on the opposite faces of crank-wheels  $m$   $m$ .

Each of said shafts  $M$  carries also a grooved pulley,  $P$ , and these pulleys are connected, by endless bands or cord  $P^1$ , to two larger grooved pulleys,  $P^2$ , arranged at the ends of a shaft,  $P^3$ , which is journaled in the upper ends of two raised standards,  $P^4 P^4$ , secured by their lower ends to casing  $A$ . Said shaft  $P^3$  carries a small drum or pulley,  $p$ , whereby power is transmitted to the shaft of a ball-governor, (not shown,) which is arranged and operates in the usual manner. If either band or cord  $P^1$  slips from its pulleys, or the connection on one side of the apparatus is otherwise broken, the other band or cord  $P^1$  will continue to operate the governor, so that no interruption of the work will occur.

$Q$  designates a steam-pipe extending from steam-dome  $C$  to a point over the forward part of the boiler, where it connects with the

middle of an arched pipe,  $Q'$ , that leads downward to valve-casings  $R$   $R$ , secured on the outer sides of cylinders  $N$   $N$ , and communicating, respectively, therewith. In steam-pipe  $Q$  is arranged a valve or cut-off, provided with a crank-arm,  $q$ , from which a rod,  $q^1$ , extends to the rear of the machine, above the operator's platform  $C^2$ . By a single movement at the rear of the apparatus the supply of steam may thus be shut off from both the engine-cylinders  $N$   $N$ . The supply to each one of said cylinders may also be independently shut off or regulated by stop cocks  $q^2$ , one of which is arranged in each upright part of said arched tube  $Q'$ .

One of the previously-described shafts  $M$  is provided with a small grooved pulley,  $m^3$ , which communicates motion, by means of an endless belt, chain, or cord,  $s$ , to a large grooved wheel,  $S^1$ , on one end of a transverse shaft,  $S$ , journaled in raised bearing-plates  $s^1 s^1$  fixed to the sides of boiler-casing  $A$ . The other end of said shaft  $S$  carries a small crank-wheel,  $S^2$ , which, by means of connecting-rod  $s^2$ , gives reciprocatory motion to the piston-rod  $t$  of a small force-pump,  $T$ , that raises water from tank  $D$  through induction-pipe  $T^1$  and discharges the same water through pipe  $T^2$  into the boiler within casing  $A$ . Said boiler may be kept filled with water to the under side of the top of cylindrical casing  $A$ , as the steam-dome  $C$  will allow sufficient space for the generation and expansion of the steam, which is supplied thence to the cylinders  $N$ .

Each of the driving-shafts  $M$  operates a link-motion, constructed as follows: On said driving-shaft are two eccentrics,  $U$   $U'$ , which give motion to two rods,  $u$   $u^1$ , that are attached thereto by their rear ends, while their forward diverging ends are connected by a link,  $w^2$ . Said link may be raised or lowered in a perforated block,  $v$ , secured to a valve-rod,  $V$ , which slides in valve-casing  $R$ . The aforesaid devices operate, like all link-motions, to reverse or modify the operation of the piston, and the wheels operated thereby, without requiring any shifting of gearing. The raising and lowering of said link  $w^2$ , whereby said changes of motion are effected, is caused by a rock-shaft,  $W$ , journaled in standards  $P^4 P^4$  under governor-operating shaft  $P^3$ . Said rock-shaft is provided at each end with a pair of toggle-arms,  $w$ , which connect it to one of said links  $w^2$ . It is also provided near the middle with a rigid arm,  $w'$ , which has a pin-and-slot connection to a long adjusting-rod,  $X$ , that extends longitudinally to the rear of the machine, passing through slotted guide-plate  $x$ . By means of said adjusting-rod, rock-shaft, and toggle-arms the action of both engines can be simultaneously reversed.

The construction of the boiler-casing  $A$ , steam-dome  $C$ , and water-tank  $D$  allows me to carry a considerable quantity of water without occupying unnecessary space. The arrangement of the gearing, and the small



size of crank-wheels *m* on driving-shafts *M*, allow the engine to be run with very little vertical vibration of connecting-rods *N'*, thus diminishing the wear and strain on said rods.

Steam-dome *C*, by allowing cylindrical boiler-shell *A* to be carried full of water, causes the steam-pipe and water-pipe to be protected by said water from injury by heat when either end of the engine is elevated in running up or down hill. It also supplies dry steam to the cylinders *N N*.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a traction-engine, the combination of plate *L'*, slotted at  $\frac{1}{8}$   $\frac{1}{4}$ , and rigidly attached to shaft *L*, with a sleeve turning on said shaft, and carrying a part of the gearing, whereby one of the transporting-wheels is operated, substantially as and for the purpose set forth.

2. In a traction-engine, the combination of two independent operating-cylinders, with the rear transporting-wheels, two independent trains of connecting gearing, and two independent slotted disconnecting-plates, *L*, arranged and operating substantially as set forth.

3. In a traction-engine, the combination of two engine-cylinders, and their piston-rods and connecting-rods, with two driving-shafts operated thereby, and a detachable connection for said shaft, substantially as and for the purpose set forth.

4. The combination of engine-cylinder *N*, connecting-rods *N'*, and shafts *M*, with detachable connecting arm or link *O*, substantially as set forth.

5. The combination, in a traction-engine, of two independent driving-shafts, with a governor-operating shaft operated by either or both of them, substantially as and for the purpose set forth.

6. In a traction-engine, the combination of boiler-casing *A*, steam-dome *C*, water-tank *D*, and suspending-band *D'*, substantially as and for the purpose set forth.

In testimony that I claim the above I have hereunto subscribed my name in the presence of two witnesses.

NOBLE M. DAVIDSON.

Witnesses:

JOHN FRIEDLY,  
SAML. ARBUTHNOT.