No. 637,658. Patented Nov. 21, 1899.

J. PENDER.

MOTOR VEHICLE.

(Application filed Mar. 15, 1898.)

(No Model.) 5 Sheets—Sheet 1.

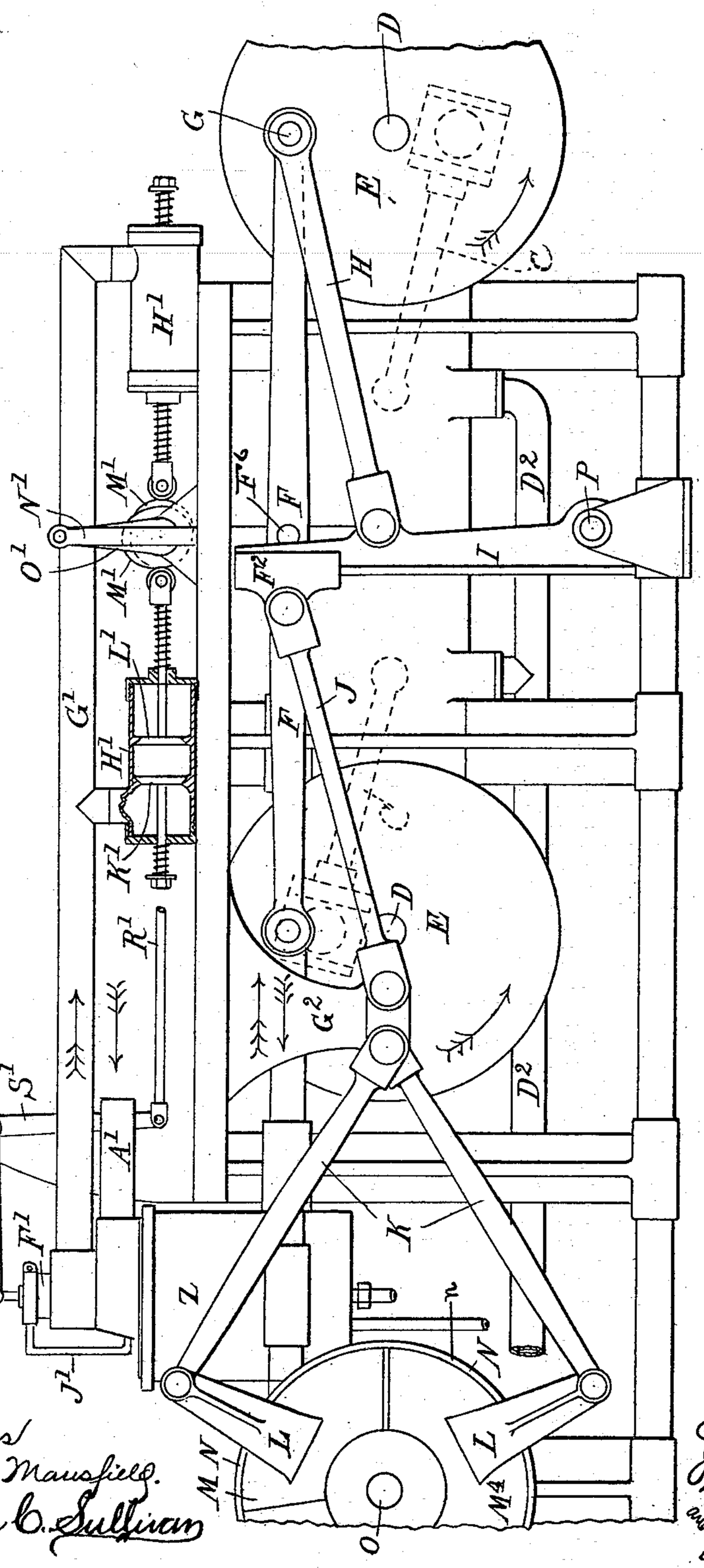

Fig 1.

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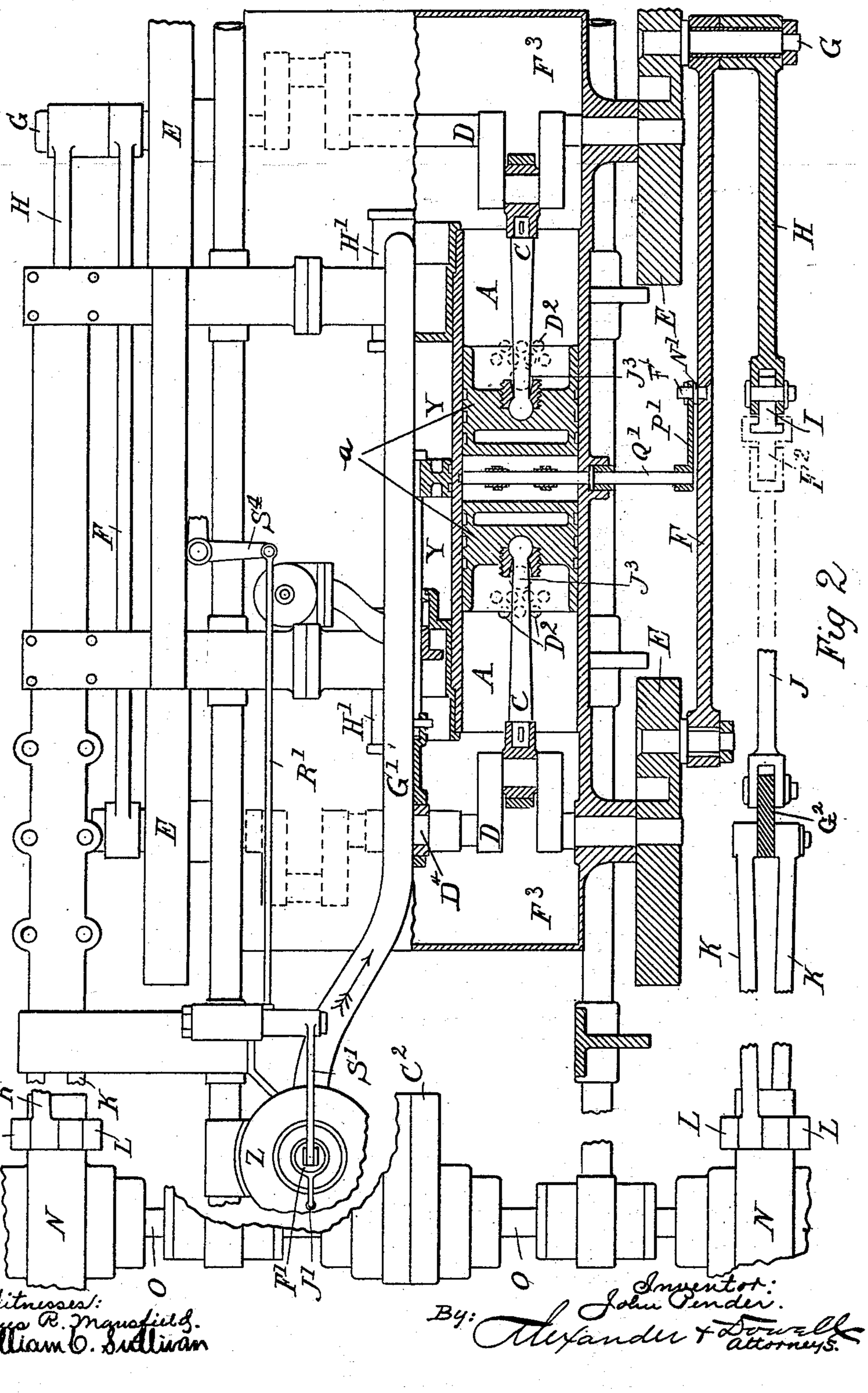

Fig 2

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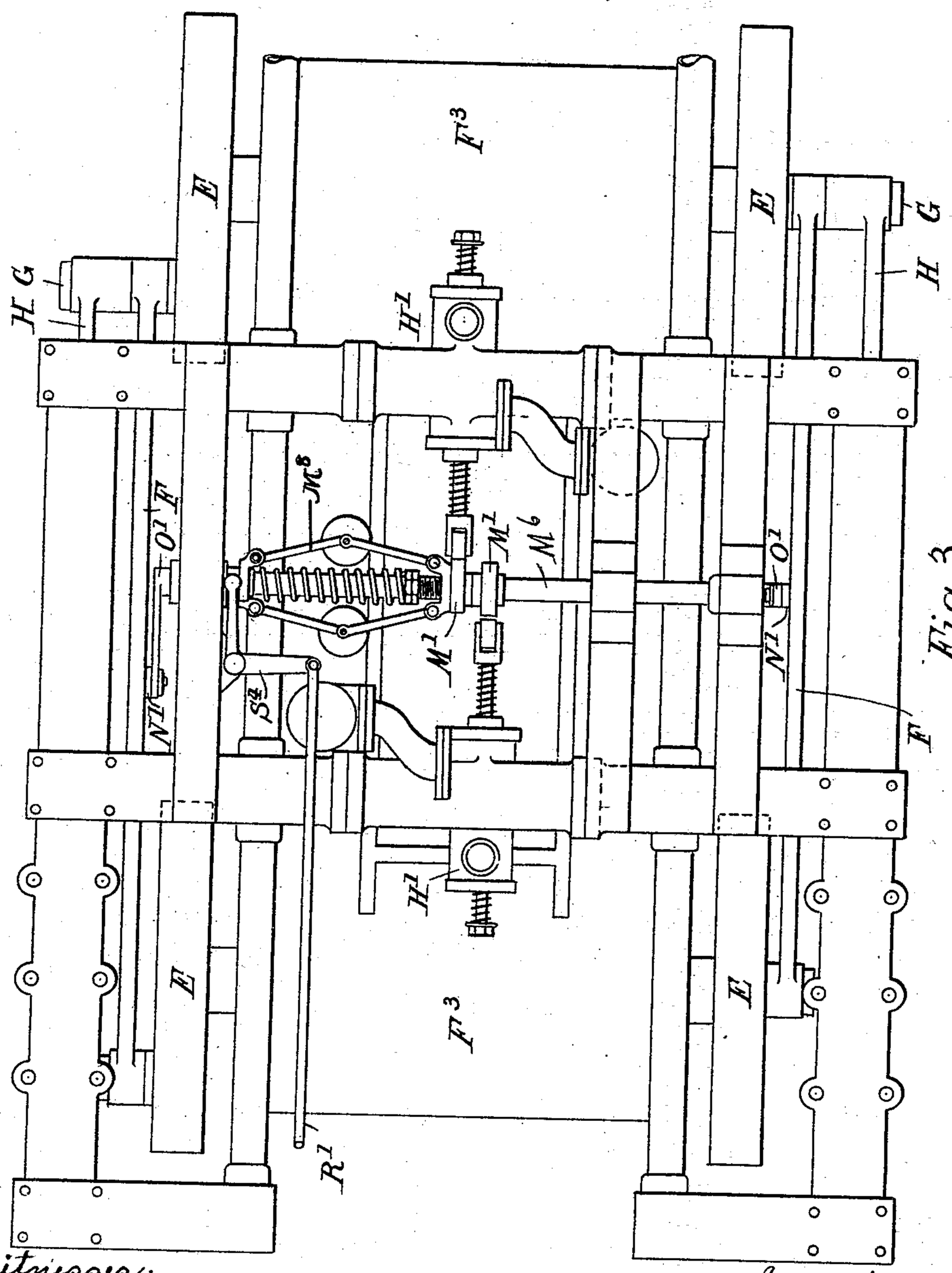

Fig 3

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(No Model.) 5 Sheets—Sheet 4.

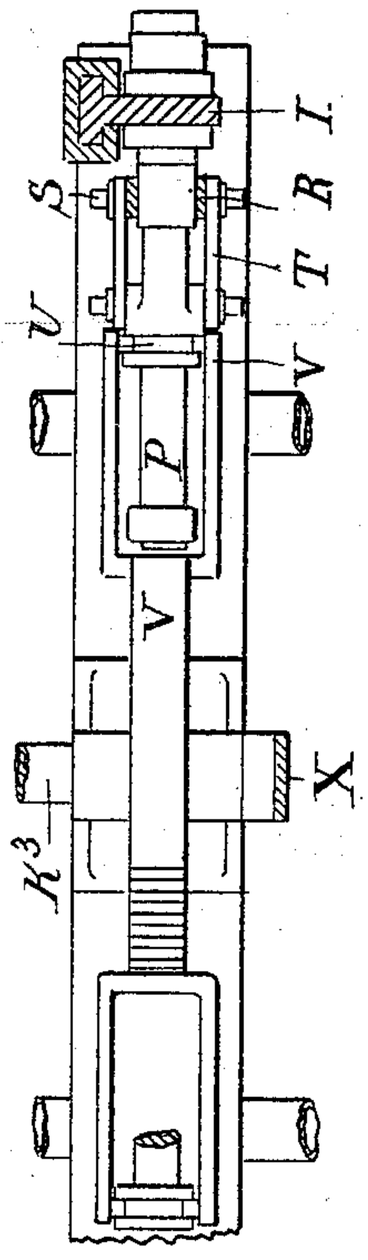

Fig 5

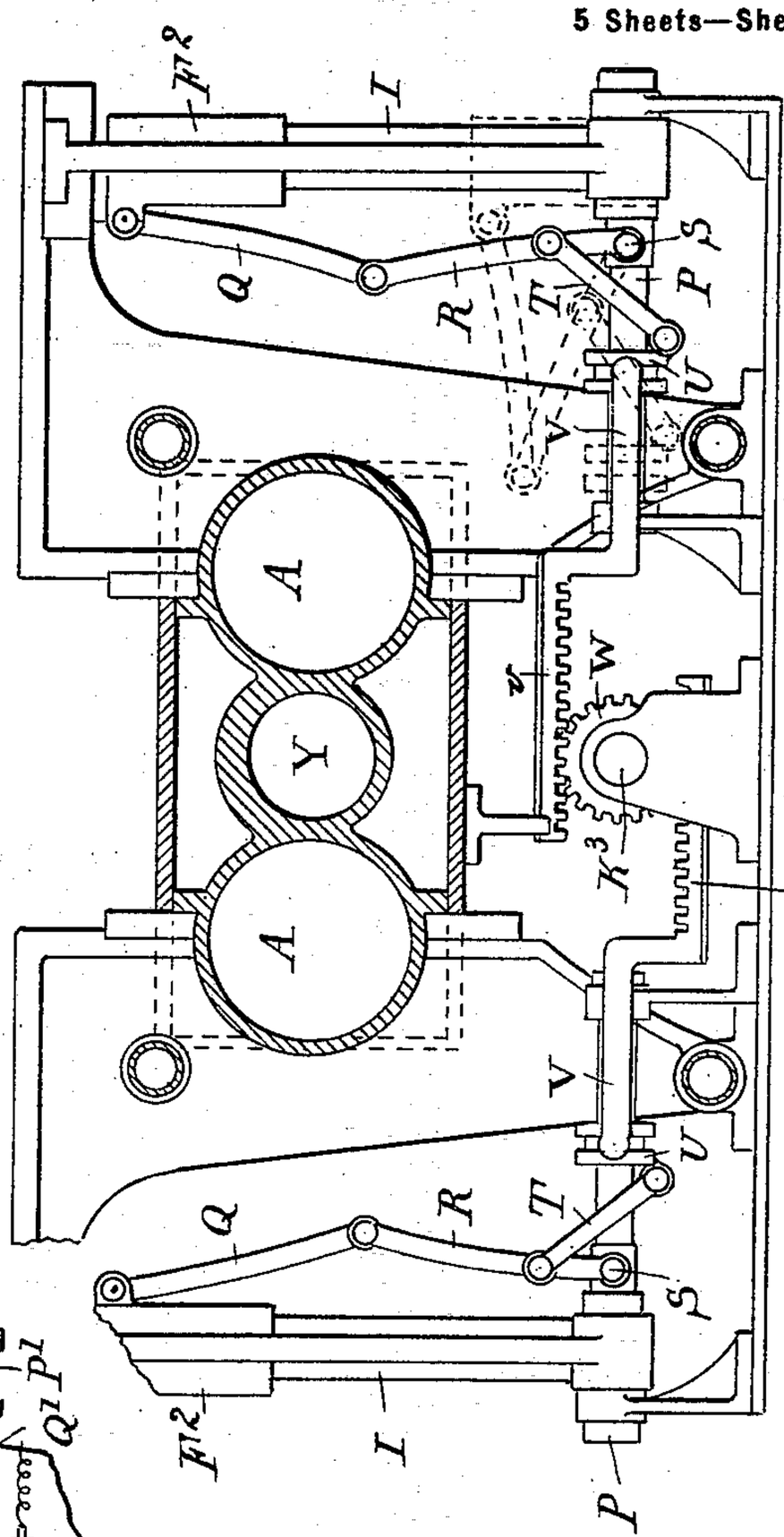

Fig. 6

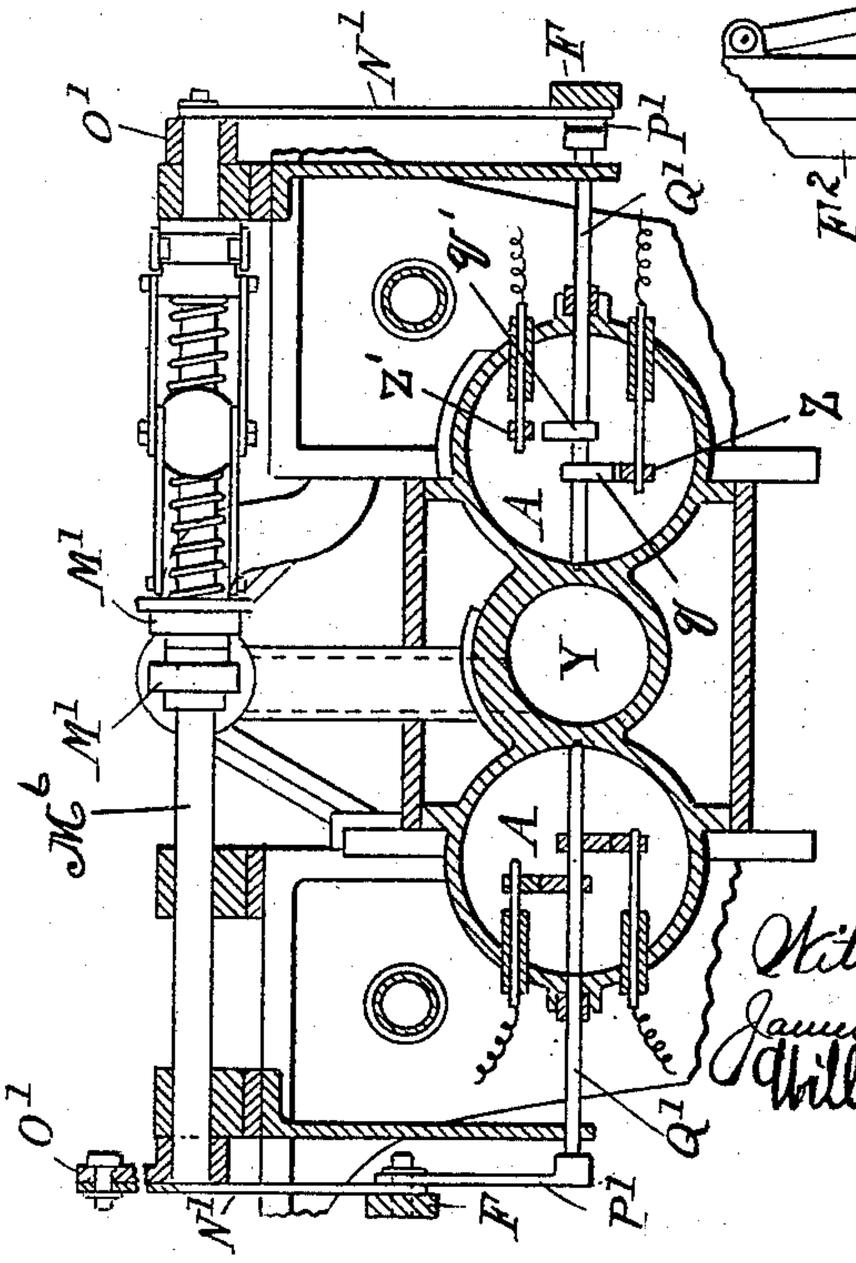

Fig 4

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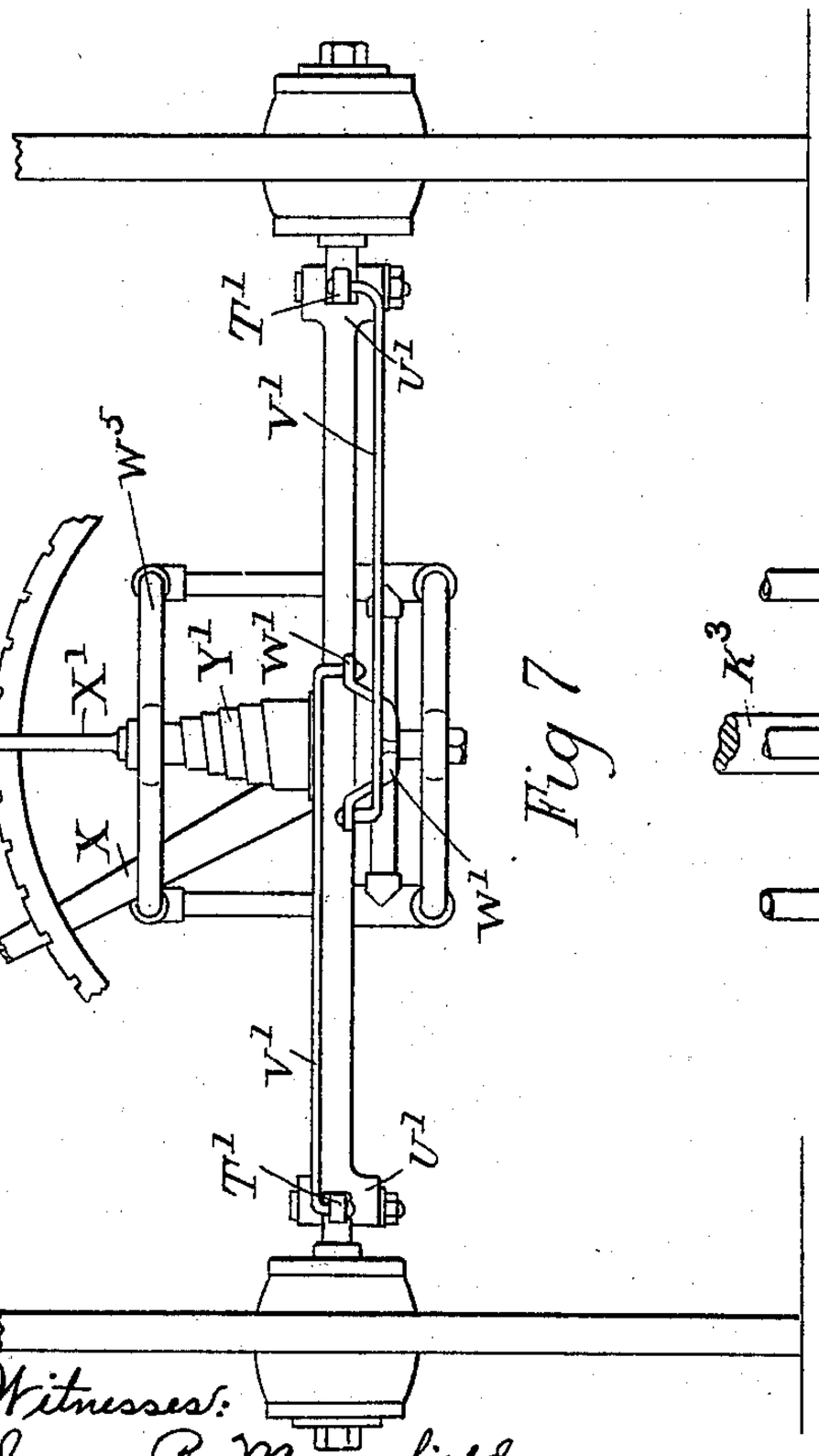

Fig 7

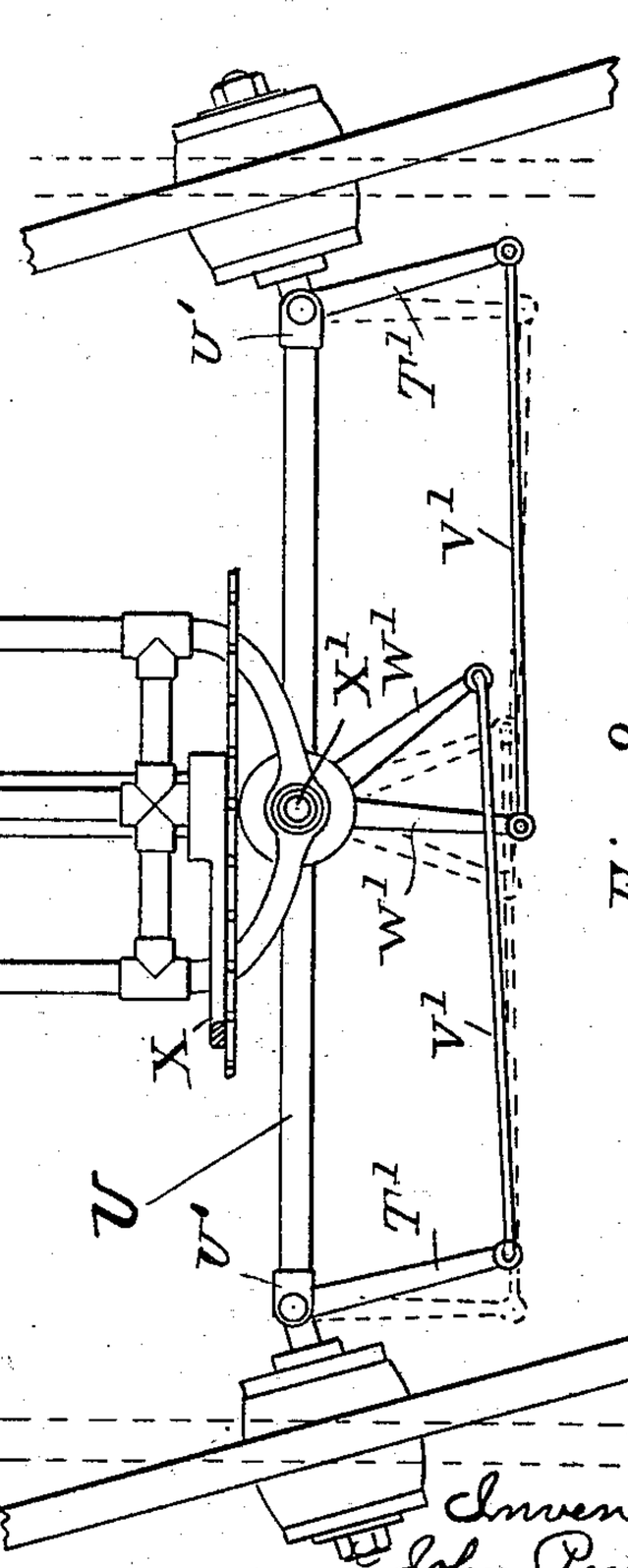

Fig 8

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UNITED STATES PATENT OFFICE.

JOHN PENDER, OF BRUNSWICK, VICTORIA.

MOTOR-VEHICLE.

SPECIFICATION forming part of Letters Patent No. 637,658, dated November 21, 1899.

Application filed March 15, 1898. Serial No. 673,961. (No model.)

To all whom it may concern:

Be it known that I, JOHN PENDER, engineer, a subject of the Queen of Great Britain and Ireland, and a resident of the Nail Works, Tinning street, Brunswick, in the Colony of Victoria, have invented certain new and useful Improvements in and Connected with the Motors and Mechanism of Mechanically-Propelled Vehicles, of which the following is a specification.

The object of my invention is to provide a mechanism for power-propelled vehicles which shall have neither chain nor leather belts nor continually-rotating toothed or sprocket wheels. It is operated by an explosion-engine, in which vaporized oil is the actuating agent, and is so constructed that it is applicable to any class of conveyance. All the parts being accurately balanced the vibration is reduced to a minimum and the explosions, of which there is one to each revolution of each opposite pair of cranks, is absorbed by two pistons in each cylinder. The explosive mixture is electrically ignited, and by a simple system of crank-levers and connecting-rods a variable-speed-transmission gear is obtained which is most effective in action. From it can be communicated to the main driving-axle all speeds or variations of the same from zero to any predetermined maximum without in any way altering the speed of the motor. The maximum power for hill-climbing and rough roads, as also all changes of speed, is obtained by the movement of one lever by the driver. By a special form of clutch-box secured to the main or driving shaft a rotary motion is imparted to the said shaft from a reciprocatory slide moving along the engine-frame. By this mechanism heavy loads or steep upgrades are treated without any unusual labor, since the power transmitted from the motor can be regulated by a rocking lever hereinafter described. The wheels are so arranged upon their driving-shaft that one can overrun or underrun the other, and thereby allow for the major curve in turning.

My invention consists of two crank-shafts, between which are two cylinders both ends of which are open. In each of these cylinders are two pistons, expelled by the same explosion occurring at each revolution. These pistons by connecting-rods are coupled to opposite cranks in such a way that they drive them in the same direction. From disks at the end of one of the crank-shafts a reciprocatory motion is conveyed by connecting-rods to a vertical rocking lever pivoted at its bottom. Up and down this lever adjustably slides (thus providing a variable transmission-gear) one end of a connecting-rod, the other end of which is pivoted to a horizontally-moving slide. To this slide are pivoted two connecting-rods, the other ends of which are connected to pins on arms protruding from cheeks moving within a clutch-box on the main or rear wheel driving-shaft. Though these connecting-rods have a reciprocatory motion, they transfer a rotary one to the driving-shaft in the manner hereinafter described. The air charge for the explosions is drawn by a double-acting air-pump (situated between the two cylinders and operated by a crank on one of the crank-shafts) through a carbureter. It then passes through valves regulated by a cam above the cylinders and enters each cylinder alternately after the pistons have covered the exhaust-port on their inward stroke. It is then compressed by the ingoing pistons and ignited.

Referring to the drawings which form a part of this specification, Figure 1 represents a side elevation of one of the motor-cylinders, showing in dotted lines the two connecting-rods which are operated by the two pistons, likewise the clutch-box and mechanism by which a reciprocatory motion is transformed into a rotary motion. Fig. 2 shows a plan of the same, partly in section. Fig. 3 also represents a plan showing the governor-gear. Fig. 4 represents an end elevation, partly in section, showing the electric igniting devices and the rotating shafts by which the circuits are completed and broken. Fig. 5 shows a plan of one side of the variable transmission-gear. Fig. 6 also shows an end elevation depicting more clearly the variable transmission-gear at its maximum travel, whereas in dotted lines it is seen so situated that no motion is imparted to the clutch. Fig. 7 is a front elevation of the steering-gear and shows also the lever and quadrant by which the speed is regulated. There is also seen the volute spring upon which the front of the motor-frame is

mounted. Fig. 8 is a plan of the steering-gear, showing in solid lines the position the wheels can assume in steering, though, as can be well understood, the levers operating the same can be so arranged that the obliquity of the two wheels can be greatly increased.

Similar letters of reference indicate similar or corresponding parts where they occur in the several views.

On reference to the drawings it will be seen that A is a cylinder open at both ends and in which are two pistons *a a*. These are coupled by connecting-rods C, as shown, to cranks on the two crank-shafts D, which cranks rotate in the oil splash-boxes F^3. The four cranks on these shafts are all arranged in the one plane. Secured to each end of the said shafts are disks E. Between and connecting each pair of these disks is a connecting-rod F, whereby the two crank-shafts D are caused to always maintain the same relative speed and position. The crank-pins G on the two opposite disks of one of the shafts are elongated, Fig. 2, and to them are coupled pitman-rods H. These pins G in elevation are preferably situated at right angles to each other. The other end of pitman-rod H is pivoted to one side of a lever I, pivoted on its bottom end to a rocking shaft P, rocking in bearings secured to the tubular frame of the machine. To an adjustable block F^2, Figs. 1, 5, 6, and 7, which travels up and down on lever I, and which forms part of the variable-speed-transmission gear described hereinafter, is pivoted one end of a link J, the other end of which is attached to a slide G^2, which moves in a horizontal plane. To this slide are pivoted two connecting-rods K, the other ends of which are pivoted to arms L. By this means the clutch-box is revolved continuously in one direction no matter which way the rods K are moving.

The manner in which the speed of the vehicle is varied independently of the motor (which generally travels at a uniform or predetermined rate) is as follows: By referring to Fig. 6 it will be seen that the position of the blocks F^2 on levers I is regulated by toggle-levers R and Q, the top ends of which are pivoted to the blocks F^2 and the bottom ends of which are pivoted to the pins S, which are secured to and rock with the shaft P. Between the ends of lever R are coupled the links T, the lower ends of which are connected to a sleeve U. This has collars thereon between which engage pins at the end of a forked slide V. At the other end of V is a toothed rack *v*, engaging with and moved backward and forward by a toothed pinion W and a shaft K^3. This shaft is operated by the speed-varying lever X, Figs. 6, 7, and 8. The position of the links and levers when the vehicle is stationary and the engine traveling is seen by the dotted lines, Fig. 6.

The mechanism for pumping, carbureting, regulating, and igniting the charges for the cylinders is as as follows: Operated by an intermediate crank D^4 at right angles to its fellows and situated between the two cylinders *a* is a double-acting air-pump Y. The air to this enters the carbureter Z at A′, Figs. 1 and 2. In a carbureter the air is mixed with oil or gas to form an explosive mixture. I do not herein claim the construction of a carbureter, as any suitable known form of carbureter may be employed; but the carbureter should be constructed with suitable means for regulating the quality of the explosive mixture, which means can be controlled from a governor M^8, Fig. 3, by connections S^4, R′, and S′, but is not herein claimed. From the carbureter the gaseous mixture passes through the pipe G′ to the regulating-valve casing H′ H′. Having reached the valve-casing H′ the vapor forces the suction-valve K′, Fig. 1, against its spring and off its seating until the suction-stroke is completed. On or after the compression-stroke has commenced the discharge-valve L′, Fig. 2, is opened by one of the cams M′, and the charge passes through a spring-closed non-return valve and enters the cylinder until its ports J^3 (see in dotted lines, Fig. 2) are overrun by the passing piston *a*. This point is situated and timed to allow the air-pump piston to get home or to the end of its stroke before the inlet to cylinder is completely closed. The said cams M′ are mounted on a rotary shaft M^6, which is operated as follows: To the connecting-rod F is attached a stud F^7, to which is pivoted a link N′, which is also connected to a lever O′, secured to the cam-shaft M^6, so that shaft M^6 is rotated from the connecting-rod F. The regulated charge having entered the explosion-cylinder, the valve L′ is closed by its spring, which closure occurs when the pistons *a* have overrun the inlet-ports or have about one-half (more or less) of their compression-stroke to travel. This completed the ignition is then effected by any suitable means or as shown. To the stud F^6, before alluded to, on the link F is also attached the end of a lever or crank P′, Figs. 2 and 4, which rotates a spindle Q′, passing through stuffing-boxes outside the cylinders and having thereon contact-formers *q q′*, which are so arranged as to alternately make and break connection with contacts in an electric circuit, and thus to emit a spark when the charge is ready for exploding. The exploded charge is exhausted through the exhaust-ports and pipe D^2, Fig. 2, into a silencing-box or muffler. On shaft M^6 is mounted a centrifugal governor M^8. This when a predetermined speed is exceeded shifts the bell-crank lever S^4 and causes the connecting-rod R′ to operate a bell-crank lever S′, which is adapted to shift the carbureter-valve closely and reduce the amount of enriched air entering the cylinders.

The spindles of the two steering-wheels have integral with them a bell-crank lever T′, Figs. 7 and 8. This is pivoted in a fork U′ at each end of the stationary axle-bar V.

One end of a connecting-rod V′ is attached to the end of T′, its other end being connected to a lever W′, situated beneath and secured to the vertical steering-spindle X′. Another like connecting-rod is attached to the corresponding levers operating the other wheel. Above the two levers, which are integral with each other upon the one spindle X′, is the steering-lever.

The front end of the frame carrying the motors and gear rests upon a pivoting-basin W^5, supported upon a volute spring Y′, Fig. 7, thereby affording an effectual absorbent of all vibration and vertical shock. It also preserves the alinement of the main axle and the motor-frame.

The main driving-wheels are not secured to the shaft O, but in order to accommodate themselves to the major and minor curves in turning are loose thereon, but connected thereto by suitable clutch mechanism, not forming part of the present invention, but which will allow them to accommodate themselves to major and minor curves.

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

1. In a variable transmission-gear, the combination of a crank-shaft, a rocking lever, a pitman connecting said crank-shaft to said lever, an adjustable block slidably mounted on said lever, an expansible and contractible toggle for shifting said block, one member of said toggle being pivoted to the block and the other member to a sliding collared sleeve, said toggle rocking with said lever, a forked slide engaging said sleeve having a toothed rack on its end and a rotatable pinion engaging said rack, and means for rotating said pinion, substantially as and for the purpose described.

2. In a motor-vehicle, the combination of the open-ended cylinder, the oppositely-movable pistons therein, the opposite crank-shafts connected to said pistons, crank-disks on the outer ends of said shafts, and links connecting said disks; a vibrating lever, a pitman connecting one of said crank-disks to said vibrating lever, an adjustable sliding block on said lever, and a toggle rocking with the lever and adapted to adjust the position of the block; with a driven shaft, the upper and lower segmental, oppositely-oscillating, clutch-cheeks thereon, links connecting said clutch-cheeks to a slide, and a rod connecting said slide to said block, and means for actuating the toggle to adjust said block on the lever, all substantially as and for the purpose described.

3. In a variable-speed motor, the combination of a pair of driving crank-shafts connected by a vibrating lever I, and a pitman for vibrating said lever I connected to one of said crank-shafts; a sliding cross-head G^2, and a pitman connecting said cross-head to a slide F^2 on said lever, the said slide being adjustable toward or from the pivot of the lever; and means for adjusting said slide on the lever; with a driven shaft, the opposite oscillating clutch-cheeks thereon, and the rods for operating said clutch-cheeks from said cross-head, for the purpose and substantially as described.

4. In a variable-speed motor, the combination of a crank, a cylinder, a piston, a piston-rod and crank-shaft, a vibrating lever I, a pitman connecting said lever to said crank-shaft, an adjustable slide-block F^2 on said lever, the toggle-lever Q and R whereby said block can be adjusted toward or from the pivot of the vibrating lever, said toggle-lever rocking with said vibrating lever, and the sliding collar U, link T, and slide-bar V for expanding or contracting said toggle-lever while the machine is in operation; with a driven shaft and means for operating said shaft connected to the said slide-block on said vibrating lever, for the purpose and substantially as described.

5. In a motor-vehicle, the combination of the cylinder A, a crank-shaft D driven therefrom carrying a crank-disk E, a pivoted vibrating lever I, a pitman H connecting said lever to said crank-disk, an adjustable sliding block F^2 on said lever, a cross-head G^2 connected to said slide, a toggle Q, R, for adjusting said block on said lever, the link T, collar U, and slide rock-bar V for operating the toggle; with the driven shaft, the oppositely-disposed clutch-cheeks M, M^4, on said shaft, and the connections between said cheeks and said cross-head G^2, for the purpose and substantially as described.

6. In a motor-vehicle, the combination of the open-ended cylinder, the oppositely-movable pistons therein, the opposite similarly-rotating crank-shafts driven by pitmen from said pistons, and the link connecting said crank-shafts; with a vibrating lever I, a pitman H connecting said lever to one of the said crank-shafts, an adjustable block F^2 on said lever, and a slide or cross-head G^2, a pitman J connecting said slide to said adjustable block, a driven shaft, clutches M, M^4, thereon and reciprocating rods K for operating said clutches, connected to said cross-head; with the toggle Q, R, for operating slide F^2, the links T, collar U, rock-bar V, gear W, and shaft K^3, for operating said toggle; all substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

JOHN PENDER.

Witnesses:

EDWIN PHILLIPS,

CECIL W. LE ELASTRIER.