No. 686,653. Patented Nov. 12, 1901.

C. HAHN.

IMPACT MOTOR.

(Application filed Dec. 22, 1899.)

(No Model.) 3 Sheets—Sheet 1.

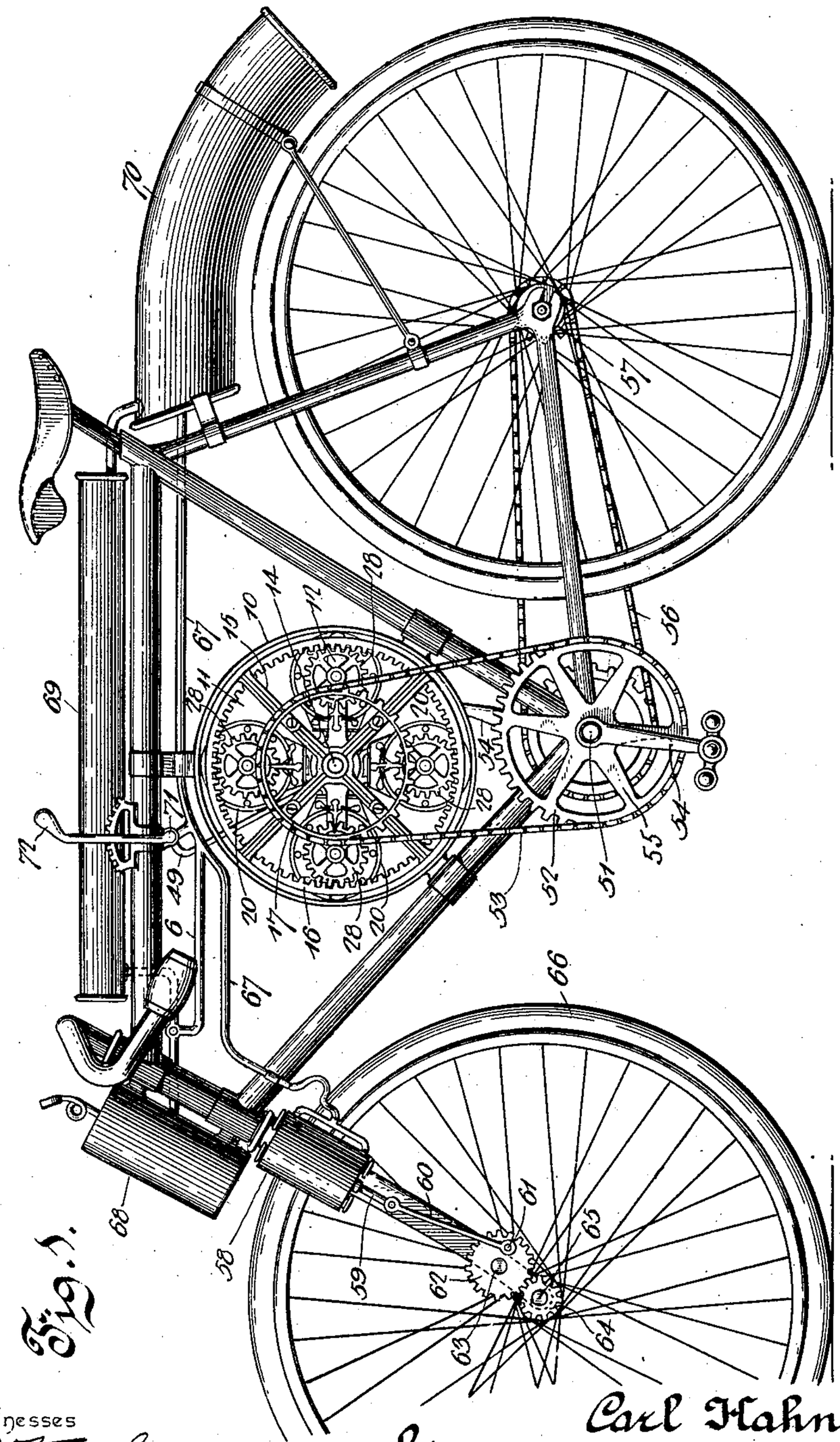

Fig. 1.

Witnesses
J. Faupel Underwell.
Geo. H. Chandlee.

Carl Hahn, Inventor.
By his Attorneys,
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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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(No Model.) 3 Sheets—Sheet 2.

Fig. 2.

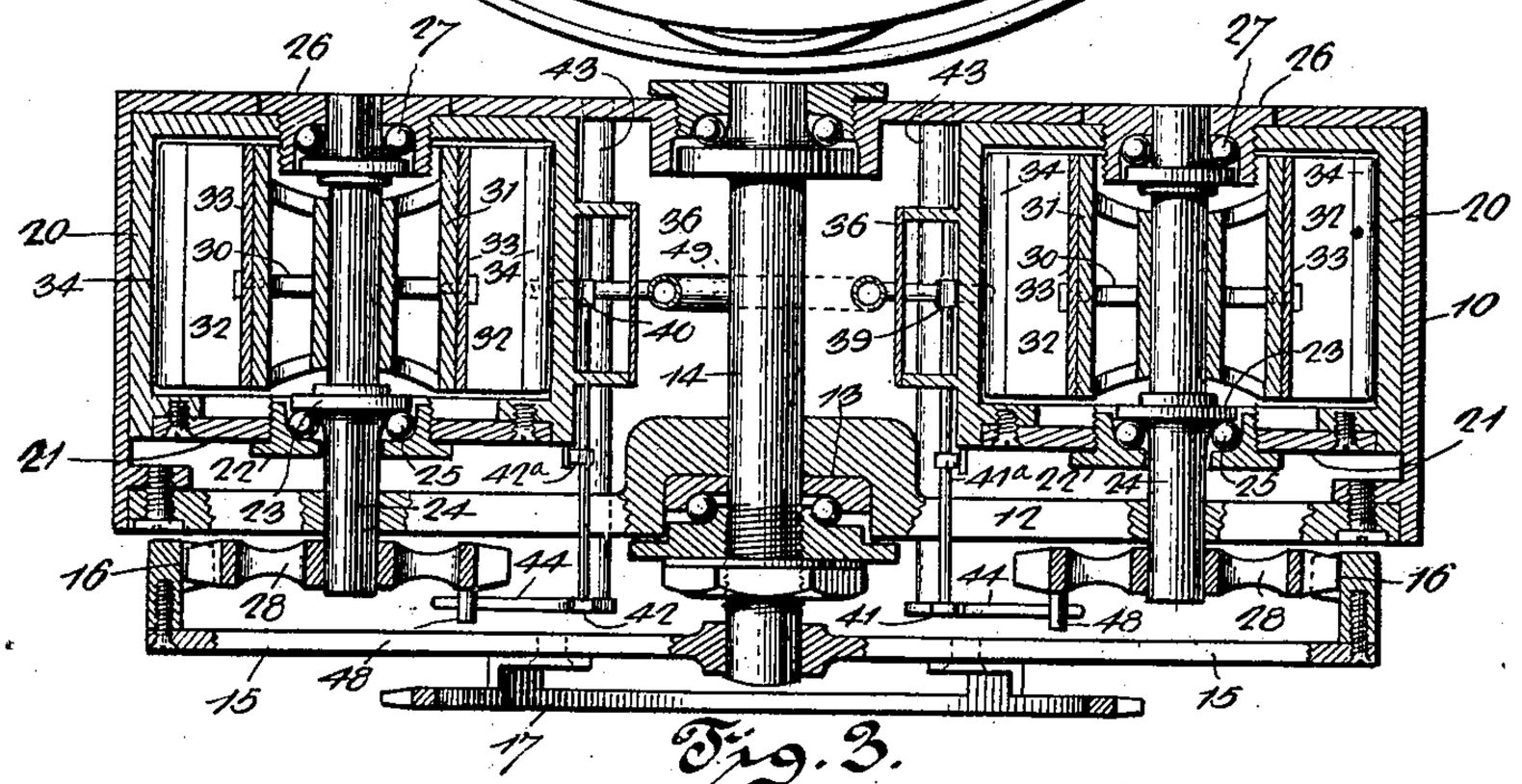

Fig. 3.

Witnesses
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3 Sheets—Sheet 3.

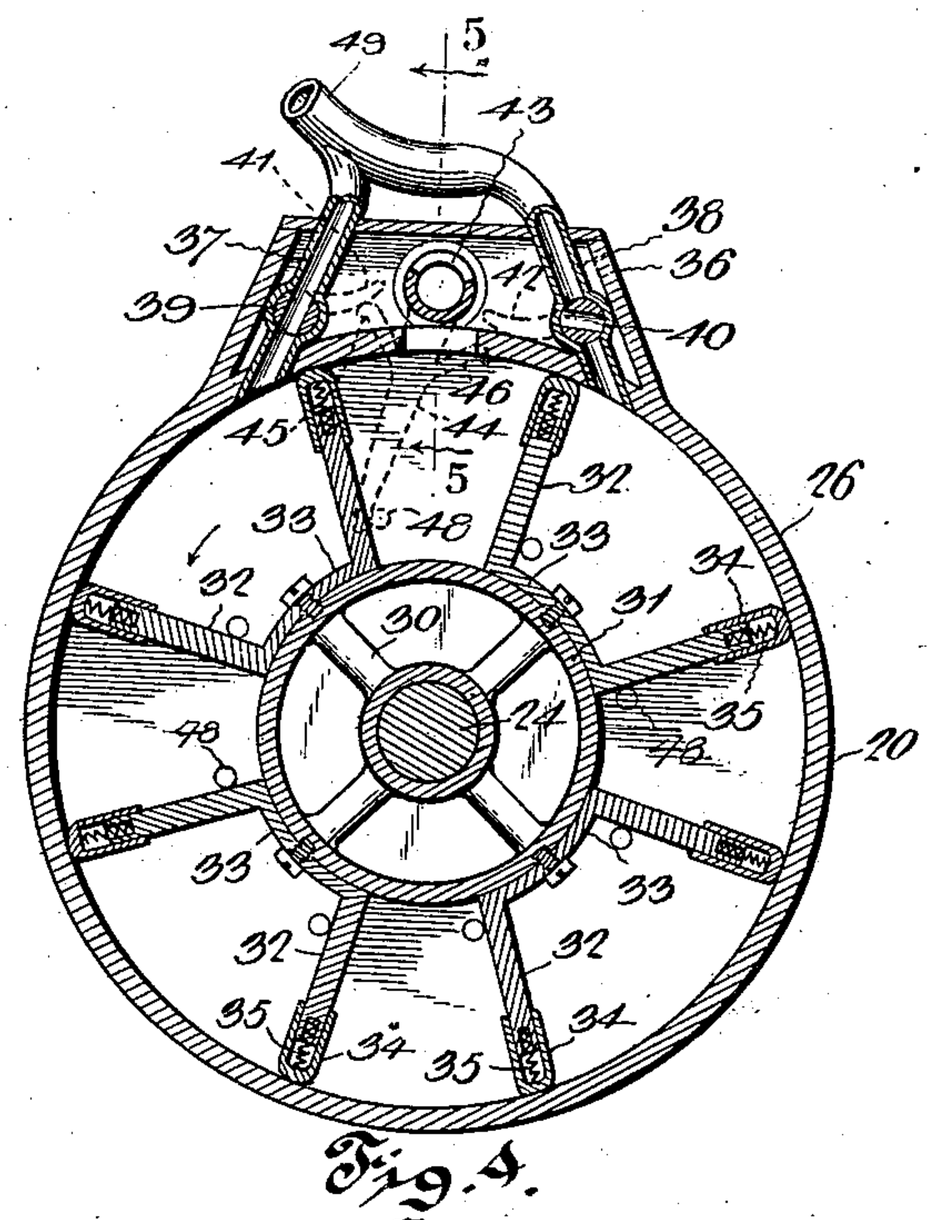

Fig. 4.

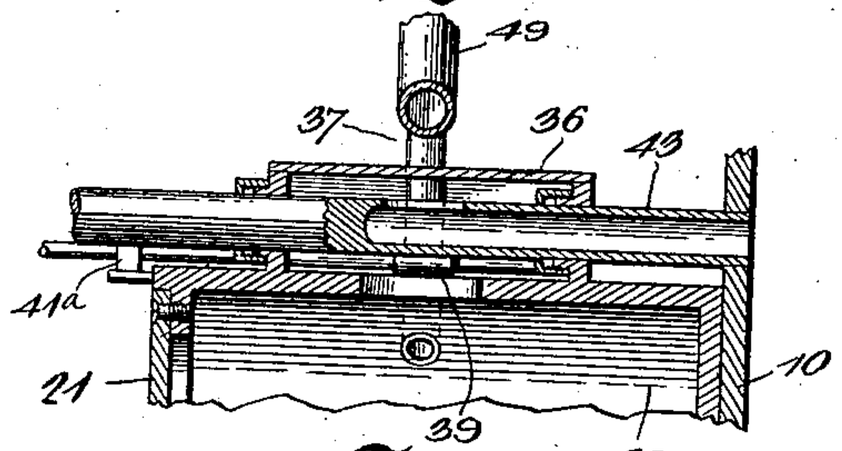

Fig. 5.

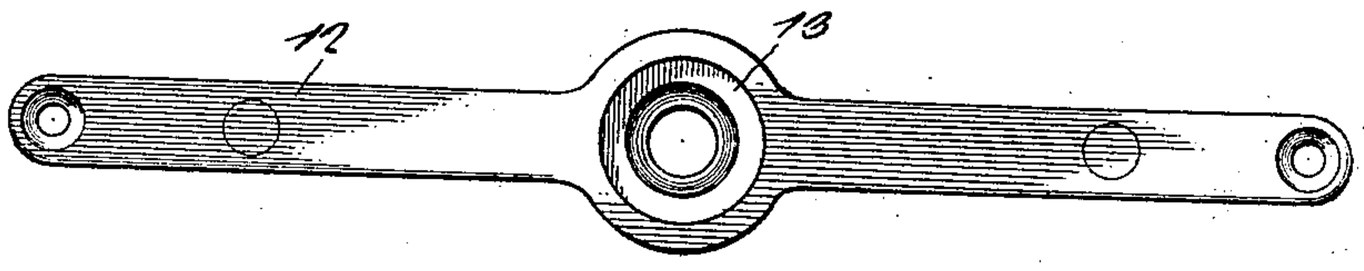

Fig. 6.

Witnesses
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Geo. H. Chandlee.

Carl Hahn, Inventor.
By his Attorneys,
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UNITED STATES PATENT OFFICE.

CARL HAHN, OF FORT WORTH, TEXAS.

IMPACT-MOTOR.

SPECIFICATION forming part of Letters Patent No. 686,653, dated November 12, 1901.

Application filed December 22, 1899. Serial No. 741,288. (No model.)

To all whom it may concern:

Be it known that I, CARL HAHN, a citizen of the United States, residing at Fort Worth, in the county of Tarrant and State of Texas, have invented a new and useful Impact-Motor, of which the following is a specification.

This invention relates to impact-motors, and more particularly to that class known as "rotary engines," and while it is particularly adapted for propelling bicycles and other vehicles it may be employed in any other connection where power is required.

The object of the invention is to provide a simple and efficient motor particularly adaptable for vehicle propulsion and which when once started in either direction will automatically arrange its valve to continue that direction of rotation.

Further objects and advantages of the invention will be evident from the following description.

In the present instance the motor is shown in connection with a bicycle, and a system of pumps and tanks are used whereby as the bicycle is traveling downgrade it may store energy in the form of compressed air in the tanks to be used in assisting the rider to go up an incline.

In the drawings forming a portion of this specification, and in which similar numerals of reference designate like and corresponding parts in the several views, Figure 1 is a side elevation of a bicycle equipped with the mechanism of the present invention. Fig. 2 is a detail elevation of the motor and its casing and showing the location and arrangement of the driving-sprocket from which the power of the engine is taken. Fig. 3 is a section on line 3 3 of Fig. 2 and showing the sprocket-shaft and two of the motor-shafts in elevation. Fig. 4 is a transverse section of one of the motor-cylinders and its piston, said section being taken through the inlet-pipes. Fig. 5 is a section on line 5 5 of Fig. 4. Fig. 6 is an elevation of one of the braces in which the sprocket-shaft has a bearing.

Referring now to the drawings, and more particularly to Figs. 2, 3, and 4, the motor of the present invention comprises a cylindrical casing 10, one end of which is closed, as shown at 11, and the other end of which is open. The open end of the cylinder is provided with a diametrical cross-beam 12, having a central recess 13, in which are disposed the bearings for one end of a shaft 14, the opposite end of which has a bearing in the closure 11 of the rear end of the casing. These bearings are of the usual ball type and require no specific explanation.

Mounted upon the shaft 14 and exteriorly of the casing 10 is a spider 15, to which is fixed an internal gear 16, lying upon the inner faces of the arms of the spider and concentric with the shaft 14, a sprocket 17 being fixed to the spider upon its outer face and disposed concentric with the shaft 14. The internal gear 16 is operated by means of a plurality of independent motors, which in this case are four in number. Each of these motors, as shown in Figs. 2, 3, and 4, comprises a cylinder 20, having covers 21 for their front ends, which are disposed in the direction of the open end of the casing 10, and centrally of which covers are engaged disks 22, adapted to coöperate with flanges 23 upon shafts 24 to form races to receive bearing-balls 25. Each of the shafts 24, which are disposed centrally of the cylinders 20, coöperates with a plug 26 to form a race for balls 27, each of the cylinders being thus provided with a central shaft having ball-bearings, and each of the shafts project beyond the beam 12 and is provided with a pinion 28, meshing with the internal gear 16. To rotate the shaft 24 of each of the cylinders, said shaft is provided with a spider 30, upon which is fixed a cylindrical base 31. To the outer face of the cylindrical base 31 are secured wings 32, which are formed in pairs integral with an arc-shaped plate 33, this arc-shaped plate being secured directly upon the outer face of the base 31. These wings 32 are equally spaced one from the next, and each wing is provided with a packing 34, which is held against the inner face of the cylinder 20 by means of helical springs 35. The piston thus formed by the wings 32 and their supporting-base is adapted for rotation by the impact of the fluid under pressure, and each of the cylinders 20 has a chest 36 affixed to its outer face, and through this chest are passed two diverging inlet-pipes 37 and 38, which are adapted to alternately deliver fluid under pressure to the wings 32, the fluid from the pipe 37 being

adapted to strike the wings at one side, while the fluid from the pipe 38 strikes the wings from the opposite side. Thus the piston may be rotated in either direction by delivering the fluid through the corresponding pipe. Each of the pipes 37 and 38 is provided with a turning plug-valve 39 and 40, respectively, the valve 39 having a lug 41, while the valve 40 has a corresponding lug 42, these lugs projecting inwardly. An exhaust-pipe 43 communicates with the cylinder 20 at a point between the pipes 37 and 38, and upon this pipe is pivotally mounted a rock-lever 44, having fingers 45 and 46, which are adapted to engage the lugs 41 and 42. These valves 39 and 40 stand normally closed.

The pinion 28 is provided with a number of equidistant pins 48, corresponding to the number and positions of the wings of the piston, and the rocker lies in the path of the pins as the piston is rotated. If the piston be started to the left, a pin 48 will strike the rocker 44 and will move it to engage its arm 45 with the lug 41 to open valve 39, when fluid under pressure will be admitted to the cylinder through pipe 37, and in striking a wing 32 of the piston will rotate the latter to the left. When the engaged pin leaves the rocker, it tends to return to its normal position; but as the piston continues to rotate the next pin 48 strikes the rocker and holds the valve open to permit the fluid under pressure to strike the next wing, the wings and pins having proper relation to accomplish this result, and the pins 48 will successively strike the rocker to continue this rotation so long as fluid under pressure is supplied to the pipe 37 and its impact is delivered to the piston-wings. If, on the other hand, the piston be started to rotate to the right, the pins successively engage the rocker to move the lug 42 and open valve 40 and hold it open to permit the impact to strike the wings on their left sides and continue the rotation to the right. When the engine is running at normal speed, the pins 48 strike the rocker with such rapidity that it is held in open position, the spring not having time to return the valve to its closed position and the rocker to drop to its normal position before the next pin strikes the rocker and the rocker in turn holds the valve open.

The reason for having the large number of striking-pins is in order that at whatever point the wheel of the motor may stop a very slight movement of the wheel in either direction will open a valve to permit fluid under pressure to be delivered to the wheel.

In Fig. 1 of the drawings this motor is shown as applied to a bicycle, and the casing 10 is attached to the frame of the bicycle by means of brackets, the crank-axle 51 of the bicycle having a second sprocket 52, which is connected by means of a chain 53 with the sprocket 17. The crank-axle 51 is provided with the usual cranks 54 and with the sprocket 55, which is connected by means of the chain 56 with the usual sprocket 57 in the ordinary manner. In order to supply the several cylinders with fluid under pressure, pumps 58 are mounted upon the sides of the fork of the front wheel and the piston-rods 59 of which have a pitman 60, the free ends of which are mounted upon wrist-pins 61 in pinions 62, mounted upon a stub-shaft 63, carried by the fork sides near their lower ends. The pinions 62 mesh with pinions 64, fixed to the front shaft 65, which rotates with the front wheel 66. Thus if the front wheel is rotated the pumps are operated. These pumps are adapted to pump air, and are connected by means of pipes 67 with reservoirs 68, 69, and 70. The feed-pipe 49 above referred to connects with the pipe 67 through a plug-valve 71, having an operating-handle 72 and by means of which the valve 71 may be manipulated to regulate the supply of fluid to the motor. The reservoirs 68, 69, and 70 are secured to different portions of the bicycle-frame, and with the arrangement shown it will be seen that the valve 71 may be closed when going downhill, when the pump will operate and pump air into the several reservoirs or tanks for use in propelling the bicycle on level or to assist in climbing the next grade.

In order to hold the valves 39 and 40 normally closed, the stems thereof, which carry the fingers 41 and 42, are provided with strap-springs 41^a and 42^a, fixed thereto, and the free ends of which bear against projections upon the cylinders. (Shown in Fig. 3 of the drawings.) Thus when the rocker releases the fingers the valves automatically close.

With the foregoing construction it will be seen that in order to drive the motor in the reverse direction it is only necessary to shut off the supply of fluid and then to start the motor in the opposite direction, when the pins 48 will engage the rockers and move them to engage the fingers of the second series of valves and open their corresponding inlets to energize the motor.

What is claimed is—

1. A motor comprising a carrier having a shaft journaled therein and provided with a gear, a plurality of cylinders upon the carrier and each having a rotary piston, a pinion carried by each piston and meshing with the gear, a projection upon each pinion, inlet-pipes for the cylinders provided with regulating-valves, and means lying in the paths of the projections of the pinions, for operating the valves of their respective cylinders.

2. A motor comprising a cylinder, a rotatable piston in the cylinder, fluid-inlets leading to the piston, a valve for each inlet, a rocker adapted for movement to successively engage the valves to operate them, and pins operably connected with the piston for successive contact with the rocker to operate one or the other of the valves, according to the direction of rotation of the piston.

3. A motor comprising a cylinder, a shaft

mounted in the cylinder, a rotatable piston fixed to the shaft, fluid-inlets leading to the cylinder and disposed oppositely, controlling-valves for the inlets, a fluid-exhaust communicating with the cylinder, a rocker mounted upon the fluid-exhaust and arranged to engage one or the other of the valves according to the direction of rotation of the piston, to operate the valves.

4. An impact-motor comprising a carrier, a shaft journaled in the carrier, a spider mounted upon the shaft and carrying an internal gear, a sprocket mounted upon the spider, a plurality of cylinders upon the carrier, a rotatable piston within each cylinder, a pinion carried by each piston and meshing with the internal gear, fluid-inlets for each cylinder, regulating-valves for the inlets of each cylinder and having operating mechanisms, means carried by each piston for moving operating mechanism of its valve, and fluid-outlets for the cylinder.

5. In a motor, the combination with a cylinder having a piston rotatably disposed therein and provided with inlets arranged to deliver fluid to the piston to rotate it in opposite directions, separate valves for the inlets, a device for operating one or the other of the valves individually, and means operable by the piston for moving the valve-operating device to operate one or the other of the valves according to the direction of rotation of the piston.

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

CARL HAHN.

Witnesses:
P. JONSON,
CARL SCHILDER.