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REGULATOR FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED MAR. 4, 1908.

943,726.

Patented Dec. 21, 1909.

FIG. 1.

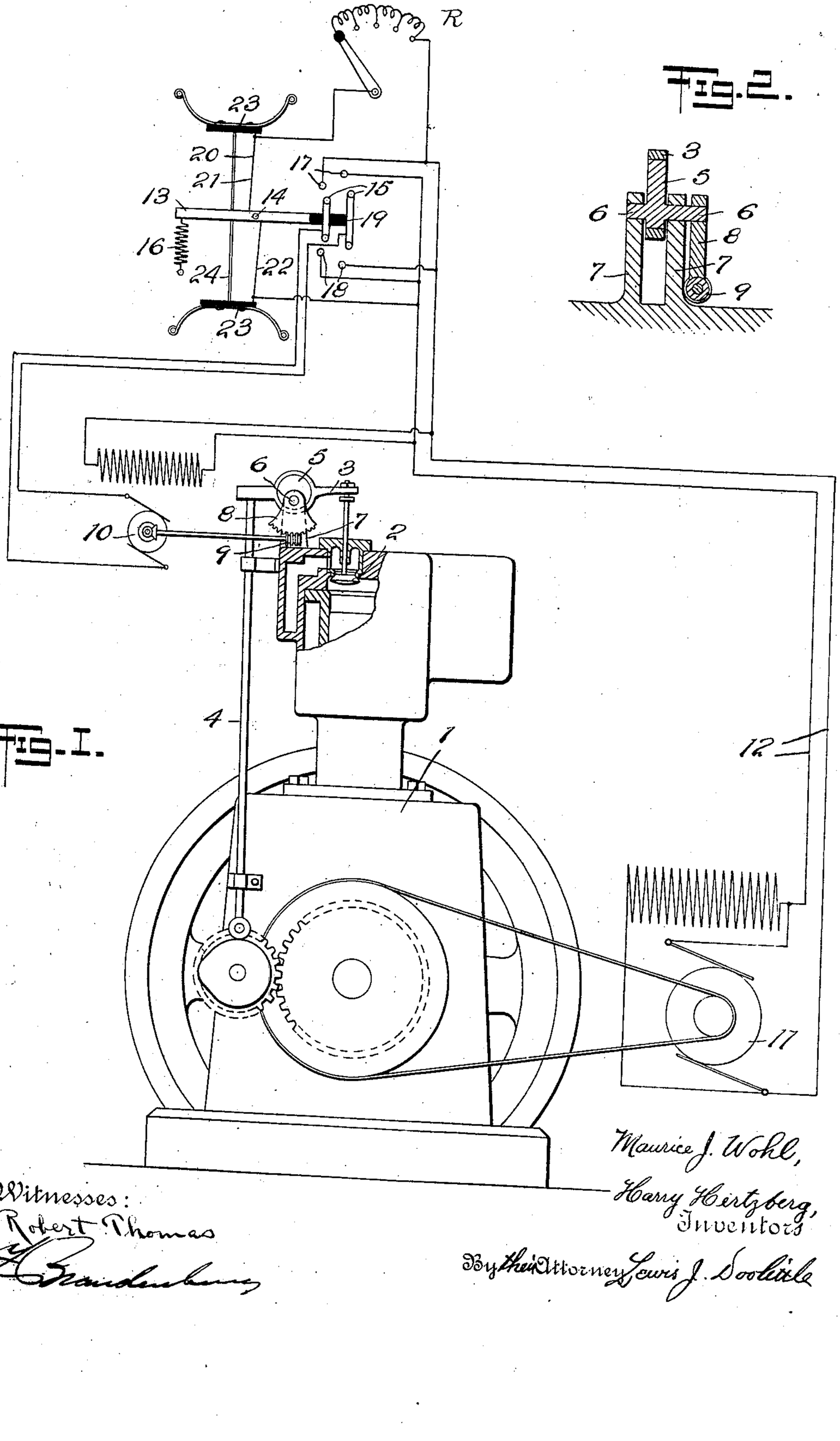

FIG. 2.

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UNITED STATES PATENT OFFICE.

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REGULATOR FOR INTERNAL-COMBUSTION ENGINES.

943,726. Specification of Letters Patent. Patented Dec. 21, 1909.

Application filed March 4, 1908. Serial No. 419,107.

To all whom it may concern:

Be it known that we, MAURICE J. WOHL and HARRY HERTZBERG, citizens of the United States, and residents, respectively, of the city of New York, borough of Manhattan, county and State of New York, and of the city of New York, borough of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Regulators for Internal-Combustion Engines, of which the following is a specification.

The object of this invention is to provide means for maintaining the speed of a gas engine constant, through the expansion and contraction of an electrical conductor, the current through which is varied by variations in the speed of the engine.

A further object is, in connection with such an arrangement, to provide means for varying the speed of the engine from one constant speed to another.

Broadly, the invention consists in the combination, with a gas engine, of a circuit including a conductor adapted to expand by reason of the heat generated by a current passing therethrough, connection between said conductor and the inlet valve of the engine, whereby the expansion and contraction of said conductor varies the degree of opening of the valve, and means whereby the speed of the engine varies the current in said circuit.

In the accompanying drawings is furnished an illustration of one way in which the invention may be carried into effect.

In these drawings, Figure 1 is a semi-diagrammatic view of the whole arrangement, and Fig. 2 is a detail in section.

Referring to these drawings, the numeral 1 indicates an engine of the internal combustion type, and 2 its inlet valve. This valve is opened and closed in a customary manner, through the rocker arm 3, actuated by the cam-operated rod 4.

5 is the pivot for the rocker arm 3; and is itself pivoted on the eccentric stub journals 6, which are conveniently received in journal lugs 7. A worm gear segment 8 may be fixed to one of these stub journals; and the gear may be actuated by a worm 9, driven by a motor 10.

11 indicates a dynamo, which may be belted or otherwise connected directly to the engine. This dynamo drives the motor 10; 12 being the conductors leading thereto. Means is provided for reversing the motor; this means being preferably in the nature of a reversing switch 13, for reversing the direction of the current in the armature of the motor. The switch is pivoted at 14, and may be partially of insulating material, as at 19, where are mounted the contact members 15. A spring 16 may be provided, for slightly more than overcoming the force of gravity. As will be readily seen, when the contact members 15 rest on the contacts 17, the current passes through the armature of motor 10 in one direction; whereas, when the contact members 15 rest on the contacts 18, the direction of current in this armature is reversed. The consequence, of course, is that the gear 8 is turned in one direction or the other; and this, in turn, raises or lowers the pivot 5, so that the degree of opening of the valve 2 is varied. Normally the contact members 15 rest neither on the contact 17 nor 18: when this is the case, the pivot 5 is not affected.

The switch 13 is operated by a conductor 20, included in a shunt from the main dynamo circuit. This conductor or wire has sufficient resistance to be heated by the current passing through it: and may be in two sections, 21 and 22, which are secured to the switch 13 at opposite sides of its pivot, so that contraction of the wires turns the switch against the tension of the spring 16. When the wires expand, the switch is turned in the opposite direction by said spring.

It is important to provide means whereby the expansion and contraction of the conductor 20 caused by the temperature of the air shall not affect the switch. This may be effected by securing the remote ends of conductor sections 21 and 22 to spring supports 23, and connecting these supports by a compensating wire 24, which is equally affected as to expansion and contraction by the temperature of the air as is the conductor 20. It will be seen that a fall in temperature of the surrounding air, causing equal contraction in conductor 20 and wire 24, results in the wire 24 drawing the supports 23 slightly toward each other. As the amount of inward movement of these supports is exactly the amount of contraction of the conductor 20, as well as of the wire 24, it follows that the conductor sections 21 and 22 exert no pull on the switch. Conversely,

expansion both of conductor 20 and wire 24, permits the spring supports 23 to separate slightly, taking up the slack in the conductor sections 21 and 22, without permitting the spring 16 to turn the switch.

It will be understood, of course, that the arrangement is such that the expansion of conductor 20, due to a greater output of current from the dynamo, due in turn to increased speed in the engine, results, through the instrumentalities described, in reducing the degree of opening of the inlet valve, with consequent reduction of engine speed. Reduced speed in the engine results, conversely, in a greater opening of the inlet valve, so that the engine speed is brought back to the desired constant.

In order to vary the speed of the engine at will, we have shown a variable resistance R in the shunt with the conductor 20.

It will be understood that the constructions and arrangements which we have shown are merely illustrative, and that the embodiment of the underlying principles of the invention, as stated at the outset, may be widely varied.

What we claim as new is:

1. In combination with a gas engine, means for regulating the speed thereof, comprising a circuit including a conductor adapted to expand by reason of the heat generated by a current passing therethrough, connection between said conductor and the inlet valve of the engine whereby the expansion and contraction of said conductor varies the degree of opening of the valve, means whereby the speed of the engine varies the current in said circuit, and means for varying the current in said circuit at will.

2. In combination with a gas engine, means for regulating the speed thereof, comprising a dynamo driven by the engine, a motor adapted to be supplied with current from said dynamo, connection between said motor and the inlet valve of the engine whereby the degree of opening thereof is increased or diminished according to the direction of rotation of the motor, a reversing switch for the motor, and a conductor in shunt from the dynamo circuit adapted to expand by reason of the heat generated by current passing therethrough, said conductor being connected to the reversing switch to operate the same through its expansion and contraction.

3. In combination with a gas engine having its inlet valve operated by a rocker-arm, means for regulating the speed of the engine, comprising an eccentrically journaled pivot for said rocker-arm, a motor connected with said pivot to turn the latter, a reversing switch for the motor, a circuit including a conductor adapted to expand by reason of heat generated by current passing therethrough, said conductor being connected with the reversing switch to operate the same, and means whereby the current in this conductor circuit is varied according to the speed of the engine.

4. In combination with a gas engine having its inlet valve operated by a rocker-arm, means for regulating the speed of the engine, comprising an eccentrically journaled pivot for said rocker-arm, a worm gear connected to said pivot, a worm meshing with said gear, a motor for driving the worm, a reversing switch for the motor, a circuit including a conductor adapted to expand by reason of heat generated by a current passing therethrough, said conductor being connected with the reversing switch to operate the same, and means whereby the current in this conductor circuit is varied according to the speed of the engine.

5. In combination with a gas engine, means for regulating the speed thereof, comprising a motor connected with the inlet valve of the engine to vary the degree of opening thereof, a reversing switch for said motor, a circuit including a conductor adapted to expand by reason of the heat generated by current passing therethrough, connection between said circuit and the engine whereby variations in speed of the latter varies the current in the circuit, spring supports to which the ends of said conductor are secured, the conductor being connected intermediately to the reversing switch to operate the latter through expansion and contraction, and a compensating wire connecting said spring supports, being adapted to be affected equally with the conductor by atmospheric temperature.

6. In combination with a gas engine, means for regulating the speed thereof, comprising a motor, connection between said motor and the inlet valve of the engine whereby the degree of opening of the latter is increased or diminished by the operation of the motor, a reversing switch for the motor, a circuit including a conductor adapted to expand by reason of the heat generated by current passing therethrough, said conductor being connected with the reversing switch to operate the same, means whereby the current in this conductor circuit is varied according to the speed of the engine, and a variable resistance in circuit with said conductor.

Signed at Brooklyn, New York city, in the county of Kings and State of New York this 29th day of Feb. 1908.

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