(No Model.) 4 Sheets—Sheet 1.

D. BEST.

OIL VAPOR TRACTION ENGINE.

No. 602,594. Patented Apr. 19, 1898.

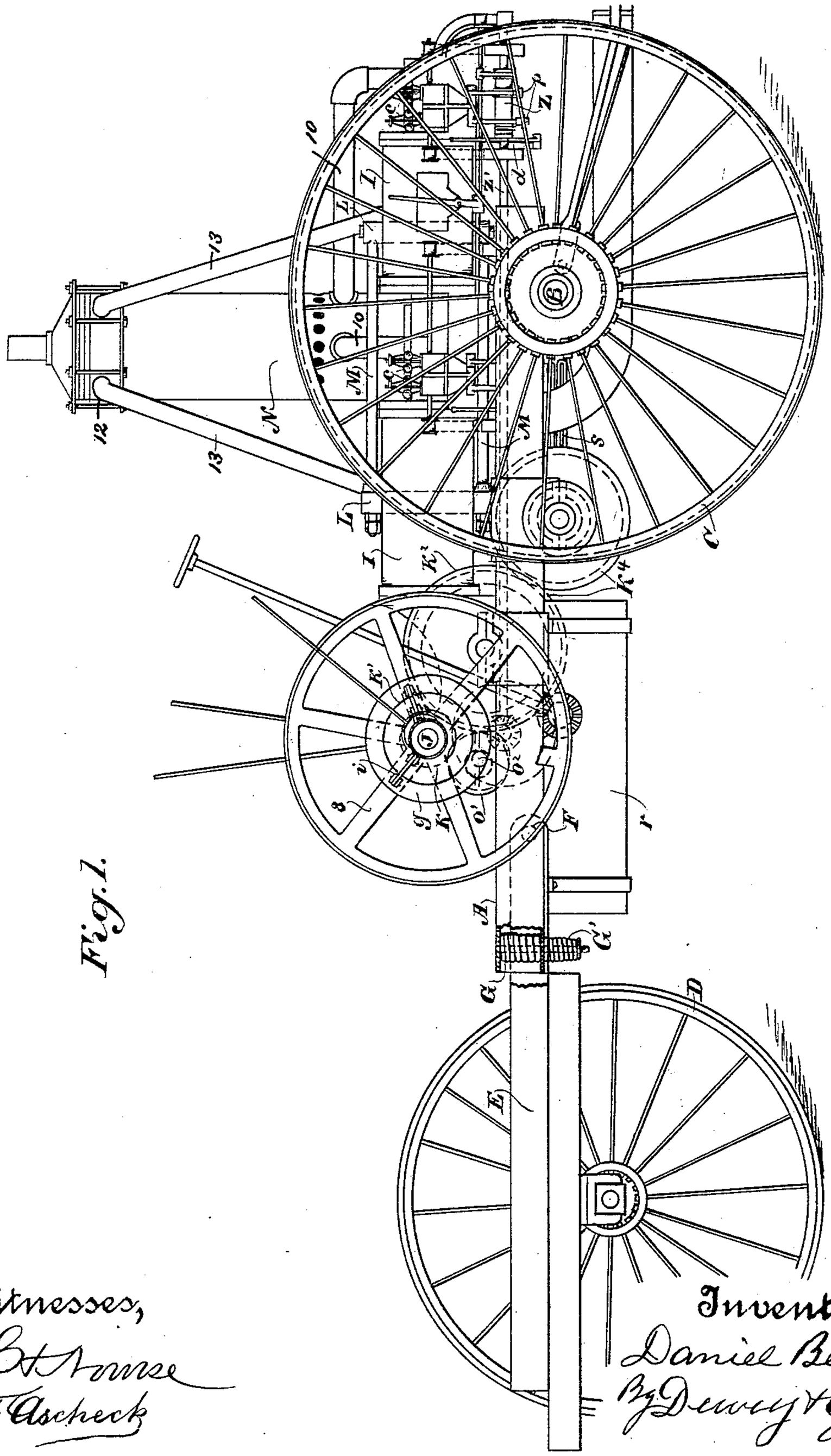

Fig. 1.

Witnesses,
S. H. Howe
H. F. Ascheck

Inventor,
Daniel Best
By Dewey & Co.
Attys

(No Model.)

4 Sheets—Sheet 2.

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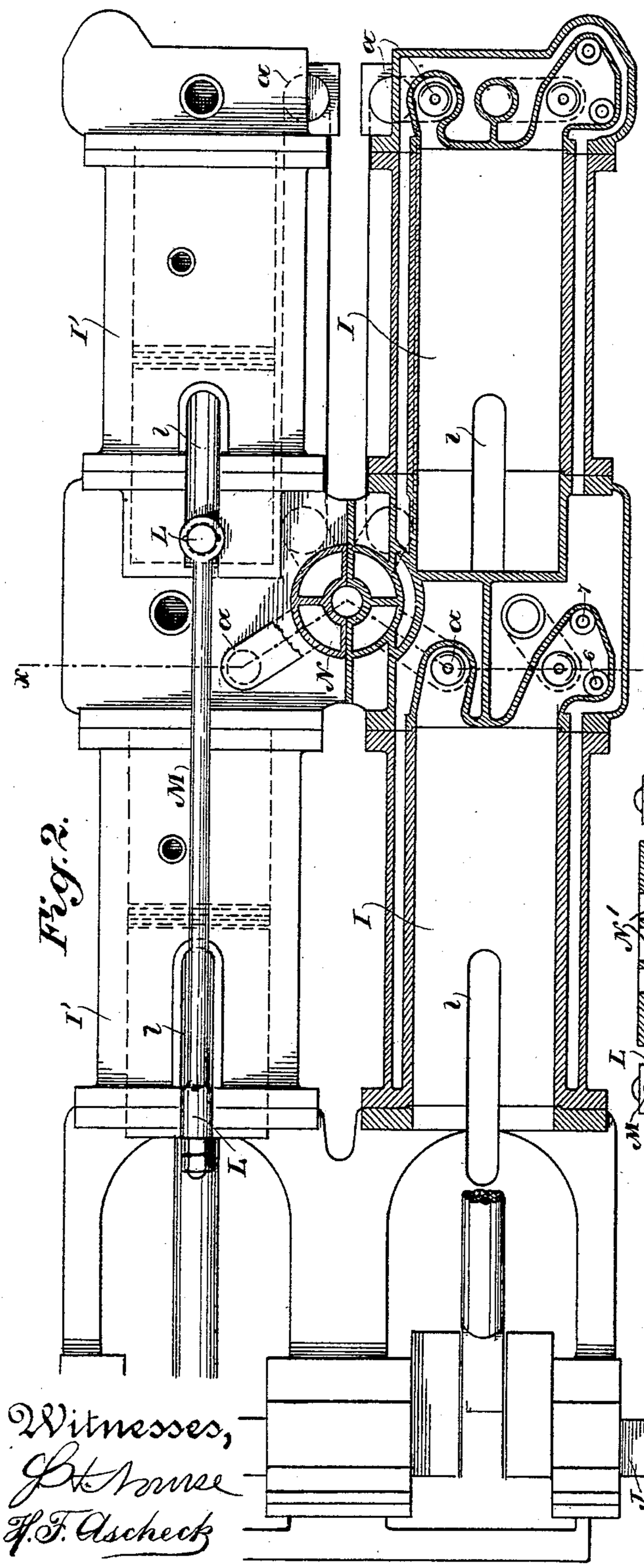

Fig. 2.

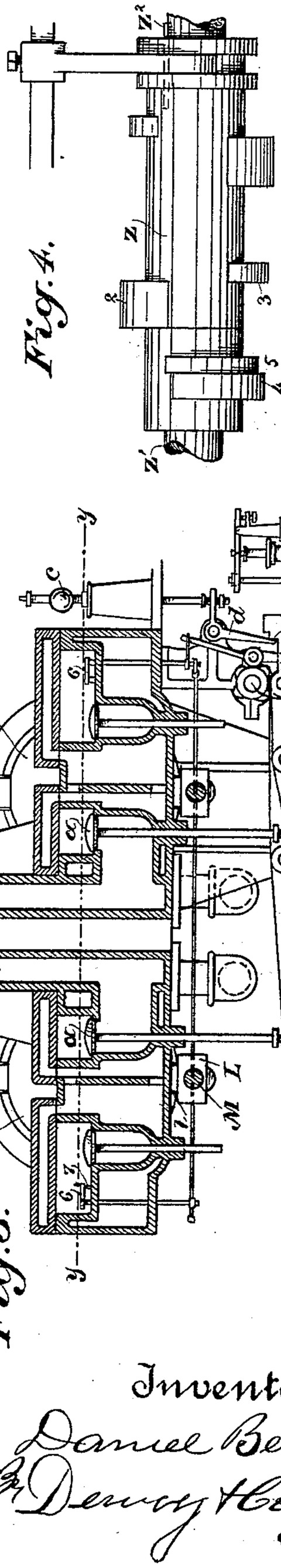

Fig. 4.

Fig. 3.

Witnesses,
J. L. Innes
H. F. Ascheck

Inventor,
Daniel Best
By Dewey & Co
Attys

(No Model.)

4 Sheets—Sheet 3.

D. BEST.

OIL VAPOR TRACTION ENGINE.

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Fig. 6.

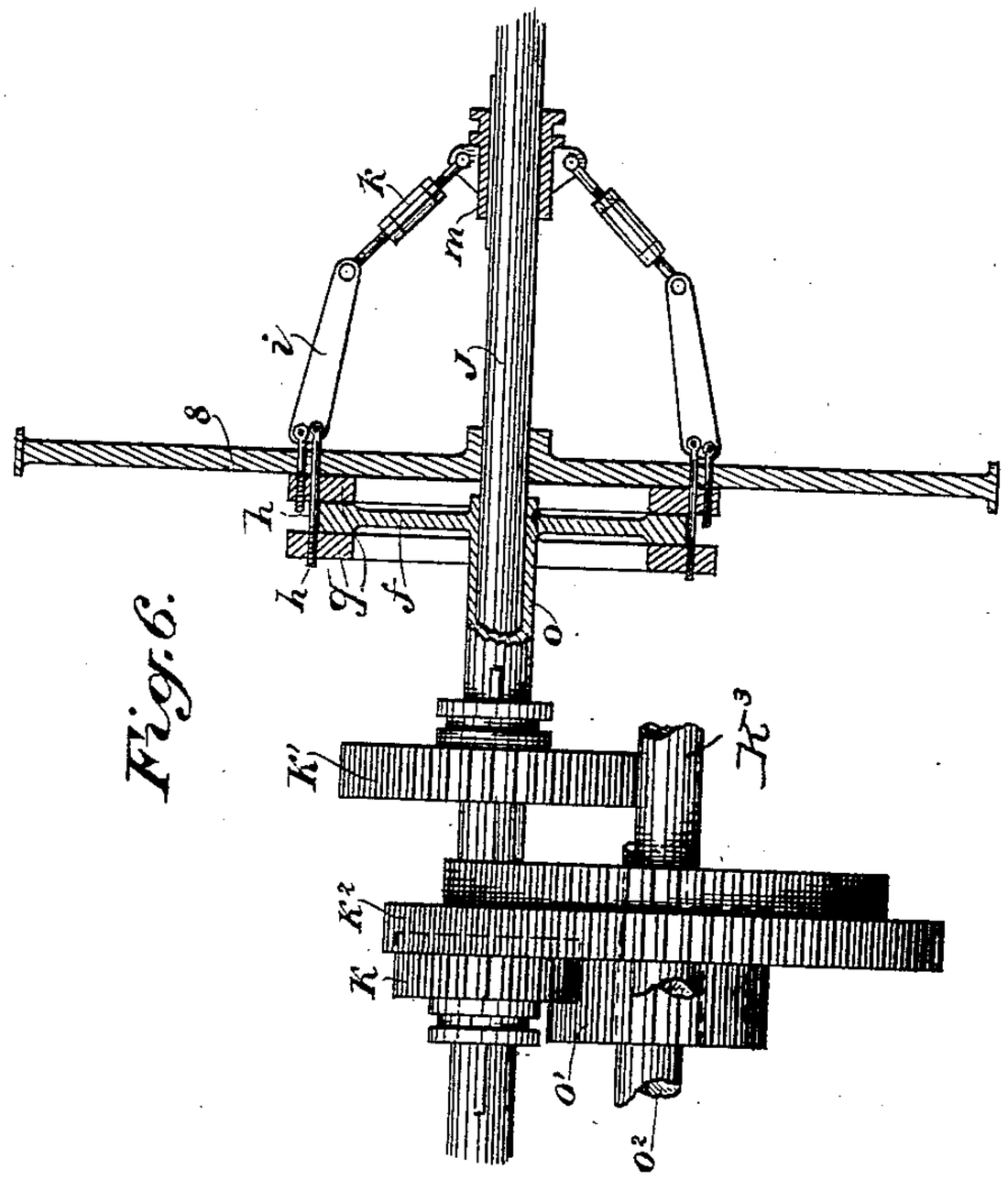
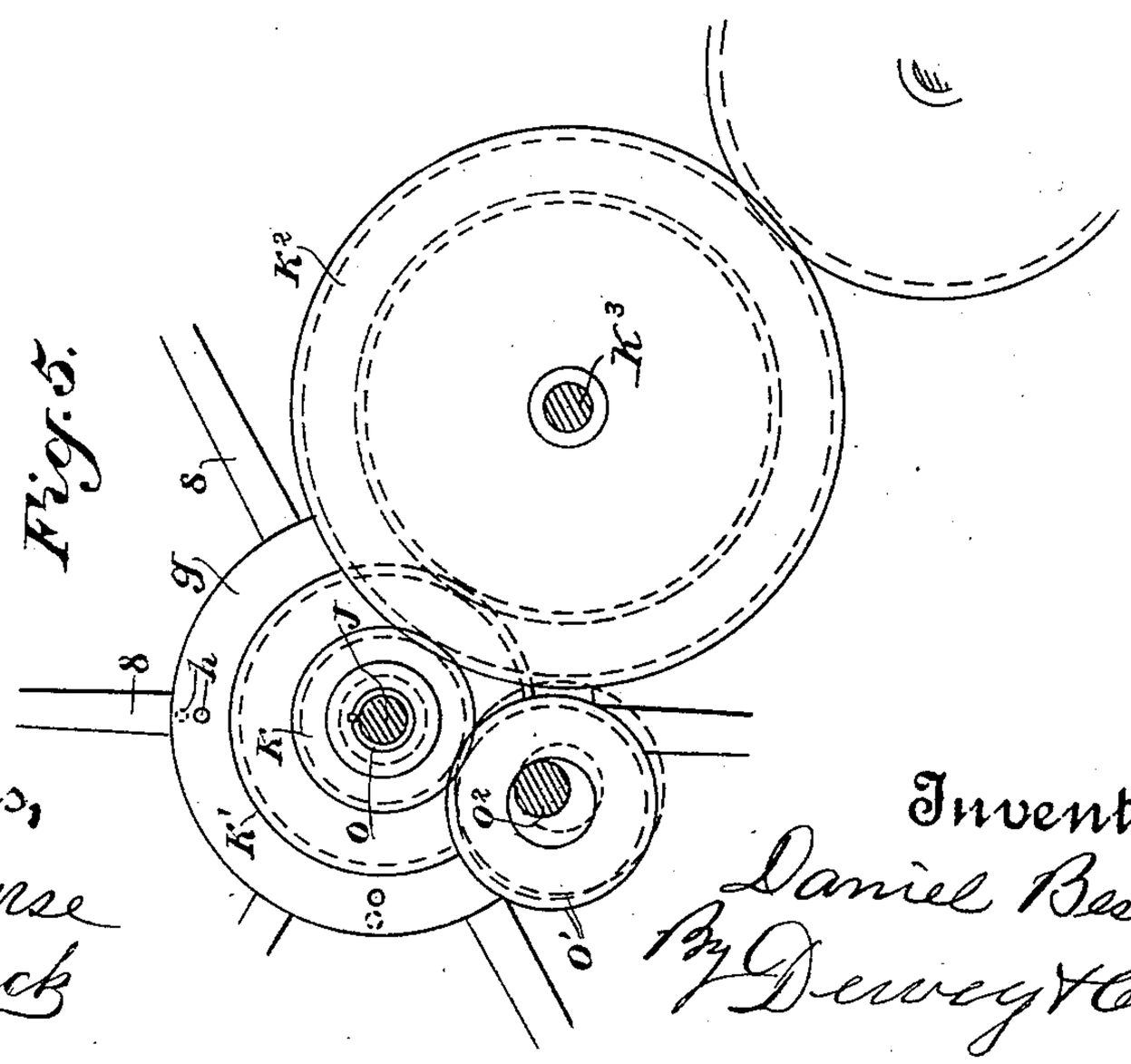


Fig. 5.



Witnesses,
P. Stowe
F. F. Ascheck

Inventor,
Daniel Best
By Dewey & Co.
Attys

(No Model.) 4 Sheets—Sheet 4.

D. BEST.

OIL VAPOR TRACTION ENGINE.

No. 602,594. Patented Apr. 19, 1898.

Fig. 7.

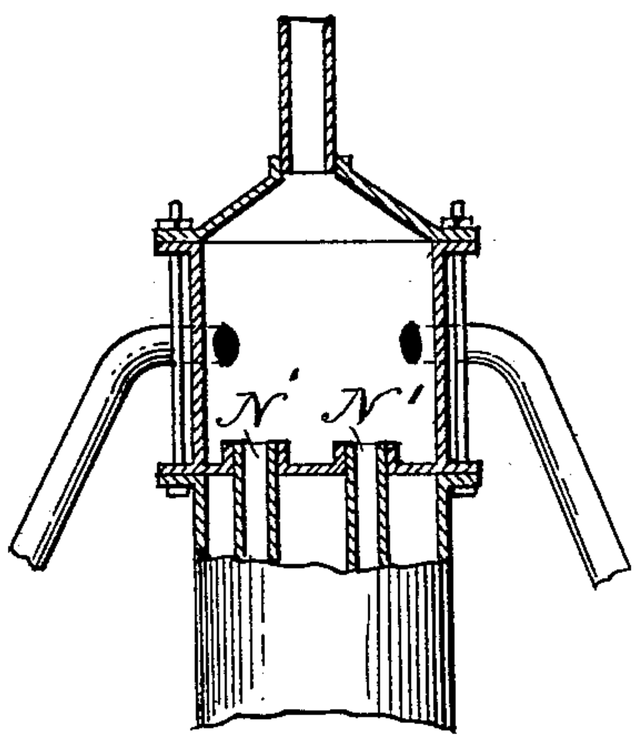


Fig. 8.

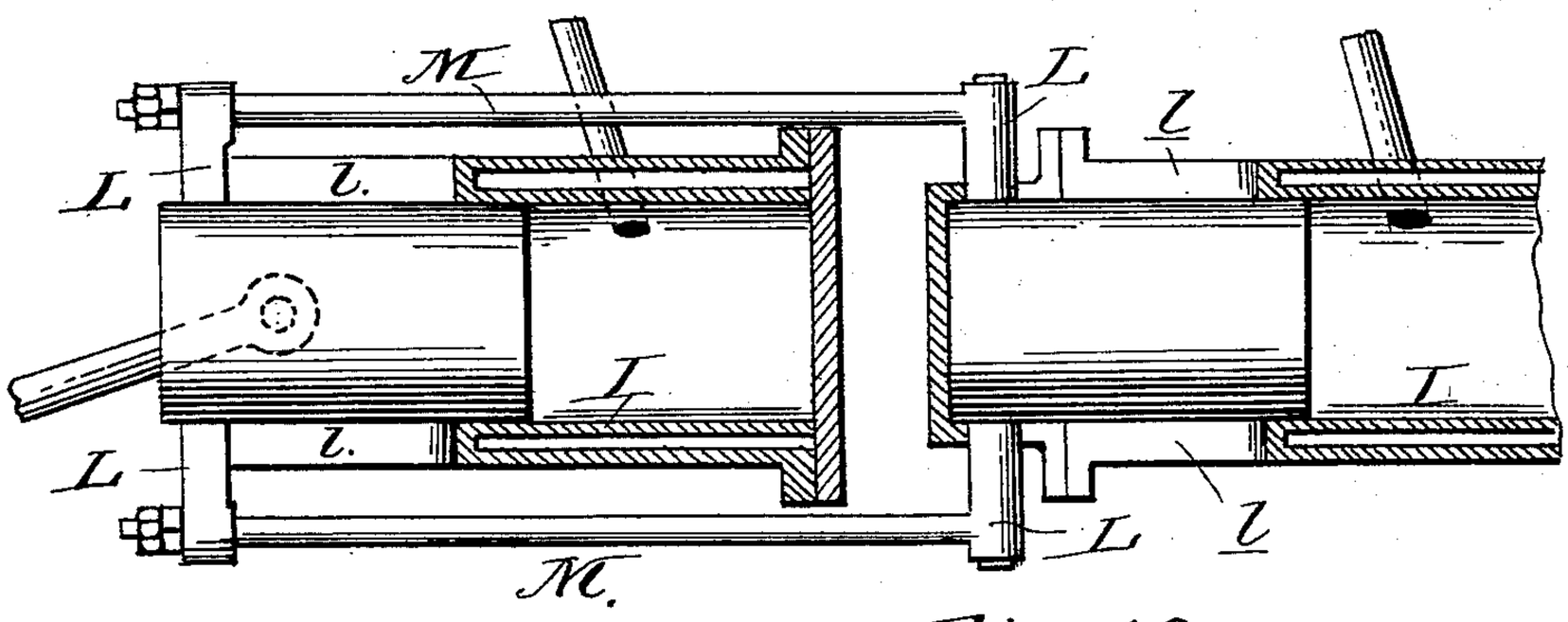


Fig. 9.

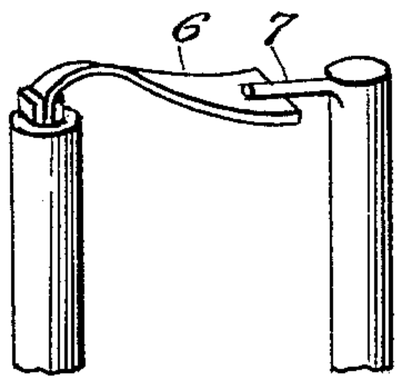
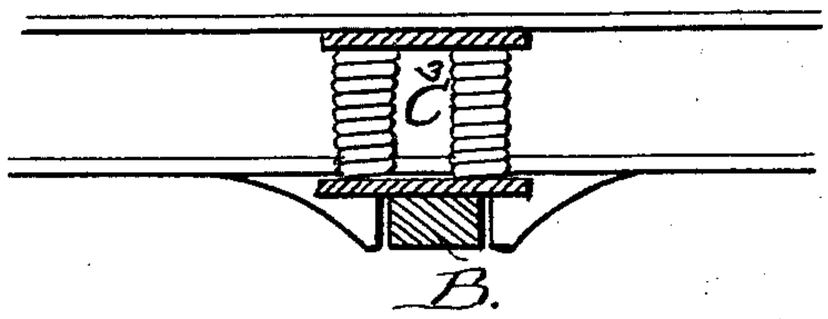


Fig. 10.



WITNESSES

Chapman & Fowler

J. Edw. Fowler

INVENTOR

Daniel Best

by Dewey & Co

his Attorneys

UNITED STATES PATENT OFFICE.

DANIEL BEST, OF SAN LEANDRO, CALIFORNIA.

OIL-VAPOR TRACTION-ENGINE.

SPECIFICATION forming part of Letters Patent No. 602,594, dated April 19, 1898.

Application filed September 14, 1896. Serial No. 605,728. (No model.)

To all whom it may concern:

Be it known that I, DANIEL BEST, a citizen of the United States, residing at San Leandro, county of Alameda, State of California, have invented an Improvement in Oil-Vapor Traction-Engines; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to improvements in what are known as "traction-engines."

It consists, essentially, in the combination, with bearing and driving wheels and a connecting-frame, of hydrocarbon-vapor-propelled engines and mechanism by which the power applied through the engines may be varied to suit the load, and in details of construction, which will be more fully explained by reference to the accompanying drawings, in which—

Figure 1 is a side elevation of my engine. Fig. 2 is a plan view of the cylinders, one set being shown in section on line *y y*, Fig. 3. Fig. 3 is a vertical section of the same on line *x x* of Fig. 2. Fig. 4 is a detail of the cam-carrying sleeve. Fig. 5 is a side view of the reversing or clutch mechanism. Fig. 6 is a front view of the same. Fig. 7 is a detail sectional view of the upper portion of the carbureter. Fig. 8 is a horizontal section showing the cylinder and pistons and the rods M and connections. Fig. 9 is a detail of an igniting device. Fig. 10 is a detail of the springs upon which the rear portion of the machine is supported.

The object of this invention is to provide a self-propelled engine capable of drawing loads upon the roads and which is specially adapted to be used in countries where water cannot be obtained in necessary quantities for the use of steam-engines. To this end I have adapted for my purpose a series of hydrocarbon-vapor engines.

A is the main frame of my engine.

B is the main shaft, having mounted upon it the traction and bearing wheels C, which support the rearmost part of the machine and the greater portion of the weight. At the front is the steering-wheel D. This wheel is journaled upon a supplemental frame E, which is fulcrumed to the main frame, as shown at F, extending thence forwardly from the main frame. Upon the main frame are fixed heavy springs G in such relation that the weight of the front end of the machine is borne upon the springs intermediate between the front of the main frame and the supplemental frame E. This allows a certain amount of vertical motion of the front wheel in passing over rough ground or obstructions and relieves the strain and jar upon the front part of the machine. Beneath the springs G are other springs G′, so arranged that any movement of the parts in the opposite direction will cause a tension upon these springs.

Between the main frame and the shaft of the bearing-wheels C are fixed other spiral springs C^3, (see Fig. 10,) having sufficient tension to bear this portion of the machinery and yield to inequalities and the irregular movements of the bearing-wheels, so that the machinery is protected from sudden jars and injurious strains.

The propelling power of this engine consists of cylinders I I′, arranged in pairs opposite to each other, each pair having its pistons connected together, so as to move in unison, and the pistons being connected with the cranks upon the crank-shaft J, through which power is applied to the traction-wheels by intermediate gearing K in the usual manner.

The cylinders I, standing in line with each other in the direction of travel, are slotted upon the upper and lower part and have cross-heads L, extending through the slots *l* from the pistons with which they are connected, and these cross-heads L are united by rods M, extending from one to the other. The pistons and piston strokes are of such length that the inner end of the piston never passes the inner ends of the slots in the cylinder. Consequently there will be no direct communication between the interior of the cylinder and the outer air. The cylinders I′, standing by the side of and parallel with the cylinders I, have their pistons correspondingly connected with each other, so that they also work in unison, and the pistons of the cylinders I and I′ are each connected by connecting-rods with cranks upon the crank-shaft J, to which the power is applied to rotate it. By disconnecting the rods M of either pair of these engines the front cylinder may be used independently with a light load, or the two pairs may be coupled and all used to-

gether when necessary. The inlet and exhaust valves of both front and rear cylinders are at the same ends, which, for convenience, I will term the "rear" end, and the explosive hydrocarbon vapor is supplied from the carbureter M, which is situated intermediate between the adjacent ends of the cylinders and extends upwardly therefrom, as shown. The construction and operation of this carbureter, which forms no essential portion of the present invention, are fully disclosed in my former patent, No. 588,381, dated August 17, 1897. From this carbureter pipes 10 lead to each of the cylinders and to the inlet-valves, and these inlet-valves are opened by suitable mechanism—such as that shown in my former patent, No. 544,879, dated August 20, 1895—so that the hydrocarbon vapor is admitted at the proper time into each of the cylinders as the pistons move away from the inlet-valves and is compressed by the return of the pistons, and is exploded by an electrical spark at the proper time after the cranks have passed the center and the pistons are beginning to move outward again, this operation being essentially the same in all engines of this class; but the mechanism by which the various actions are produced is somewhat different. The exhaust from the cylinders discharges through passages N′ and passes through the carbureter and into a common exhaust-chamber 12 above, as shown in my former patent, No. 588,381, dated August 17, 1897, and I divert a portion of the exhaust when the exhaust is greater than is necessary and carry it directly into said chamber 12 by means of the pipes 13, which connect with cylinders at points intermediate of their length, the connection of these parts being shown in detail in my said former patent, No. 588,381.

The valves of the engines are actuated by eccentrics or cams 2 and 3 upon a sleeve Z. This sleeve is slidable upon the rotating shaft Z′, moving on a feather Z^2, so that it may be moved longitudinally a distance sufficient to disengage one or the other of the eccentrics or cams from the levers by which the valves are actuated. This movement of the sleeve is effected by a lever and is made for the purpose of using a cam 3 for starting purposes, which is set differently from the main cam 2. The latter closes the exhaust-valve, so that when the engine-piston returns after having drawn a charge of gas into the cylinder it compresses it in the rear of the cylinder and the explosion-chamber, and the compressed charge is then ignited, so as to produce the highest efficiency. When the engine is first started, having no momentum, it is not possible to use this high compression. Therefore the sleeve is moved by a lever, as above stated, so that the cam 3 is brought into position to act on the valve-lever, and this keeps the exhaust-valve open so long that there is little or no compression of the gas in the cylinder. The cams 4 and 5, which actuate the igniting device, correspond in position with 2 and 3, and the cam 5 is so set that the spark to ignite the charge is produced after the crank has passed the center. As soon as one or two revolutions have been made the cams are shifted to their normal position.

The exhaust-valves *a* are shown in the transverse section, and they are actuated by the levers *p*, one end of each lever acting as a toe or lifter to raise the valves at the proper time. These levers are moved by eccentrics on the sleeve Z, as before described; but when it is desired to cut out any one of the engines the action of its governor *c* moves the bell-crank lever *d* so that the point will engage with a notch or step *e* upon the end of the lever *p*, which controls its particular valve. When this engagement takes place, the exhaust-valve *a* remains open, and the movement of the piston then draws air in through this exhaust-valve and expels it at each reciprocation without there being any opening of the inlet-valve to admit any of the hydrocarbon vapor, and consequently no explosive action will take place within this cylinder as long as the exhaust-valve remains open. As soon as the speed of the engine is again reduced so that the governor acts in the opposite direction it withdraws the arm of the bell-crank lever *d* from the step *e*, and thus allows the lever to tilt so as to come in contact with the actuating cam or eccentric, when the valve will then remain closed at the proper time, so that the inlet-valve will be opened and the usual operation of the engine again take place, the exhaust-valve being opened regularly for the escape of the waste vapors when the piston returns toward the rear end of the cylinder.

The igniting device (see Fig. 9) may be of any of the well-known forms; but I prefer to use a device of my own invention, consisting of a diagonally-set elastic propeller-like blade 6, which is fixed to a shaft connected with one of the battery-poles and which is oscillated by the action of the cam 4 or 5 on the sleeve Z, as before described. This igniting device is fully described and claimed in my former patent, No. 484,727, dated October 18, 1892. The other pole of the battery is connected with a stationary pin 7, so set with relation to the propeller-blade that the latter touches it alternately with its upper and its lower surfaces as it oscillates, its elasticity allowing it to bend each way as it passes the pin, and a spark is produced as contact is broken. This igniting device is substantially what is shown and described in my former patent, No. 484,727, dated October 18, 1892; but any other well-known device of this character may be used without departing from the spirit of my invention.

Power is transmitted from the engine to the crank-shaft J, as previously described, and from this through the intermediate gear-wheels K K^2 K^4 to the traction-wheel C. This power is practically transmitted through a

friction-clutch. This clutch consists of a plate or disk *f*, situated between two other rings *g*. The rings *g* are connected with the fly-wheel S on the shaft J by studs *h*, passing through it, and the disk *f* is fixed to a sleeve *o*, which turns loosely on the shaft J and carries the main driving-gears K and K′, of different sizes, which are slidable on a feather on the sleeve *o*, and one or the other may be engaged with a corresponding gear K^2 on an intermediate shaft K^3 to transmit a higher or lower speed to it, and thence to the traction-wheels C. The rings *g* are each connected by a stud *h* with the adjacent end of levers *i*, and these levers are each connected with the end of arms *k*, the opposite end of which is connected with a sleeve *m*, slidable upon the shaft J. This sleeve is actuated by a suitable lever or mechanism, and when moved in one direction it presses upon the connecting-rod *k*, and this actuates the levers *i* and the studs *h* in opposite directions and forces the disks *g* to clamp strongly upon the plate *f*. When moved in the opposite direction, the disks are disengaged and the disk *f* is allowed to stop, the others continuing with the engine-shaft and fly-wheel. The length of the connecting-rod *k* is adjustable by making it in two parts with right and left screw-threads, respectively, and a coupling-sleeve turnable upon these threads, so that it may be lengthened or shortened at will.

The reversing of the engine is effected by means of a pinion *o*′, which is mounted eccentrically upon a shaft o^2, so as to engage with the two gears K and K^2 or to be disengaged therefrom by partially turning this shaft. When the gears K and K^2 engage directly, the machine will be driven forward. If it is desired to reverse it, the clutch *f g* is disengaged and the gear K is no longer driven. It is then shifted along its shaft until disengaged from K^2, but still remaining in engagement with the pinion *o*′, which is made long for that purpose. Now by turning the eccentric o^2 so as to also engage the pinion *o*′ with the gear K^2, as well as K, the movement of the former will be reversed and the machine will be driven in the opposite direction when the friction-clutch is again engaged.

The tanks for the petroleum or hydrocarbon liquid to be used are situated at any suitable or convenient point upon the frame of the machine, as shown at *r*, and from these tanks the hydrocarbon may be pumped or otherwise delivered to the carbureter by any well-known means.

A certain amount of water is necessary to surround the cylinders and valve-chambers in order to prevent too great a heat by the constant explosions, and in order to preserve this water and use it over and over under conditions where a good supply is not obtainable I employ a system of pipes so arranged, as at *s*, that the water is constantly circulated through these pipes and around the jackets of the engines. After leaving the jacket of the cylinders the water passes into these pipes, which form a long continuous series and zig-zag back and forward, being exposed to the air, so that the temperature of the water will be cooled down sufficiently before it is again carried around the cylinder-jackets.

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

1. A traction-engine comprising a frame and supporting and driving wheels upon which it is mounted, an engine consisting of two sets of cylinders mounted in pairs one behind the other and each cylinder having the top and bottom of its open end formed with longitudinal slots or channels, cross-heads or pins projecting from the pistons and slidable in said slots, detachable connecting-rods uniting said cross-heads whereby the cylinders of each pair may be used together or the rearmost piston disengaged and only one pair be employed, connections between the pistons of the foremost cylinders and a crank-shaft, and gearing intermediate between said crank-shaft and the driving-wheels whereby power is transmitted thereto, and a carbureter intermediate of the adjacent ends of the cylinders and connections between the same and said cylinders.

2. A traction-engine comprising in a single structure, pairs of horizontal engines with the cylinders of each pair independently coupled in line, pistons reciprocating in the cylinders, having pins or cross-heads extending from them and rods detachably connecting said rods with the cross-heads, a carbureter, vertically disposed in the space between the adjacent ends of the pairs of cylinders and means connecting said carbureter with each cylinder.

3. In a traction-engine, the main and engine frame mounted upon bearing and traction wheels, an engine supported thereon consisting of two pairs of horizontally-disposed cylinders, each pair having their pistons detachably connected, a vertical carbureter standing in the space intermediate between the adjacent ends of the four cylinders, connections between the carbureter and the inlet-passages, and between the exhaust-passages of each of the cylinders and the carbureter whereby the exhaust products of all the engines in operation are passed therethrough.

4. In a traction-engine, a main frame, bearing and traction wheels upon which it is supported, an engine consisting of two pairs of horizontally-disposed cylinders standing in line, pistons reciprocating therein, exterior connections between each of the lineal pairs of pistons and connections between the foremost pistons and a crank-shaft through which power is transmitted to the traction-wheels, means for disengaging the rearmost pistons from the foremost whereby the power of only one pair of cylinders will be used, a vertical carbureter situated between the adjacent ends of the four cylinders, inlet and exhaust

passages from the engines connecting with said cylinders and cam-actuated levers whereby the valves are alternately opened and closed at proper intervals.

5. In a traction-engine, a main frame, traction and steering wheels, and intermediate elastic supports between the frame and the wheels as shown, an engine consisting of four horizontal cylinders coupled together in pairs, one behind the other, with detachable connecting-rods between the pistons of the front and rear cylinders, a vertically-disposed carbureter standing between the adjacent ends of the cylinders, supply-pipes extending therefrom to the inlet-valve of each cylinder and passages from the exhaust-valves of the cylinders to the carbureter, supplemental exhaust-pipes connecting with the cylinders and leading therefrom to the exhaust-chamber above the carbureter whereby the hot exhaust products may be partially diverted so as not to pass through the carbureter.

6. In a traction-engine, a main frame, bearing and traction wheels upon which said frame is supported, a supplemental frame having its rear end hinged to the main frame and the front end carrying journal-boxes of a front steering-wheel, springs G and G′ forming independent concentric coils and forming a fulcrum connection between the main and supplemental frames substantially as described.

7. In a traction-engine, main bearing and driving wheels, a framework and propelling-engines mounted thereon, a gearing interposed between the engines and the driving-wheels whereby power is applied to advance the machine, a pinion eccentrically mounted so as to be engaged with or disengaged from the main gears, one of said gears being slidable upon a feather in the shaft so as to be indirectly connected with its fellow through the pinion whereby the direction of the machine may be reversed, and a friction-clutch consisting of disks fixed to the sleeve which carries the driving-gear, clamping-rings connecting with the crank-shaft which passes through said sleeve, and mechanism whereby the rings may be clamped to the disk to impart motion to it and the gears are disengaged therefrom to allow the gears to be shifted with relation to the pinion to reverse the engine.

8. In a traction-engine, a frame, driving and steering wheels upon which the frame is supported, a crank-shaft journaled upon the frame, and engines from which power is transmitted to said shaft, gear-wheels intermediate between the crank-shaft and the driving-wheels, and a pinion eccentrically mounted so as to be engaged with or disengaged from the main gears, one of said gears being also slidable upon a feather so as to be indirectly connected with its fellow through the pinion, whereby the movement of the machine may be reversed.

9. A reversing mechanism consisting of a gear-wheel fixed upon a shaft to which power is to be transmitted, a parallel shaft with a gear slidable upon a feather so as to engage the first-named gear to drive directly, a second gear upon the second shaft, and a pinion long enough to remain in mesh with these two gears when they are shifted, said pinion being mounted eccentrically upon a third shaft with a mechanism by which it may be turned to engage the gears upon the first and second shaft as an intermediate, whereby the mechanism is reversed.

In witness whereof I have hereunto set my hand.

DANIEL BEST.

Witnesses:
ANTONIO AUGUST,
D. H. GLEASON.