No. 710,329. Patented Sept. 30, 1902.

R. C. MARKS.

EXPLOSIVE ENGINE FOR MOTOR VEHICLES.

(Application filed Sept. 7, 1901.)

(No Model.) 2 Sheets—Sheet 1.

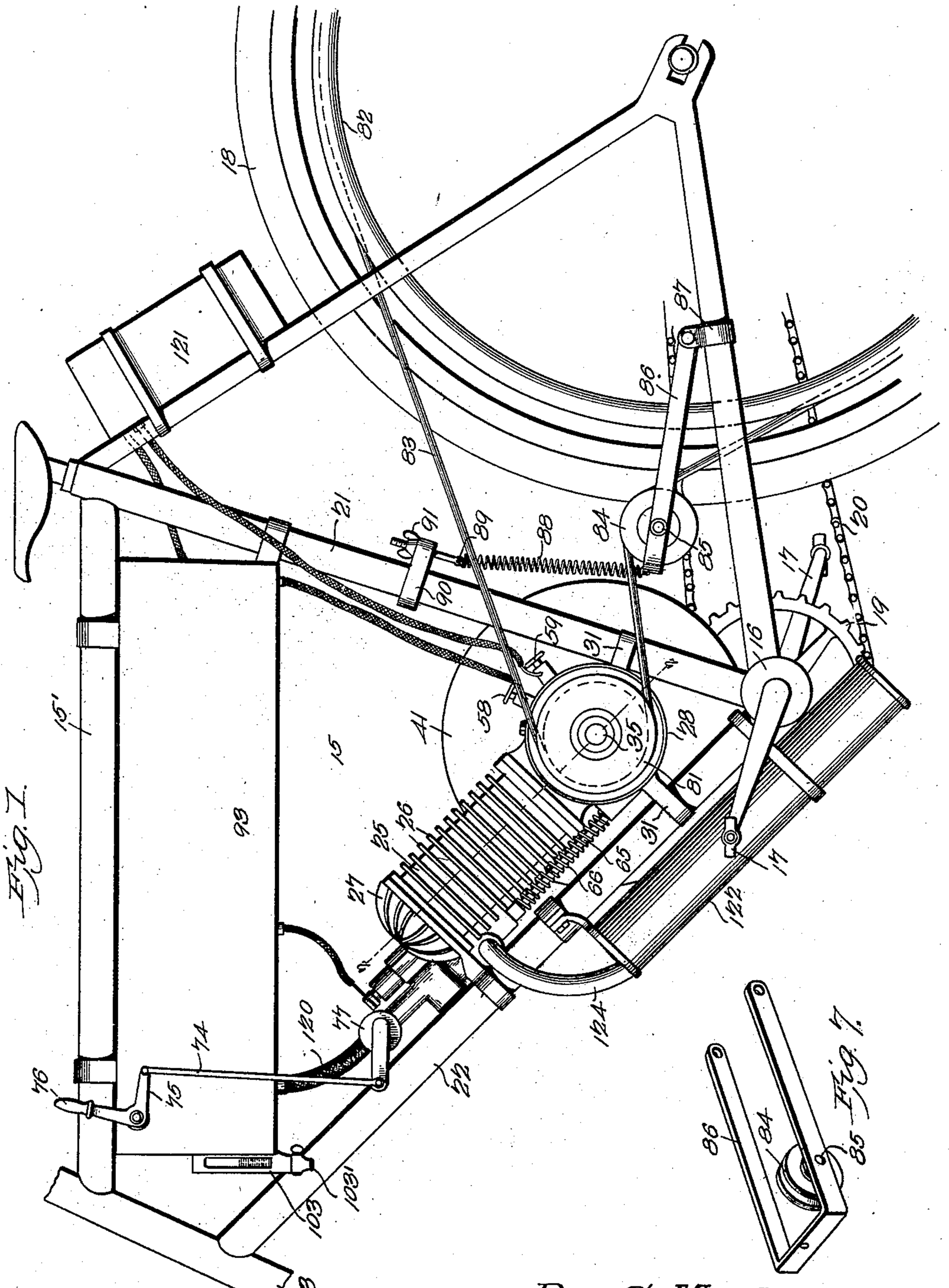

Fig. 1.

Fig. 7.

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Fig. 2.

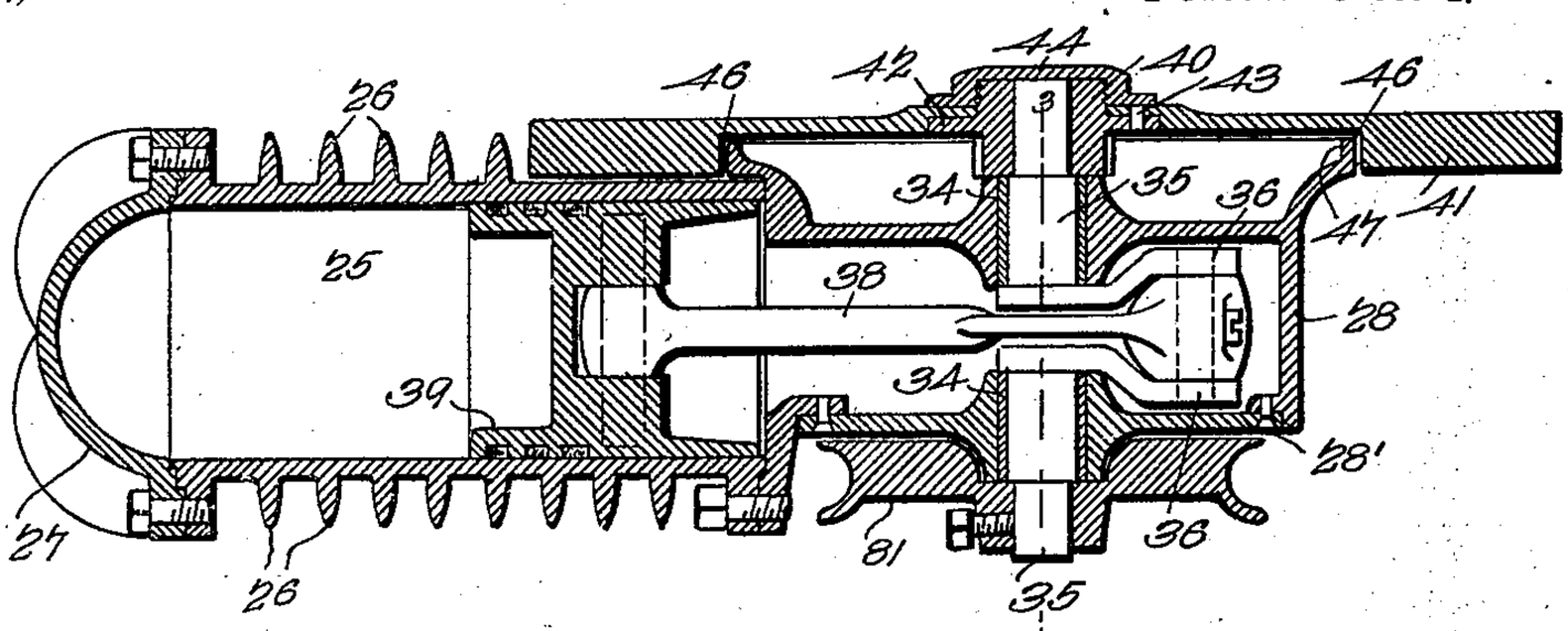


Fig. 3.

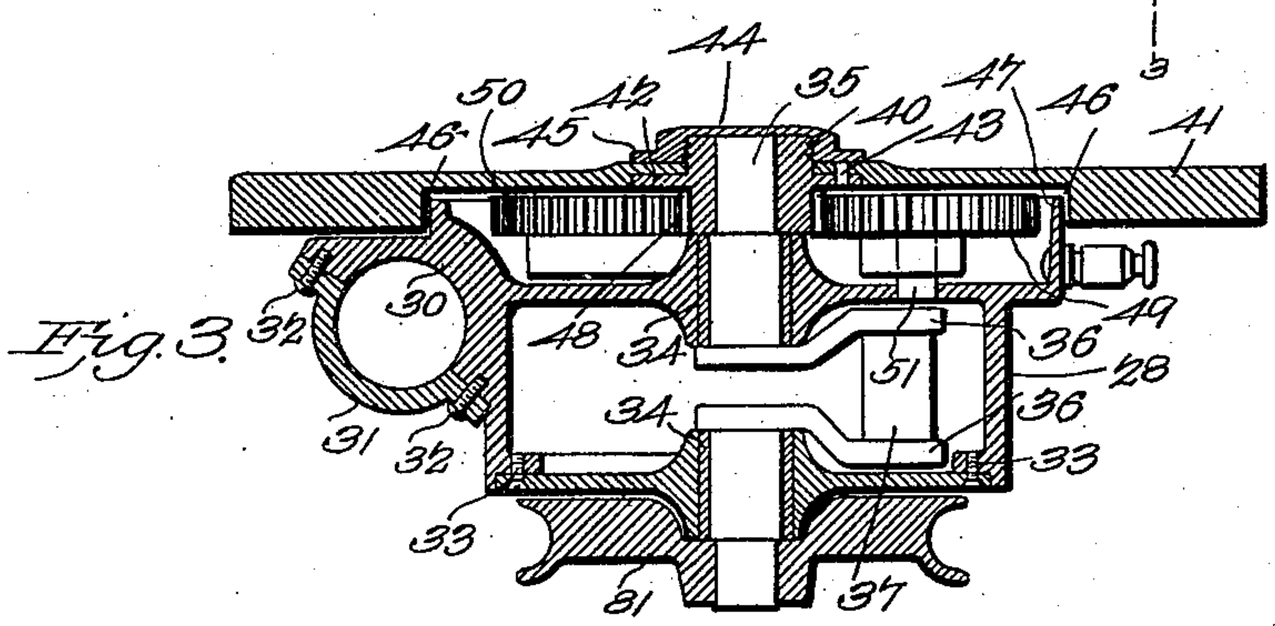


Fig. 4.

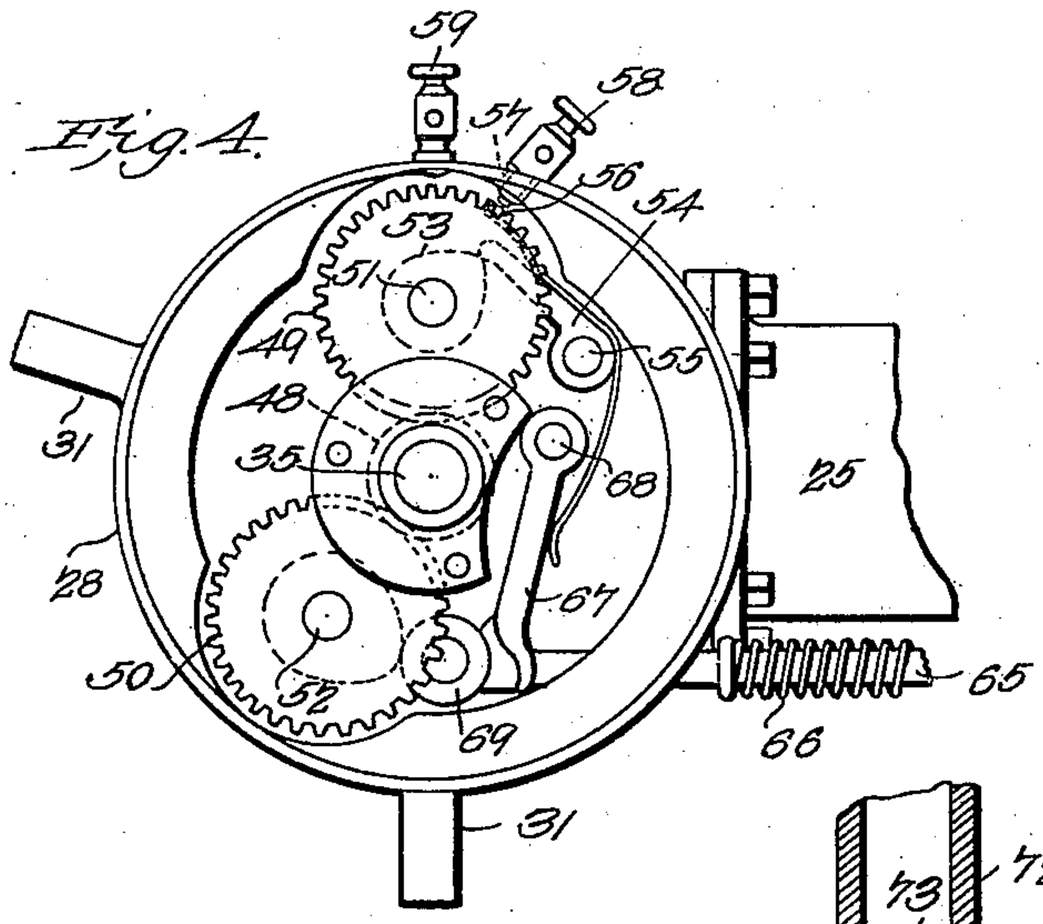


Fig. 5.

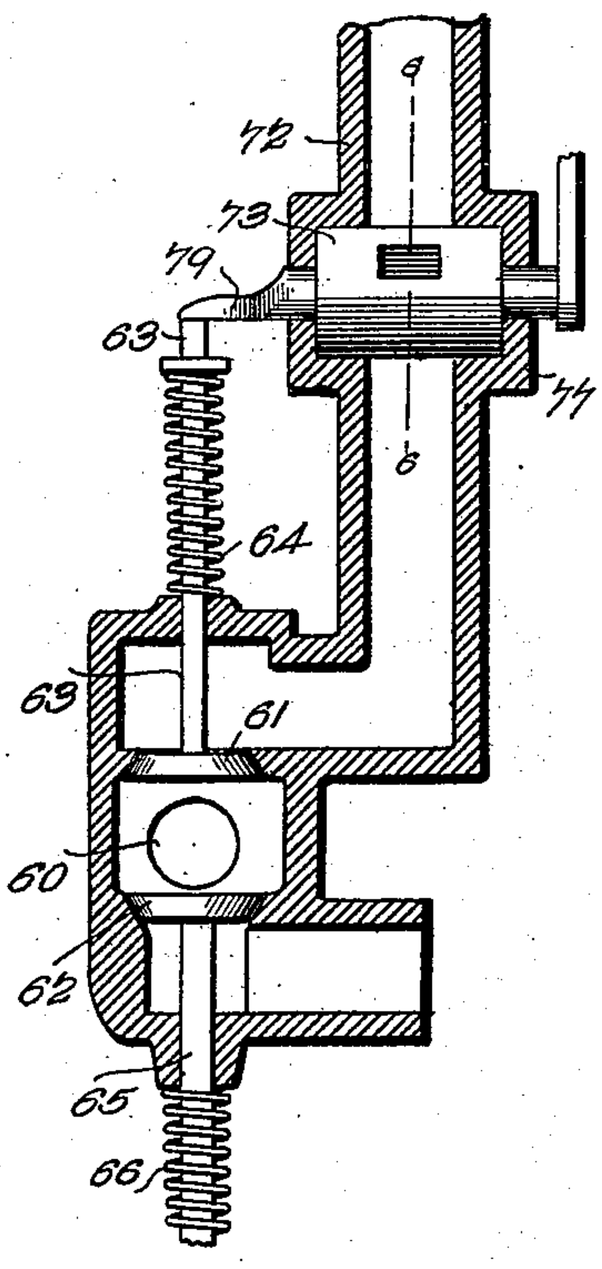
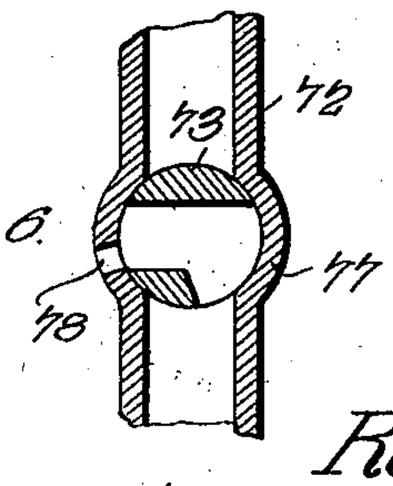


Fig. 6.



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UNITED STATES PATENT OFFICE.

ROY CLIFTON MARKS, OF SAN DIEGO, CALIFORNIA.

EXPLOSIVE-ENGINE FOR MOTOR-VEHICLES.

SPECIFICATION forming part of Letters Patent No. 710,329, dated September 30, 1902.

Application filed September 7, 1901. Serial No. 74,654. (No model.)

To all whom it may concern:

Be it known that I, ROY CLIFTON MARKS, a citizen of the United States, residing at San Diego, in the county of San Diego and State of California, have invented a new and useful Explosive-Engine for Motor-Vehicles, of which the following is a specification.

My invention relates to certain improvements in motor-bicycles; and it has for its principal object to provide an improved form of gas-motor which may be applied to any bicycle of the safety type without any change in the construction of any portion of the bicycle and without interfering with the pedal operating mechanism employed for propelling the machine by manual power.

A further object of the invention is to provide a simple means of securing the motor in place in such manner as to render it in a measure self-adjusting and to provide for the low seating of the motor, so as not to disturb the center of gravity of the machine.

A still further object of the invention is to so arrange and combine the crank-shaft casing and the fly-wheel as to form a dust-proof chamber for containing a spark-timing and valve-operating mechanism, and, further, to reduce the width of the machine at this point, so that it will not interfere with the rider when using the pedals either as foot-rests or in propelling of the machine.

A still further object of the invention is to provide an elongated bearing-surface for the main crank-shaft of the motor without unduly increasing its length and without weakening the crank-pin connections.

A still further object of the invention is to provide, in connection with the suction inlet-valve of the motor, a combined throttle and compression-relief valve, so that the two valves may be opened by a single movement to place the interior of the cylinder in communication with the atmosphere in the starting of the motor.

With these and other objects in view the invention consists in the novel combination and arrangement of parts hereinafter more fully described, illustrated in the accompanying drawings, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a side elevation of the motor-bicycle constructed and arranged in accordance with my invention. Fig. 2 is a transverse sectional view of the motor on the line 2 2, Fig. 1. Fig. 3 is a transverse sectional elevation through the crank-shaft casing on the line 3 3, Fig. 2. Fig. 4 is an end elevation of a portion of the crank-shaft casing and its connected parts, the fly-wheel being removed. Fig. 5 is an elevation of a portion of the upper end of the motor. Fig. 6 is a transverse sectional elevation of the same on the line 6 6, Fig. 5. Fig. 7 is a detached perspective view of the mechanism for taking up the slack of the driving-belt.

Similar numerals of reference indicate corresponding parts throughout the various figures of the drawings.

In the drawings, 15 designates an ordinary bicycle-frame having the usual crank-hanger 16, pedals 17, and rear driving-wheel 18, operatively connected to the usual sprocket-wheel 19 by a link belt 20. The motor is secured to the seat-post tube 21 and the lower front bar 22, which extends from the crank-hanger 16 to the steering-head 23, and is seated down as low as possible in the angle formed by these two tubes, the object being to secure as low a seating as possible in order not to materially disturb the center of gravity of the machine. The motor, which is of the four-cycle type, has a cylinder 25, provided, as usual, with heat-radiating ribs 26 and which offer an extended surface for the action of the air and tend to keep the cylinder cool. To one end of the cylinder is bolted a ribbed head 27, and to the opposite end is secured a crank-axle casing 28, the whole forming a rigid structure, which is secured to the bicycle-frame by clamps, as shown. The clamps, of which three are employed in the present instance, are arranged one on the cylinder-head and the remaining two on the crank-casing, and each comprises a substantially semicircular socket-piece 30, formed integral with the cylinder-head or the casing, and a semicircular clip 31, secured in place by screws 32. The sockets and the various clips extend completely around the tubes of the frames and when the motor is to be placed in position are adjusted loosely in place and

the motor allowed to seat itself in the angle formed by the tubes to which it is secured. The clips are then tightened in place and the motor is securely locked in position.

The crank-casing 28 is circular in form and has one head or end 28′ removably secured thereto by screws 33, so that it can readily be taken off, if desired, to gain access to the crank. In this casing 28 and the head 28′ are formed elongated bearings 34 for the reception of a two-piece crank-shaft 35, the adjacent spaced ends of which are secured to cranks 36. The outer ends of the cranks are bent outwardly to points beyond the lines of the bearings and at their outer ends are connected by a crank-pin 37. By thus reducing the space between the adjacent ends of the crank I am enabled to produce a much longer bearing-surface for the crank-shaft, and thus add to the life of the machine, without reducing the strength of the crank-pin connection or increasing the length of the crank-shaft. The crank-pin 37 is connected by a rod 38 to a piston 39 of the ordinary construction, as illustrated in Fig. 2. To one end of the crank-shaft is secured a hub 40 of the fly-wheel 41. This hub is provided with an enlarged annular flange 42, to which are secured a number of pins 43, adapted to suitable openings in the central web of the fly-wheel, and the latter is secured in place by a nut 44, adapted to the threaded outer end of the hub, said nut being preferably provided with enlarged flange 45, which will fit over the openings formed in the web of the fly-wheel. The central portion of the inner side of the fly-wheel is provided with an enlarged circular recess 46, into which fits a flanged portion 47 of the crank-casing and forming a dust-proof casing for the reception of the exhaust-valve-operating mechanism and a timing-cam for the sparking circuit. The inner end of the hub 40 is provided with gear-teeth 48, and said teeth intermesh with the teeth of gear-wheels 49 and 50, mounted, respectively, on fixed studs 51 and 52, carried by the crank-casing, the relative arrangement and size of the gearing being such that two complete revolutions of the crank-shaft 35 and pinion 48 will result in one complete revolution of the gear-wheels 49 and 50. To the gear-wheel 49 is secured a cam 53, adapted to operate upon the lever 54, pivoted on a fixed stud 55 and provided with a contact-piece 56, adapted when moved outwardly by the cam 53 to make contact with a block 57, carried by the binding-post 58, insulated from the casing and forming a terminal of the sparking circuit. The opposite terminal is formed by a binding-post 59, electrically connected to the crank-casing, and the circuit being completed at these points once at each two revolutions of the engine and held closed during the time of the passing of the usual sparking electrodes in the cylinder. The arrangement of the sparking electrodes may be that ordinarily followed in the construction of gas-engines of the four-cycle type, in which the piston has, first, a vacuum or suction stroke to fill the cylinder with gas; second, a compression-stroke; third, the explosion or working stroke, and, fourth, the exhaust-stroke, and the contact through the plates 56 and 57 taking place at or near the end of the compression-stroke.

At one side of the cylinder is the gas inlet and exhaust port 60, provided with a suction inlet-valve 61 and exhaust-valve 62, both of the usual type. The valve-stem 63 of the inlet-valve extends out through a suitable opening in the casing and is surrounded by a coiled compression-spring 64, which normally tends to hold said valve in the closed position. The stem 65 of the exhaust-valve is similarly provided with a coiled compression-spring 66. The lower end of the stem 65 of the exhaust-valve extends down through an opening in a crank-casing and is seated against the lever 67, pivoted on a stud 68 and having at its free end an antifriction-roller 69, which travels in contact with a cam 70, secured to the gear-wheel 50, the construction of the cam being such that it will operate positively upon the antifriction-roller 69 to move the exhaust-valve to the open position at or near the end of the working stroke of the piston, such operation taking place once during every two revolutions of the engine.

In the gas-inlet pipe 72 is a throttle-valve 73, connected by a rod 74 to a bell-crank lever 75, the vertical arm of said lever 75 being provided with a handle 76, arranged at the upper forward part of the bicycle-frame at a point near the handle-bars and within convenient reach of the rider. The casing 77 of the throttle-valve is provided with an opening 78, which by moving the throttle-valve to a point a trifle beyond the full closed position may be placed in communication with the lower portion of gas-pipe 72. The movement of the throttle-valve to this position will cause the engagement of an arm 79, carried by the valve, with the upper end of the stem 63 of the inlet-valve 61, opening said valve and placing the interior of the cylinder in communication with the atmosphere, so that the piston may be operated by hand in starting the motor. This may usually be accomplished by propelling the bicycle for a short distance by the ordinary pedals 17.

To one end of the crank-shaft 35 is secured a belt-wheel 81, and to the felly of the driving-wheel 18 is secured a grooved ring 82, said ring being connected to the pulley 81 by a belt 83, which also passes over an idler 84, journaled at 85 in a frame 86. The frame 86 is of U shape, with one arm passing on each side of the driving-wheel and fulcrumed to brackets 87, carried by the lower forks of the bicycle-frame. The forward central portion of this frame is secured by a tension-spring 88 to an eyebolt 89, adapted to a bracket 90 on the seat-post tube and provided with a thumb-screw 91, which may be turned to reg-

ulate the tension of the spring and take up any slack in the belt.

Secured to the under side of the upper bar 15′ of the frame is a tank 93, having in its lower rear portion a compartment 94 for the reception of a sparking coil 95 of the usual character, the main body of the tank serving as a reservoir for the gasolene. The compartment or reservoir is preferably provided with a sight-tube 103, by which the height of the gasolene may be observed, the lower portion of the sight-tube being provided with a drain-cock 103′, by which the tank may be emptied when required.

To the rear of the frame at a point under the seat is secured the battery-box 121, of a size sufficient to contain enough batteries to form a spark, and such batteries are connected by wires in the usual manner to the sparking coil and the electrodes.

The construction of the device is such that the motor will not interfere with the propulsion of the device by manual power, and in case of breakdown the removal of the belt 83 will enable the rider to entirely disconnect the motor and use the pedals for driving the machine.

The construction may be modified in a variety of ways in order to accommodate different conditions of use, and various details may be altered within the scope of the claims without departing from the spirit or sacrificing any of the advantages of my invention.

Having thus described my invention, what I claim is—

1. A gas-operated motor having a crank-shaft, a crank-casing, a recessed fly-wheel into which said casing extends to form a closed chamber, valve-operating mechanism contained within said chamber, and gearing connecting said valve-operating mechanism to the crank-shaft.

2. A gas-operated motor having a crank-casing, an annular flange on said casing, and a fly-wheel having a recess for the reception of the flange of the crank-casing, the whole forming a closed chamber for the protection of the valve-operating mechanism.

3. The combination in a motor, of a crank-shaft, a casing therefor, a fly-wheel on said crank-shaft, a pinion carried thereby, gears having journals on the crank-shaft casing and intermeshing with said pinion, spark-timing and valve-operating cams carried by said gears, and a protective casing for said gears, said casing being formed partly by the fly-wheel and partly by said crank-casing.

4. The combination in a motor, of a crank-shaft, a crank, a crank-casing, a recessed fly-wheel mounted on the crank-shaft at a point outside the casing, and a valve-gear casing formed partly by the outer portion of said crank-casing and partly by said fly-wheel.

5. The combination in a motor, of a crank-shaft, a toothed and flanged hub secured thereto, pins carried by the flange, a recessed fly-wheel having in its central web openings for the reception of said pins, a securing-nut adapted to threads on the hub, and valve-operating gearing intermeshing with the teeth of said hub.

6. The combination in a motor, of a crank-shaft, a hub secured thereto and having gear-teeth, a recessed fly-wheel secured to said hub, a crank-casing having an annular flange adapted to fit within the recess of the wheel, gear-wheels mounted on studs carried by the crank-casing and intermeshing with the teeth of the hub, a spark-timing cam operatively connected to one of said gear-wheels, a contact-breaker adapted to be operated by said cam, a valve-operating cam operatively connected to the second gear-wheel, and mechanism connecting said cam to the exhaust-valve of the motor.

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

ROY CLIFTON MARKS.

Witnesses:
LOUIS H. BILL,
ADOLPH R. THEISEN.